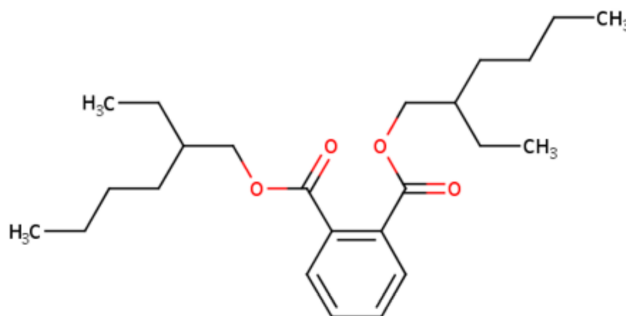


**Data Quality Evaluation and Data Extraction Information for
Environmental Release and Occupational Exposure for
Diethylhexyl Phthalate (DEHP)
(1,2-Benzenedicarboxylic acid, 1,2-bis(2-ethylhexyl) ester)**

Systematic Review Support Document for the Risk Evaluation

CASRN: 117-81-7



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

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

Additionally, each data type and condition of use is evaluated independently within a given study; therefore, each reference may have more than one overall quality determination (OQD) to reflect the quality of each outcome and the exposures and releases more appropriately as described by the study authors. No OQD is determined for each reference, as a whole, if it contains data from more than one evidence stream.

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Occupational Exposure		
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6302293	Sealants,, Tremco (2015). Safety Data Sheet (SDS): Universal C/P Super White.	727
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6302554	Smooth-On, (2007). Material Safety Data Sheet (MSDS): PMC-744 Part A.	729
6302561	Smooth-On, (2007). Material Safety Data Sheet (MSDS): Reoflex™ Series Part A.	730
6302571	Smooth-On, (2008). Material Safety Data Sheet (MSDS): VytaFlex™ Series Part A.	731
6302536	Spectrum Chemical Mfg Corp, (2015). Safety Data Sheet (SDS): Dioctyl phthalate.	732

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6311466	StatSpin, (2004). Material Safety Data Sheet (SDS): Hematocrit tube sealant pad.	735
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5432967	SUNY, (2019). Phthalates in infant cotton clothing: Occurrence and implications for human exposure. Science of the Total Environment 683:109-115.	738
6302301	Systems,, Ultraflex (2018). Material Safety Data Sheet (MSDS): BriteLine Banner.	739
6311493	Tools,, Imperial (2015). Safety Data Sheet (SDS): Imperial Liqui-Vac.	740
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5155525	Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates in specified materials at concentrations above 0.1 percent.	743
1335161	Turnbull, D., Rodricks, J. V. (1985). Assessment of possible carcinogenic risk to humans resulting from exposure to di-2-ethylhexylphthalate. Journal of the American College of Toxicology 4(2):111-146.	745
11138808	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.	746
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11803647	U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization, volume 1.	748
11845553	U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization appendices, volume 2.	750
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7315471	U.S. EPA, (2016). Chemical Data Reporting (CDR): Complete 2016 submissions.	761
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7315841	U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.	763
9102524	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.	764
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6311470	Valspar, (2017). Safety Data Sheet (SDS): Red glazing putty 1# tube.	769
6311471	Valspar, (2024). Safety Data Sheet (SDS): Pronto Kombi Spot Putty.	770
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6302307	Wasser, (2021). Material Safety Data Sheet (MSDS): Polyflex 411A Iso-Catalyst.	775
6302308	Wasser, (2021). Safety Data Sheet (SDS): MC-Shieldcoat 100.	776
6311459	Williams,, Sherwin (2019). Safety Data Sheet (SDS): PLANET COLOR™ FX Rubber Black.	777
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5533553	Zhang, L.,i, Su, W.,ei, Qian, Y., Zhao, Y., Zhu, Z., Wang, D. (2016). Quantitative detection and impact evaluation of phthalate plasticizers in insulating oil. <i>IEEE Transactions on Dielectrics and Electrical Insulation</i> 23(6):3429-3434.	787
7976469	Ügdüler, S., Geem, Van, K. M., Roosen, M., Delbeke, P., E.I., Meester, De, S. (2020). Challenges and opportunities of solvent-based additive extraction methods for plastic recycling. <i>Waste Management</i> 104:148-182.	788

Study Citation:	Afshari, A., Gunnarsen, L., Clausen, P. A., Hansen, V. (2004). Emission of phthalates from PVC and other materials. Indoor Air 14(2):120-128.			
HERO ID:	789522			
Conditions of Use:	Industrial/Commercial Use Products			
EXTRACTION				
Parameter	Data			
Worker activity description:	PVC flooring, PVC skirting, Electric cable, Electric wire, Wallpaper, Refrigerator strip, Polyolefine			
Exposure route:	Vapor			
Area sampling data:	Air concentrations show little variation between products containing DEHP. After 150 days they were in the range of 0.2 ug/m3 for polyolefine (which was not added DEHP)to 1.2 ug/m3 for PVC skirting.			
Comments:	These data can be used for determining background DEHP levels in buildings with DEHP-containing materials.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	This is a very comprehensive study that can be directly applied to occupational settings which use the products tested in the study.
	Metric 4:	Temporal Representativeness	Medium	Methods utilized are applicable to current uses, though the study is between 10 and 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination		High		

Study Citation:	Albar, H., Ali, N., Shahzad, K., Ismail, I., I.M., Rashid, M. I., Wang, W.,ei, Ali, L. N., Eqani, S. (2017). Phthalate esters in settled dust of different indoor microenvironments; Source of non-dietary human exposure. Microchemical Journal 132:227-232.			
HERO ID:	3859024			
Conditions of Use:	Household/consumer use			
EXTRACTION				
Parameter	Data			
Exposure route:	ingestion, inhalation			
Physical form:	dust			
Area sampling data:	Table 1 gives concentrations of indoor dust (ug/g) - min, max, mean, median: Floor dust - 71.5, 2401, 1140, 1020; Car dust - 62.6, 2446, 1170, 1250; AC filter dust - 76, 3196, 1300, 790; Another floor dust sample - 30, 784, 4.2, 2.8; Another car dust sample - 30, 784, 310, 320. Dust samples from other countries in Table 2, does not mention if they are means, medians or maxes, etc: Sweden - 449, 770 223; Denmark - 210, 179; Germany - 703, 604; France: 462, 185; Kuwait: 2256; Bulgaria - 1050; China - 183, 228; US - 304, 340; UK - 192; Spain - 195.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so methodology is high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for Saudi Arabia and Kuwait, both non-OECD countries.
	Metric 3:	Applicability	Uninformative	Data is gen pop house hold exposure and does not have to do with any occupational setting.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes sample type, exposure route, and physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different indoor environments and comparing to other studies. Does not address uncertainty.
Overall Quality Determination		Uninformative		

Study Citation:	Andaluri, G., Manickavachagam, M., Suri, R. (2018). Plastic toys as a source of exposure to bisphenol-A and phthalates at childcare facilities. Environmental Monitoring and Assessment 190(2):65.			
HERO ID:	4728733			
Conditions of Use:	Commercial/Consumer Use (Toys, playground, and sporting equipment)			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	solid plastics			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	1 hour/day estimated			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for childcare facilities, which is similar to the in-scope occupational scenario use of toys, playground, and sporting equipment.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (average) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling at multiple facilities.
Overall Quality Determination		High		

Study Citation:	Baek, K. M., Kim, M. J., Seo, Y. K., Kang, B. W., Kim, J. H., Baek, S. O. (2020). Spatiotemporal variations and health implications of hazardous air pollutants in Ulsan, a multi-industrial city in Korea. Atmosphere 11(5):547.			
HERO ID:	6950643			
Conditions of Use:	Industrial Use			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Area sampling data:	DEHP and DBP were found to be the most common phthalates in the ambient air of Ulsan. Atmospheric concentrations (ng/m3) of DEHP in industrial and residential areas of Ulsan were: Site A - 71.27 +/- 62.03; Site B - 46.16 +/- 24.97; Site C - 109.27 +/- 69.18; Site D - 53.02 +/- 33.02; Site E - 79.77 +/- 52.14. Sites A, B, and C are industrial areas, and Sites D and E are residential areas. Summation of phthalates vary with seasons as follows (concentrations as ng/m3): Site A – 38.82 (winter) to 192.75 (autumn); Site B – 32.40 (winter) to 103.82 (autumn; Site C – 66.35 (winter) to 286.15 (summer); Site D – 36.54 (winter) to 110.73 (summer); Site E – 57.95 (winter) to 203.01 (summer).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	methodology is well described
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country. other than the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses variability and uncertainty
Overall Quality Determination		High		

Study Citation:	Chakraborty, P., Sampath, S., Mukhopadhyay, M., Selvaraj, S., Bharat, G. K., Nizzetto, L. (2019). Baseline investigation on plasticizers, bisphenol A, polycyclic aromatic hydrocarbons and heavy metals in the surface soil of the informal electronic waste recycling workshops and nearby open dumpsites in Indian metropolitan cities. Environmental Pollution 248(Elsevier):1036-1045.			
HERO ID:	5433039			
Conditions of Use:	Disposal - electronic waste			
EXTRACTION				
Parameter	Data			
Area sampling data:	Sampling data in ng/g of soil and tabulated in Table 1 (min-max (mean +/- SD)): Precious metal recovery (EWR) - 43-2804 (614 +/- 1225); e-waste dismantling (EWD) - 16-68 (29 +/- 22); e-waste shredding - 17-91 (44 +/- 33); Dumpsite (DS) - 16-30 (21+/- 5).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so methodology is likely to be accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for India, a non-OECD country.
	Metric 3:	Applicability	Low	Data is for informal sector of waste dismantling and includes municipal dumpsites.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes release media and activity of source.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different sources of release in the same industry. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Chao, K. P., Huang, C. S., Wei, C. Y. (2015). Health risk assessments of DEHP released from chemical protective gloves. Journal of Hazardous Materials 283(Elsevier):53-59.			
HERO ID:	2718083			
Conditions of Use:	Laboratory use of nitrile and PVC gloves.			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	Dermal exposure data			
Personal protective equipment:	PPE tested in this study were nitrile (Best 727-11, USA) and PVC (Best BO710, Japan)chemical protective gloves.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed, analytical methodology is likely accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for Taiwan, a non-OECD country.
	Metric 3:	Applicability	Low	Data is for dermal exposure of DEHP in nitrile and PVC gloves based on a specific solvent permeating through the glove into the skin. Likely not applicable to an occupational scenario.Related COU would be DEHP used in plastics which is used for plastic gloves (this may be relevant for understanding leaching of DEHP from plastic glove.)
	Metric 4:	Temporal Representativeness	High	Data is from 2015 so less than 10 years old.
	Metric 5:	Sample Size	Medium	Range of data for the permeability and dose data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents results, methods and assumptions in its analytical technique and calculations. Generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by the different chemicals used to determine what the dermal dose would be. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Chien, Y. C., Ton, S., Lee, M. H., Chia, T., Shu, H. Y., Wu, Y. S. (2003). Assessment of occupational health hazards in scrap-tire shredding facilities. Science of the Total Environment 309(1-3):35-46.			
HERO ID:	1488993			
Conditions of Use:	Disposal - recycling of tires			
EXTRACTION				
Parameter	Data			
Worker activity description:	Individual workers generally worked only within a limited area and ensured proper operating conditions, while also removing the product from each processing stage as necessary.			
Area sampling data:	Total volatile organic compound levels in the plants, measured from instruments that provided direct readings, were in the range of 1.4–2.2 ppm, and were stable across the different areas. Due to the sensitivity of the instrument, the levels measured within the facility might not differ from the background level of ~1.4 ppm. See Table 1 - DEHP identified in one of the two plants as a VOC. // See Table 2 for total and respirable PNOR concentrations, ranging from 0.43-6.54 mg/m3 (total) and 0.23-1.25 (respirable). See Table 4 - DEHP was identified in airborne particulate condensates in both plants.			
Particle size characterization:	The respirable fraction of total particulate were nearly constant in each plant, being ;35% for plant A and ;20% for plant B (Table 2). The difference is believed to be associated not only with the control measures in each plant but also with the sizes of the rubber crumbs produced. Plant B mostly generates large rubber granules of 10–15 mesh in size, while plant A produces crumbs of 8–40 mesh in size.			
Number of workers:	Both plants utilized a two shift per day working schedule, with each shift lasting for 10 and 8 h and involving 9 and 18 workers as plants B and A, respectively.			
Engineering control:	Air -pollution control devices, for example cyclone, were applied during the latter stages of the shredding process to remove rubber particles and nylon fiber. These control devices generally limit dust levels to within permissible exposure levels, although their performance is not always optimal.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure limits, industry/ process technologies) may impact exposures relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Operations, equipment, and worker activities are expected to be reasonably representative of current conditions. The monitoring data were collected after the most recent PEL establishment or update but are generally more than 10 years old. If no PEL is established, the data are more than 10 years but generally, no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/orworker activities.
Domain 4: Variability and Uncertainty				
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Study Citation:		Chien, Y. C., Ton, S., Lee, M. H., Chia, T., Shu, H. Y., Wu, Y. S. (2003). Assessment of occupational health hazards in scrap-tire shredding facilities. Science of the Total Environment 309(1-3):35-46.		
HERO ID:		1488993		
Conditions of Use:		Disposal - recycling of tires		
		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 7:	Metadata Completeness	High	The monitoring study addresses variability in the determinants of exposure for the sampled site or sector. The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination				

Study Citation:	Christia, C., Poma, G., Harrad, S., Wit, De, C. A., Sjostrom, Y., Leonards, P., Lamoree, M., Covaci, A. (2019). Occurrence of legacy and alternative plasticizers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption. Environmental Research 171:204-212.			
HERO ID:	5772597			
Conditions of Use:	Household use (dust exposure)			
EXTRACTION				
Parameter	Data			
Exposure route:	ingestion, inhalation and dermal			
Physical form:	dust			
Area sampling data:	Table 2 provides statistics of DEHP dust exposure in different indoor environments (mean, median, SD, min, max) (ug/g dust). Belgium homes - 88, 62, 115, 9.0, 497; Ireland homes - 127, 114, 80, 24, 254; Netherland homes - 123, 111, 87, 32, 307; Netherland offices - 240, 150, 201, 31, 651; Sweden offices - 751, 200, 786, 40, 1957; Sweden daycare centers (winter) - 252, 200, 152, 133, 423; Sweden daycare centers (spring) - 109, 109, 37, 83, 140.			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed which would indicate high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data consists of various OECD countries.
	Metric 3:	Applicability	Low	Data is dust concentration in homes, offices, and classrooms. Not occupational exposures.
	Metric 4:	Temporal Representativeness	High	Data is from 2019.
	Metric 5:	Sample Size	Medium	Characterized by a range with statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes exposure route, sample type, sampling location.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different indoor environments across different countries. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Craig, J. A., Ceballos, D. M., Fruh, V., Petropoulos, Z. E., Allen, J. G., Calafat, A. M., Ospina, M., Stapleton, H. M., Hammel, S., Gray, R., Webster, T. F. (2019). Exposure of nail salon workers to phthalates, di(2-ethylhexyl) terephthalate, and organophosphate esters: A pilot study. Environmental Science & Technology 53(24):14630-14637.			
HERO ID:	6318028			
Conditions of Use:	Commercial Use - Nail Salons			
EXTRACTION				
Parameter	Data			
Worker activity description:	nail technicians and nail salon owners			
Exposure route:	inhalation			
Personal sampling data:	195+-4.3 ng/g			
Exposure duration:	8 hours/day			
Exposure frequency:	40 hours/week			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for the use of nail polish at a salon, which is similar to the commercial use of paints and coatings.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, standard deviations, medians, ranges) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling at seven salons during multiple days.
Overall Quality Determination		High		

Study Citation:	Dirven, A.,M, H.A., Broek, v.d., H., P.H., Arends, M., A.M., Nordkamp, H. H., Lepper, de, G.,M, A.J., Henderson, P. T., Jongeneelen, F. J. (1993). Metabolites of the plasticizer di(2-ethylhexyl)phthalate in urine samples of workers in polyvinylchloride processing industries. International Archives of Occupational and Environmental Health 64(8):549-554.			
HERO ID:	68266			
Conditions of Use:	PVC Processing			
EXTRACTION				
Parameter	Data			
Area sampling data:	0.02 - 0.5 mg/m3			
Exposure duration:	5 days/week for 10-30 years			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Dirven, A.,M, H.A., Broek, v.d., H., P.H., Arends, M., A.M., Nordkamp, H. H., Lepper, de, G.,M, A.J., Henderson, P. T., Jongeneelen, F. J. (1993). Metabolites of the plasticizer di(2-ethylhexyl)phthalate in urine samples of workers in polyvinylchloride processing industries. International Archives of Occupational and Environmental Health 64(8):549-554.			
HERO ID:	68266			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Mixing, extruding			
Exposure route:	inhalation			
Physical form:	liquid			
Personal sampling data:	Boot Factory: Mixing - 261ug/m3 (100-1214) n=16, Extruder - 120 ug/m3 (48-278) n=11, Cable Factory: Mixing - 180 ug/m3 (9-809) n=8, Extruder - 239 ug/m3 (10-1266) n=13			
Exposure duration:	2hr once or twice a day			
Number of workers:	Boot Factory - 9, Cable Factory - 10			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country. other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure limits, industry/ process technologies) may impact exposures relative to the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years ago.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations, exposure durations worker activities, and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Dobrzyńska, M. M. (2016). Phthalates - widespread occurrence and the effect on male gametes. Part 1. General characteristics, sources and human exposure. Roczniki Państwowego Zakładu Higieny 67(2):97-103.			
HERO ID:	3230347			
Conditions of Use:	Consumer use - gen pop exposure for indoor air			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, ingestion			
Physical form:	vapor, dust			
Area sampling data:	Indoor air had 12 mg/m^3 of phthalates, of which DEHP was 2.43 mg/m^3). Median concentration of sum of phthalates in house dust was measured as 362 mg/kg with DEHP at the level of 4 mg/kg.			
Comments:	Rest of sampling conducted was urinary metabolite data and multiple other forms of human sampling.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so methodology is likely highly accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Source is from Poland, an OECD country.
	Metric 3:	Applicability	Low	Data is for gen pop exposure in indoor air and rest is urinary metabolite data for more gen pop.
	Metric 4:	Temporal Representativeness	High	Report is from 2015 and sampling data is from 2013, so less than 10 years old.
	Metric 5:	Sample Size	Low	Only median data source is given, no other statistical information.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides sampling type, physical form and exposure route but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.			
HERO ID:	7325405			
Conditions of Use:	Manufacturing, Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Workers are exposed to DEHP during manufacturing of DEHP, the formulation of DEHP (compounds, dry-blends and plastisol formulations) and the production of articles (polymer processing by calendering, spread coating, extrusion, injection moulding).			
Exposure route:	Dust ingestion and inhalation			
Physical form:	Colorless oily liquid			
Area sampling data:	The article provides information to calculate DEHP exposure. Calculated various concentrations in indoor air for DEHP based on EU and Danish data (ug/m3): Children ´s play room - 9.4 Children ´s play room, typical case - 0.16Children ´s play room, reasonable worst case - 0.81			
Dermal exposure data:	Dermal exposure data			
Personal protective equipment:	goggles			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country. other than the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Report from 2012 but data from 2001 and 2010.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The exposure results addresses variability by comparing results using different datasets but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Fishbein, L. (1992). Exposure from occupational versus other sources. Scandinavian Journal of Work, Environment and Health 18(S1):5-16.			
HERO ID:	200024			
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Occupational exposure to phthalate esters occurs during production and during the add ition to plastics (ie, PVC) during calendering and coating operations (processing of softened plastics)			
Exposure route:	Inhalation			
Personal sampling data:	Occupational air levels of up to 66 mg /m3 have been reported for DEHP, with occupational exposure which can amount to 2.0 mg/day.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Cannot access source to review sampling or analytical methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country. other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure limits, industry/ process technologies) may impact exposures relative to the U.S. The data are for an occupational scenario within the scope of the risk evaluation. More than 20 years old. Cannot access source to review sample size used.
	Metric 3:	Applicability	High	
	Metric 4:	Temporal Representativeness	Low	
	Metric 5:	Sample Size	Low	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Fong, J. P., Lee, F. J., Lu, I. S., Uang, S. N., Lee, C. C. (2014). Estimating the contribution of inhalation exposure to di-2-ethylhexyl phthalate (DEHP) for PVC production workers, using personal air sampling and urinary metabolite monitoring. International Journal of Hygiene and Environmental Health 217(1):102-109.			
HERO ID:	1600110			
Conditions of Use:	Processing - furniture/furnishing or PVC			
EXTRACTION				
Parameter	Data			
Worker activity description:	High-exposure group composed of workers who prepared (mixed, rolled, and pressed) and packaged raw materials. Low exposure were administrative staff.			
Exposure route:	inhalation, ingestion (possibly from food packaging)			
Physical form:	vapor, dust			
Personal sampling data:	See Table 1, Across all workers (ug/m^3): mean - 20.4; range - (0.10-1581.9); Low-exposure aka administrative staff: mean - 5.27; range - (0.10 - 236.8); For high exposure aka raw material processing: mean - 32.7; range - (1.26 - 1581.9)			
Area sampling data:	LOD was 0.264 ng/sample (0.55 ng/m^3 under 480 L of ambient air was sampled). Concentrations <LOD were set to one-half the LOD for calculations			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Data is peer reviewed and consists of high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for Taiwan, a non-OECD country.
	Metric 3:	Applicability	High	Data is for processing and is applicable to a COU.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Data consists of a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Has sample type, exposure route, worker activity but lacks other critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by testing across different processing sites and addressing correlation between urinary metabolite data and airborne data. Addresses uncertainty by its handling of the LOD.
Overall Quality Determination		High		

Study Citation:	Frery, N., Santonen, T., Porras, S. P., Fucic, A., Leso, V., Bousoumah, R., Duca, R. C., Yamani, El, M., Kolossa-Gehring, M., Ndaw, S., Viegas, S., Iavicoli, I. (2020). Biomonitoring of occupational exposure to phthalates: A systematic review. International Journal of Hygiene and Environmental Health 229:13548.			
HERO ID:	7978498			
Conditions of Use:	Processing: Plasticizer in plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	PVC production workers			
Exposure route:	Since phthalates usually have a low vapor pressure, inhalation is often not the dominant route of uptake; oral (e.g., hands to-mouth transfer) and dermal routes can thus play an important role in the total exposure. (2/22)			
Physical form:	oily liquid (6/22)			
Personal sampling data:	Workers in 3 PVC FactoriesPersonal air monitoring: DEHP levels significantly higher in the high vs low exposure group (Airborne DEHP GM [range]: 32.7[1.26–1581.9] µg/m3 vs 5.27 [0.10–236.8] µg/m3).			
Number of workers:	89 workers			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3:	Applicability	High	Data are for the use of plasticizers in plastic and resin products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (ranges, means, mins, maxes) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata but missing exposure duration/frequency, and PPE/controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by comparing exposure in different groups of people.
Overall Quality Determination		High		

Study Citation:	Fromme, H., Lahrz, T., Piloty, M., Gebhart, H., Oddoy, A., Rden, H. (2004). Occurrence of phthalates and musk fragrances in indoor air and dust from apartments and kindergartens in Berlin (Germany). Indoor Air 14(3):188-195.
HERO ID:	5556411
Conditions of Use:	Consumer use - household items in apartments or kindergarten classrooms

EXTRACTION	
Parameter	Data
Exposure route:	inhalation, ingestion
Physical form:	vapor, dust
Area sampling data:	Table 2 provides provides air and dust measurements in ng/m^3 and mg/kg in mean, median and maximum: indoor air apartments in order of mean, median, and max: 191, 156, 615; in kindergarten classrooms: 599, 458 and 1510. Household dust in apartments: 775.5, 703.4 and 1763. Figure 2 shows percent distribution of phthalates based on sampling data.

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Journal article is peer reviewed so highly accurate data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is from Germany, an OECD country.
	Metric 3: Applicability	Uninformative	Data is for kindergarten and apartment exposure so constitutes consumer use.
	Metric 4: Temporal Representativeness	Medium	Data is over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range with statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Contains exposure type, sample type, physical form.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by sampling various different indoor apartments and kindergarten classrooms. Does not address uncertainty.

Overall Quality Determination	Uninformative
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Study Citation:	Garberg, P., Högberg, J., Lundberg, I., Lundberg, P. (1990). NIOH and NIOSH basis for an occupational health standard. Di(2-ethylhexyl)phthalate (DEHP). 25(1989):90-110.			
HERO ID:	679543			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Area sampling data:	Liss et al.0.02-4.1 mg/m^3 for 6 heavily exposed workers.Non-detections for 44 other workers.A German factory for pthtlate production measured concentrations between 0.09 and 0.16 mg/m^3 for DEHP.Gilioli et al. measured total phthalate exposure concentration between 1 and 60 mg/m^3 with an average air concentration around 5 mg/m^3.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from three factories: one in Germany, one in Italy and the other is unspecified. These are OECD countries.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Monitoring data are greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Sample type provided but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by discussing data from different studies, but uncertainty is not addressed.	
Overall Quality Determination		Low		

Study Citation:	Garberg, P., Högberg, J., Lundberg, I., Lundberg, P. (1990). NIOH and NIOSH basis for an occupational health standard. Di(2-ethylhexyl)phthalate (DEHP). 25(1989):90-110.			
HERO ID:	679543			
Conditions of Use:	Plastics Compounding (PVC)			
EXTRACTION				
Parameter	Data			
Personal sampling data:	In a Swedish PVC processing plant, total phthalic acid ester concentrations were between 0.01-2.0 mg/m^3 in 96 2-hr personal samples.			
Area sampling data:	In a Russian PVC processing plant, total phthalate concentrations between 1.7-66 mg/m^3 were recorded.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Source includes data from Sweden and Russia. Russia is not an OECD country.
	Metric 3:	Applicability	High	Data are for PVC Processing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing two separate exposure studies, but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	Garberg, P., Högberg, J., Lundberg, I., Lundberg, P. (1989). NIOH and NIOSH basis for an occupational health standard. Di(2-ethylhexyl)phthalate (DEHP).			
HERO ID:	807356			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	Occupational exposure occurs during the production of DEHP, during the addition of DEHP to plastics, and in the processing of softened plastics.			
Exposure route:	inhalation and dermal			
Physical form:	DEHP is a colourless to yellow, oily liquid at room temperature and normal atmospheric pressure.			
Personal sampling data:	pg. 8/54: 8 hr TWA of 0.02 - 4.1 mg/m3 for 6 heavily exposed workers, 44 other workers at the same plant were below the limit of detection.			
Area sampling data:	pg 9/54: In an Italian factory for production of DEHP had between 1 and 60 mg/m3 with an avg of around 5 mg/m3....DEHP air concentrations between 0.09 and 0.16 mg/m3 were reported from a German factory for phthalate production.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from European countries
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Low		

Study Citation:	Gaspar, F. W., Castorina, R., Maddalena, R. L., Nishioka, M. G., Mckone, T. E., Bradman, A. (2014). Phthalate exposure and risk assessment in California child care facilities. Environmental Science & Technology 48(13):7593-7601.			
HERO ID:	2345959			
Conditions of Use:	DEHP exposure in childcare facilities			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal			
Physical form:	indoor dust			
Personal sampling data:	0.01 ug/m3			
Exposure duration:	Approximately 22, 41, and 37% of children spent <5 h, 5–8 h, and >8 h per day attending the 40 ECE facilities, respectively.			
Exposure frequency:	5 days/week			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for childcare facilities, which is similar to the in-scope occupational scenario use of toys, playground, and sporting equipment.
	Metric 4:	Temporal Representativeness	Medium	Data is more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, standard deviation, percentiles, p-values) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling during multiple visits to many facilities.
Overall Quality Determination		Medium		

Study Citation:	G Giovanoulis, G., Bui, T., Xu, F., Papadopoulou, E., Padilla-Sanchez, J. A., Covaci, A., Haug, L. S., Cousins, A. P., Magnér, J., Cousins, I. T., Wit, de, C. A. (2017). Multi-pathway human exposure assessment of phthalate esters and DINCH. Environment International 112:115-126.			
HERO ID:	4166920			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal, ingestion			
Physical form:	dust, gas			
Personal sampling data:	55.6 ng/m3			
Area sampling data:	88.1 ng/m3			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	24 hours/day			
Exposure frequency:	365 days/year			
Comments:	the measurements are not likely to worker or occupational setting.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Norway, an OECD country.	
	Metric 3: Applicability	Low	Data are for consumer use of personal care products, furniture and furnishings, and fabric products, which is similar to the in-scope occupational scenario commercial use of these categories.	
	Metric 4: Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (percentiles, medians) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Most critical metadata included.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by performing Mann Whitney U tests.	
Overall Quality Determination		High		

Study Citation:	Giovanoulis, G., Bui, T., Xu, F., Papadopoulou, E., Padilla-Sanchez, J. A., Covaci, A., Haug, L. S., Cousins, A. P., Magnér, J., Cousins, I. T., Wit, de, C. A. (2020). Corrigendum to "Multi-pathway human exposure assessment of phthalate esters and DINCH" [Environ. Int. 112 (2018) 115-126]. Environment International 143(Elsevier):106071.			
HERO ID:	7976806			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	dust ingestion, inhalation, dietary intake (2/5)			
Physical form:	dust (2/5)			
Personal sampling data:	Daily inhalation intake is 19.1 (3.35-976 ug/kg/day). (4/5)			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling methodology not specified, but may be described in main article.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Sweden, Belgium, and Norway, al OECD countries.
	Metric 3:	Applicability	Low	Data are for consumer use of plastic products and ambient indoor air, which is similar to commercial use of plastic products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, ranges, 95th percentiles) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Exposure concentration and route are provided but missing engineering controls, PPE, and frequency and duration of exposure.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology and by including corrections to the original report. Variability addressed by comparing results to other published studies.
Overall Quality Determination		Medium		

Study Citation:	González-Mariño, I., Rodil, R., Barrio, I., Cela, R., Quintana, J. B. (2017). Wastewater-based epidemiology as a new tool for estimating population exposure to phthalate plasticizers. Environmental Science & Technology 51(7):3902-3910.			
HERO ID:	3859087			
Conditions of Use:	General Population Exposure			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal, ingestion			
Area sampling data:	Ares: 133 ug/day/person Baiona 86 ug/day/person Cambados: 321 ug/day/person Gondomar: 395 ug/day/person Nigran: 63 ug/day/person Santiago: 62 ug/day/person			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Spain, an OECD country.	
	Metric 3: Applicability	Low	The data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (means) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Monitoring data include sample type but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector.	
Overall Quality Determination		Medium		

Study Citation:	Hagmar, L., Akesson, B., Nielsen, J., Andersson, C., Linden, K., Attewell, R., Moller, T. (1990). Mortality and cancer morbidity in workers exposed to low levels of vinyl chloride monomer at a polyvinyl chloride processing plant. American Journal of Industrial Medicine 17(5):553-565.
HERO ID:	675185
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing

EXTRACTION	
Parameter	Data
Worker activity description:	"highly" exposed workers -calender operators "moderately" exposed workers - workers in the mixing departments and machine attendants among workers exposed to "low" levels of VCM - quality inspectors and packing personnel
Exposure route:	Inhalation
Personal sampling data:	The time-weighted average breathing zone level of phthalic acid esters among "highly" exposed workers (calender operators) was >0.5-3 mg/m3, among "moderately" exposed workers (workers in the mixing departments and machine attendants) >0.1-0.5 mg/m3 and among workers exposed to "low" levels of VCM (quality inspectors and packing personnel) up to 0.1 mg/m3 .
Number of workers:	2031

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.

Overall Quality Determination

Low

Study Citation:	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
HERO ID:	6558535			
Conditions of Use:	Commercial use - spray painting.			
EXTRACTION				
Parameter	Data			
Worker activity description:	sanding, grinding, welding, spray painting.			
Number of workers:	13			
Personal protective equipment:	half face piece air purifying respirators are used to reduce worker exposure to paint overspray in spray painting booths. NIOSH study recommends use of supplied-air respirators operated in a positive pressure mode. Eye and skin protection to be worn - rubber gloves should be worn, presently in the study they wear uniforms.			
Engineering control:	Spray painting booths have air entering the booth through filters in the door or through a supply air plenum. Air flows parallel to the ground, around the car and toward exit filters located in the back of the car. Car remains in booth until dry. Two booths opearte at a flow rate of 9500 cfm, one booth had flow rate of 3000 cfm and increased to 7000 cfm when adjusted. At the time 12,000 cfm is specified by OSHA standard for spray painting.			
Comments:	There is sampling data but not for DEHP or any phthalates. Marked for potential useful COU data in spray painting.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling conducted by NIOSH
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Medium	Occupational scenario falls under a condition of use but DEHP or phthalates are not mentioned.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Low	No samples provided for DEHP.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes process description, PPE and some engineering controls
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Heitbrink, W., Cooper, T., Edmonds, M., Bryant, C., Ruch, W. (1993). In-depth survey report: control technology for autobody repair and painting shops at Valley Paint and Body Shop, Amelia, Ohio.			
HERO ID:	6558536			
Conditions of Use:	commercial use - spray painting			
EXTRACTION				
Parameter	Data			
Number of workers:	7			
Personal protective equipment:	Half-facepiece, air-purifying respirators are used to control worker exposure to airborne particles during some sanding and welding operations. During abrasive blasting operations with crystalline-silica containing sand, a positive pressure air-supplied, half-facepiece respirator is used. At the time, OSHA respiratory practice standards is not being completely followed.			
Engineering control:	Air flow measurements on Spray Painting Booths - airflow into entry duct: 8200 cfm; airflow from top of booth: 13000 cfm; airflow from bottom of booth: 11400 cfm; airflow at exhaust stk: 11600 cfm; leakage into exhaust air plenum: 1300 cfm; recirculation around damper: 750 cfm. Employees required to wear respirators when operating with spray paint operations as well as sanding, grinding, and welding.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study conducted by NIOSH.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Medium	Data is likely for an in-scope of use which is paints and coatings, however the study does not mention DEHP or phthalates in this source.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old
	Metric 5:	Sample Size	Low	Samples do not consist of DEHP data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Contains process description, number of workers, PPE and some engineering controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Hines, C., Hopf, N., Deddens, J., Silva, M., Calafat, A. (2011). Estimated daily intake of phthalates in occupationally exposed groups. Journal of Exposure Science & Environmental Epidemiology 21(2):133-141.			
HERO ID:	697394			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Phthalate manufacturing			
Personal sampling data:	Range: 1.3-8.9 ug/kg/day, GM (GSD): 3.2 (1.8) ug/kg/day			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Operations, equipment, and worker activities are expected to be reasonably representative of current conditions. The monitoring data were collected after the most recent PEL establishment or update but are generally more than 10 years old. If no PEL is established, the data are more than 10 years but generally, no more than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination			High	

Study Citation:	Hines, C., Hopf, N., Deddens, J., Silva, M., Calafat, A. (2011). Estimated daily intake of phthalates in occupationally exposed groups. Journal of Exposure Science & Environmental Epidemiology 21(2):133-141.		
HERO ID:	697394		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Number of sites:	1 site for each activity		
Worker activity description:	PVC film, PVC compounding, Vehicle filters, Rubber hoses, Rubber gaskets, Rubber boots		
Personal sampling data:	PVC film: 1.4-78 ug/kg/day, GM (GSD): 17 (2.3) ug/kg/day; PVC compounding: 1.1-37 ug/kg/day, GM (GSD): 12 (3.1) ug/kg/day; Vehicle filters: 1.9-27 ug/kg/day, GM (GSD): 4.3 (2.1) ug/kg/day; Rubber hoses: 1.1-55 ug/kg/day, GM (GSD): 3.2 (2.4) ug/kg/day; Rubber gaskets: 1.9-130 ug/kg/day, GM (GSD): 7.2 (3.0) ug/kg/day; Rubber boots: 0.9-51 ug/kg/day, GM (GSD): 6.9 (2.4) ug/kg/day		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Operations, equipment, and worker activities are expected to be reasonably representative of current conditions. The monitoring data were collected after the most recent PEL establishment or update but are generally more than 10 years old. If no PEL is established, the data are more than 10 years but generally, no more than 20 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination		High	

Study Citation:	Hines, C., Hopf, N., Deddens, J., Silva, M., Calafat, A. (2011). Estimated daily intake of phthalates in occupationally exposed groups. Journal of Exposure Science & Environmental Epidemiology 21(2):133-141.			
HERO ID:	697394			
Conditions of Use:	Commercial Use			
EXTRACTION				
Parameter	Data			
Number of sites:	13			
Worker activity description:	Nail-only salons			
Personal sampling data:	Range: 0.6-850 ug/kg/day, GM (GSD): 4.7 (5.2) ug/kg/day			
Comments:	This COU seems to contain outliers.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Operations, equipment, and worker activities are expected to be reasonably representative of current conditions. The monitoring data were collected after the most recent PEL establishment or update but are generally more than 10 years old. If no PEL is established, the data are more than 10 years but generally, no more than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination			High	

Study Citation:	Huang, L. P., Lee, C. C., Hsu, P. C., Shih, T. S. (2011). The association between semen quality in workers and the concentration of di(2-ethylhexyl) phthalate in polyvinyl chloride pellet plant air. Fertility and Sterility 96(1):90-94.			
HERO ID:	788241			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizer in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing.			
Number of sites:	2			
Worker activity description:	Producing unfoamed PVC pellets for flooring			
Exposure route:	inhalation			
Physical form:	solid and vapor			
Personal sampling data:	Range: 1.0 - 110.6 ug/m3 Median: 23.7 ug/m3 in personal air			
Exposure duration:	Full shift			
Exposure frequency:	Daily			
Number of workers:	45			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure limits, industry/ process technologies) may impactexposures relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Processes are representative of current industry practices.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector.
Overall Quality Determination		High		

Study Citation:	Huang, L. P., Lee, C. C., Hsu, P. C., Shih, T. S. (2011). The association between semen quality in workers and the concentration of di(2-ethylhexyl) phthalate in polyvinyl chloride pellet plant air. Fertility and Sterility 96(1):90-94.			
HERO ID:	788241			
Conditions of Use:	PVC Processing			
EXTRACTION				
Parameter	Data			
Area sampling data:	12-26 ug/kg-day assuming inhalation of 10 m3/day and 70 kg body weight			
Exposure frequency:	5 days/week			
Comments:	This data is referenced from Huber et al. HERO ID 699512.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector.
Overall Quality Determination			Low	

Study Citation:	Huang, L. P., Lee, C. C., Hsu, P. C., Shih, T. S. (2011). The association between semen quality in workers and the concentration of di(2-ethylhexyl) phthalate in polyvinyl chloride pellet plant air. Fertility and Sterility 96(1):90-94.			
HERO ID:	788241			
Conditions of Use:	Pipe coating with plastisol			
EXTRACTION				
Parameter	Data			
Area sampling data:	10 ug/kg-day assuming inhalation of 10 m3/day and 70 kg body weight			
Exposure frequency:	5 days/week			
Comments:	This data is referenced from Huber et al. HERO ID 699512.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector.
Overall Quality Determination		Low		

Study Citation:	Huang, L. P., Lee, C. C., Hsu, P. C., Shih, T. S. (2011). The association between semen quality in workers and the concentration of di(2-ethylhexyl) phthalate in polyvinyl chloride pellet plant air. Fertility and Sterility 96(1):90-94.				
HERO ID:	788241				
Conditions of Use:	Manufacturing				
EXTRACTION					
Parameter	Data				
Area sampling data:	7.1 ug/kg-day assuming inhalation of 10 m3/day and 70 kg body weight				
Exposure frequency:	5 days/week				
Comments:	This data is referenced from Huber et al. HERO ID 699512.				
EVALUATION					
Domain	Metric		Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.	
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector.	
Overall Quality Determination			Low		

Study Citation:	IARC, (2012). Chemical agents and related occupations: A review of human carcinogens.			
HERO ID:	1104286			
Conditions of Use:	Commercial use in paint & processing into rubber products			
EXTRACTION				
Parameter	Data			
Worker activity description:	Painter, rubber product manufacturer (molding and curing had higher exposures)			
Exposure route:	inhalation is main route			
Personal sampling data:	Personal sampling data were urinary metabolite samples not PBZ. Urinary samples in rubber product manufacturing had GM of 83 ug/L with absolute increase of 70 ug/L. (Page 546) Higher amounts above GM were in molding and curing (no samples provided)			
Comments:	Note that the levels are for phthalates and not specific to DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Data published by WHO and the International Agency for Research on Cancer so methodology and data is likely accurate and high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Study conducted in US and sources are from US and other OECD countries.
	Metric 3:	Applicability	High	Data is applicable to conditions of use.
	Metric 4:	Temporal Representativeness	Medium	Study of reported exposures is over 10 years old.
	Metric 5:	Sample Size	Medium	Rang with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes industry and worker activities, and sample type.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	IARC, (2013). Some chemicals present in industrial and consumer products, food and drinking-water. IARC monographs on the evaluation of carcinogenic risks to humans 101:9-549.
HERO ID:	2525812
Conditions of Use:	All COUs.

EXTRACTION	
Parameter	Data
Worker activity description:	1983 study: DEHP manufacturing plant - chemical operators, technicians and maintenance workers. PVC processing industry (Sweden 1985): thick film department: calendar operators/machine attendants. PVC processing plants 1990 Finland study: extrusion, calendaring, hot embossing, welding, injection molding, compounding, thermoforming, high-frequency welding. Netherlands 1993 study was boot factory, mixing process, cable factory, mixing process, extruder process for personal sampling in 2 hour exposures). Various other plants for sampling were 2 aerosol filter testing facilities and a PVC sheet-processing plant (personal 4-5 hr samples and is a 1983 US study).
Exposure route:	inhalation
Physical form:	aerosol (vapor/mist)
Personal sampling data:	Table 1.2, pg 168. Samples in mg/m ³ . US 1983 study had range (ND - 4.11) for whole shift. Sweden 1983 study: mean - 0.4 (total phthalates, but DEHP was main plasticizer), range - (0.1-0.8). Netherlands 1993 study: boot factory: mixing process: mean - 0.26, range (0.1 - 1.2); extruder process: mean - 0.12, range (0.05 - 0.28); cable factory: mixing process: mean - 0.18, range (0.01 - 0.81); extruder process: mean - 0.24, range (0.01-1.27). Two aerosol filter testing facilities: range (0.01 - 0.14); PVC sheet-processing plant: range (0.06 - 0.29)
Area sampling data:	Old studies report concentrations above 60 mg/m ³ (does not state how old). Finland 1990 study: extrusion: mean - 0.05, range (0.02-0.08); extrusion: mean - 0.3, range (0.1-0.5); Calendaring: mean - 0.5, range (0 - 1); hot embossing: mean - 0.05, range (0.03 - 0.07); Welding: mean - 0.3, range (0.25 - 0.35); injection molding: mean - 0.02, range (0.01 - 0.03); compounding: mean - 0.02, range (0.01 - 0.03); thermoforming: mean - (0.02), range (0 - 0.04); high frequency welding: mean - <0.02 (sampling was from 1.5 - 3h).
Number of workers:	1981-83 National Occupational Exposure Survey: 341,800 workers in the US were potentially exposed to DEHP.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is for international agency for research on cancer so data they reference are likely credible and accurate and is published by the World Health Organization.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data consists of mix of US data and OECD country data.
	Metric 3:	Applicability	High	Data is directly applicable to manufacturing, processing, industrial and commercial uses.
	Metric 4:	Temporal Representativeness	Low	Most data is over 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty				

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Study Citation:	IARC, (2013). Some chemicals present in industrial and consumer products, food and drinking-water. IARC monographs on the evaluation of carcinogenic risks to humans 101:9-549.			
HERO ID:	2525812			
Conditions of Use:	All COUs.			
		EVALUATION		
Domain	Metric	Rating	Comments	
	Metric 7: Metadata Completeness	Medium	Addresses variability by providing data from many different uses of DEHP, does not address uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.			
HERO ID:	27010			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Major in scope industries in which exposure was judged to be highest were worker activities in plastics and rubber products manufacture			
Physical form:	Liquid			
Area sampling data:	0.4-3.2 mg/m3 (0.25-2 ppm)			
Number of workers:	625,000 annually			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical method is approved by WHO and equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Source is from an international organization, but the data are from the U.S. and representative of the industry.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The data were collected before the most recent PEL establishment and are > 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Monitoring data include all associated metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Ishii, S., Katagiri, R., Minobe, Y., Kuribara, I., Wada, T., Wada, M., Imai, S. (2015). Investigation of the amount of transdermal exposure of newborn babies to phthalates in paper diapers and certification of the safety of paper diapers. Regulatory Toxicology and Pharmacology 73(1):85-92.			
HERO ID:	2915537			
Conditions of Use:	Consumer Use			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Japan, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer exposure to personal care products, which is similar to commercial use of personal care products.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Dermal data and exposure type provided but missing engineering controls, PPE, area/personal samples, duration, and physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling multiple brands of diapers.
Overall Quality Determination			High	

Study Citation:	Jaakkola, J., Knight, T. (2008). The role of exposure to phthalates from polyvinyl chloride products in the development of asthma and allergies: A systematic review and meta-analysis. Environmental Health Perspectives 116(7):845-853.
HERO ID:	699155
Conditions of Use:	Commercial use

EXTRACTION

Parameter	Data
Worker activity description:	Production of artificial leather; activities that involve fumes from residential fire involving plastic laminates, refrigerator components, wall coverings, and synthetic drapery material; unheated PVC resin mixtures; and dioctyl phthalate from work with a conveyor belt for bottle stoppers.
Exposure route:	Exposure to DEHP is mainly from ingestion, from consumer products and medical procedures, and to a minor extent, by inhalation, via indoor air and household dust. In occupational settings, the inhalation of phthalates via fumes from heated PVC most likely constitutes a comparatively larger fraction of exposure for workers.
Physical form:	fumes and solid particulates (as dust)
Personal sampling data:	In one study, measured levels of phthalates in 48-hr personal air samples collected from homes of pregnant women in New York, New York, and Krakow, Poland. The range of DEHP was 0.05–0.41 ug/m3 (mean \pm SD, 0.22 ± 0.10 μ g/m3) in New York and 0.08–1.1 ug/m3 (0.43 ± 0.24 ug/m3) in Krakow.
Area sampling data:	In one study, the median indoor air concentration for DEHP was reported as 0.04 ug/m3 and worst-case concentration of DEHP was reported as 1.2 ug/m3. In another study, using on-floor and airborne dust levels in Oslo and Denmark and personal air samples from Poland, worst-case human exposure value to DEHP was 300 μ g/m3. Another study reported the median concentration of DEHP was 0.770 mg/g dust (mean concentration was 1.310 mg/g). Another study showed that in 38 samples of sedimented dust, DEHP accounted for 32–97% (mean, 69%) of the total amounts of phthalates in total dust. It was reported DEHP concentrations in different work sites in the polyvinyl processing industry ranging from 20 to 2,000 ug/m3.
Exposure duration:	various-see table 1
Number of workers:	various-see table 1

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Some of the reported data had statistical analysis
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	Langer, S., Weschler, C. J., Fischer, A., Bekö, G., Toftum, J., Clausen, G. (2010). Phthalate and PAH concentrations in dust collected from Danish homes and daycare centers. Atmospheric Environment 44(19):2294-2301.			
HERO ID:	1007791			
Conditions of Use:	Dust samples from daycare centers and bedrooms			
EXTRACTION				
Parameter	Data			
Exposure route:	The mass-fraction of an SVOC in settled dust provides information on its anticipated concentration in other indoor compartments and can be used to estimate human exposure via multiple pathways including inhalation, ingestion and dermal sorption.			
Physical form:	Solid - dust on surfaces			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling and analytical methodology is well described.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country other than the U.S.
	Metric 3:	Applicability	Low	The data are for a non-occupational scenario that may be applicable to an occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Source was published in 2010.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as exposure durations, exposure frequency, and worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses variability in the determinants of exposure for the sampled site or sector. The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination		Medium		

Study Citation:	Laursen, S. E., Hansen, J., Drøjdahl, A., Hansen, O. C., Pommer, K., Pedersen, E., Bernth, N. (2003). Survey of chemical compounds in textile fabrics.			
HERO ID:	6302196			
Conditions of Use:	Fabric Finishing			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	High	Data are for fabric finishing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by calculating dermal exposures to multiple fabrics, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Liang, Y., Xu, Y. (2014). Improved method for measuring and characterizing phthalate emissions from building materials and its application to exposure assessment. Environmental Science & Technology 48(8):4475-4484.				
HERO ID:	2346023				
Conditions of Use:	Incorporation into article/Use (vinyl floor)				
EXTRACTION					
Parameter	Data				
Exposure route:	inhalation, ingestion, and dermal				
Personal sampling data:	Data in Table 1 could be used for breathing zone concentration of the workers installing floor				
Area sampling data:	Concentrations of DEHP in 4 samples of vinyl floorings are: Sample 1 - 13 +/- 2%, Sample 2 - 23 +/- 3%, Sample 3 - 0.1 +/- 0.02%, Sample 5 - 7 +/- 1%.				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	methodology is well described	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States	
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	High	Data less than 10 years old	
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study provides only limited discussion of the variability but none on uncertainty	
Overall Quality Determination			High		

Study Citation:	Lim, M., Lee, K. (2020). Aggregate exposure assessment using cosmetic co-use scenarios: II. Application and validation for phthalates. Food and Chemical Toxicology 144:111583.			
HERO ID:	6968274			
Conditions of Use:	Consumer Use			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	liquid, mist, vapors, gels			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Korea, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of Personal care products, which is similar to the in-scope occupational scenario commercial use of personal care products, and paints and coatings.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (percentiles, ranges) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by sampling different subpopulations and doing a Monte Carlo analysis.
Overall Quality Determination		Medium		

Study Citation:	Liss, G. M., Albro, P. W., Hartle, R. W., Stringer, W. T. (1985). Urine phthalate determinations as an index of occupational exposure to phthalic anhydride and di(2-ethylhexyl)phthalate. Scandinavian Journal of Work, Environment and Health 11(5):381-387.			
HERO ID:	63766			
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Greatest exposure exists during sample acquisition, loading tank trucks.			
Exposure route:	Inhalation			
Personal sampling data:	20 - 4110 ug/m3			
Exposure duration:	Full shift			
Number of workers:	625,000 nationally			
Personal protective equipment:	Use of respiratory protection is required and local exhaust ventilation is utilized at the loading ports.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations, exposure durations worker activities, and exposure frequency
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector. The monitoring study provides only limited discussion of the uncertainty in the exposure estimates.
Overall Quality Determination		Medium		

Study Citation:	Liss, G. M., Hartel, R. W. (1983). Health Hazard Evaluation Report No. HETA-82-032-1384, Badische Corporation, Kearny, New Jersey. NIOSH(HETA-82-032-1384):82-032.
HERO ID:	1334319
Conditions of Use:	Manufacture

EXTRACTION	
Parameter	Data
Worker activity description:	Tank farm
Exposure route:	Inhalation
Personal sampling data:	Of sixteen personal samples for DEHP collected from tank farm and PA/DOP operators by Badische from 1978 to 1981, three were above the analytical limit of detection, with results ranging from 0.0002 to 0.004 mg/m3.
Area sampling data:	Of seventeen general area samples for DEHP collected during this same time period, five were above the analytical LOD, with results ranging from 0.64 to 12.1 mg/m3, averaging 1.1 mg/m3. The personal exposure for the employee working in the area where the 12.1 mg/m3 DEHP concentration obtained (railcar manway) was less than 0.7 mg/m3, which probably reflects the relatively short period of time spent in this area by the employee.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector. The monitoring study provides only limited discussion of the uncertainty in the exposure estimates.

Overall Quality Determination

Medium

Study Citation:	Liss, G. M., Hartel, R. W. (1983). Health Hazard Evaluation Report No. HETA-82-032-1384, Badische Corporation, Kearny, New Jersey. NIOSH(HETA-82-032-1384):82-032.			
HERO ID:	1334319			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter		Data		
Worker activity description:		One maintenance worker and five process operators		
Exposure route:		Inhalation		
Personal sampling data:		50 samples ranging from 0.02 to 4.11 mg/m3,- averaging 0.71		
Area sampling data:		Two general area samples, collected from the third esterifier sample port and the carbon dump chute, were reported at 0.171 mg/m3 and 0.154 01g/m3, respectively.		
Exposure duration:		Full-shift (8-10 hours/day)		
Comments:		The highest reported at 4.11 mg/m3, was obtained from the "B" operator who spent approximately six hours of the shift outside the control room, near the process, with no respiratory protection.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations, exposure durations worker activities, and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses variability in the determinants of exposure for the sampled site or sector. The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination			High	

Study Citation:	Lodén, M. (1986). The permeability of human skin in vitro to di-(2-ethylhexyl)phthalate.			
HERO ID:	11328008			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from Belgium, an OECD Country.
	Metric 3:	Applicability	High	Data is for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by testing multiple skin samples at different exposure durations.
Overall Quality Determination		Medium		

Study Citation:	Masi, F., Lepri, L., Bubba, Del, M., Sacco, C., Nostro, Lo, A., Comodo, N. (1999). Organic chemicals and microbial facies of liquid aerosols from a wastewater treatment plant. Annali di Chimica 89(3-4):231-248.			
HERO ID:	680348			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Area sampling data:	150-370 ng/m3			
Comments:	Concentration range of classes of phthalates in aerosols collected from above the aeration tanks of the wastewater treatment plant of Baciacavallo (Prato) from December 1995 to October 1996.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	Relates to wastewater concentration of phthalates in general rather than DEHP specifically.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site.
Overall Quality Determination		Medium		

Study Citation:	McKee, R. H. (2001). Letter to the Editor. Journal of the Air and Waste Management Association (1990-1992) 51(10):1386-1390.			
HERO ID:	1341516			
Conditions of Use:	Consumer use - miscellaneous use/exposure.			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Area sampling data:	Dust sampling DEHP- 0.3-1.18 ug/day (mean of 0.76 ug/day).			
Comments:	Labeled for worker activity but sampling data is for gen pop.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed and comments on letter are made by reputable chemistry sources, the EPA and other academic institutions.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Low	Data is for gen pop and office or home dust exposure.
	Metric 4:	Temporal Representativeness	Medium	Data is over 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Data is for area dust sampling and does not contain other important metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Millar, J. D. (1983). Special Occupational Hazard Review. Alternatives To Di-2-Ethylhexyl Phthalate (“DOP”) Respirator Quantitative Fit Testing. Public Health Service(83-109):83-250.			
HERO ID:	1334123			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Liquid			
Area sampling data:	Concentration in a DEHP manufacturing plant: 0.006-0.01 ppm.			
Exposure frequency:	0.3-35 years of work exposure.			
Number of workers:	101 workers at the German DEHP manufacturing plant.			
Personal protective equipment:	Respirator.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure duration.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	Modigh, C. M., Bodin, V., S.L., Lillienberg, L., Dahlman-Höglund, A., Akesson, B., Axelsson, G. (2002). Time to pregnancy among partners of men exposed to di(2-ethylhexyl)phthalate. Scandinavian Journal of Work, Environment and Health 28(6):418-428.			
HERO ID:	5771124			
Conditions of Use:	Manufacturing DEHP			
EXTRACTION				
Parameter	Data			
Worker activity description:	Manufacturing of DEHP - process operators, maintenance workers (electricians, mechanics and welders), and laboratory personnel.			
Exposure route:	inhalation			
Personal sampling data:	Process operators in control room had DEHP exposures below or close to the detection limit (0.01 mg/m^3). Lab staff had exposures below LOD. Mechanics had a mean exposure of 0.1 mg/m^3 during a 4 hour period in the DEHP production area.			
Area sampling data:	Stationary measurements in the control room and the lab showed values below the LOD. In process area, showed values between 0.02 and 0.04 mg/m^3.)			
Exposure frequency:	Nonselective method used in the production plant showed 2 to 40 times higher values (0.05-0.75 mg/m^3).			
Number of workers:	Process operators work 2-3 months a year in the production area.			
Engineering control:	962 workers across 3 plants.			
	Close-meshed filter is used to help filter air within production area of DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed which would indicate high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Sweden, an OECD country.
	Metric 3:	Applicability	High	Data is directly applicable to manufacturing and processing of DEHP.
	Metric 4:	Temporal Representativeness	Low	Data was published in 2002 but states sampling was conducted in 1998/99.
	Metric 5:	Sample Size	Medium	Some data is fully characterized from literature sources, but data sampled is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Provides worker activity, number of sites, number of workers, exposure duration, personal and area sampling data, exposure route.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling both manufacturing and processing sites, sampling area and personal samples, and sampling among different worker activities. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Modigh, C. M., Bodin, V., S.L., Lillienberg, L., Dahlman-Höglund, A., Akesson, B., Axelsson, G. (2002). Time to pregnancy among partners of men exposed to di(2-ethylhexyl)phthalate. Scandinavian Journal of Work, Environment and Health 28(6):418-428.			
HERO ID:	5771124			
Conditions of Use:	Processing - PVC			
EXTRACTION				
Parameter	Data			
Worker activity description:	PVC processing plant - workers were calender or machine operators, machine attendants, maintenance workers, product controllers, and mixing workers.			
Exposure route:	inhalation			
Personal sampling data:	Mean exposure during whole shift measurements ranged from <0.1 - 2.1 mg/m^3 with GSDs ranging from 1.04 to 4.91. Appendix I shows the data tabulated.			
Number of workers:	962 workers across 3 plants.			
Engineering control:	Local exhaust ventilation above the calenders in PVC plant.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed which would indicate high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Sweden, an OECD country.
	Metric 3:	Applicability	High	Data is directly applicable to manufacturing and processing of DEHP.
	Metric 4:	Temporal Representativeness	Low	Data was published in 2002 but states sampling was conducted in 1998/99.
	Metric 5:	Sample Size	Medium	Some data is fully characterized from literature sources, but data sampled is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Provides worker activity, number of sites, number of workers, exposure duration, personal and area sampling data, exposure route.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling both manufacturing and processing sites, sampling area and personal samples, and sampling among different worker activities. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Muenhor, D., Moon, H. B., Lee, S., Goosey, E. (2018). Organophosphorus flame retardants (PFRs) and phthalates in floor and road dust from a manual e-waste dismantling facility and adjacent communities in Thailand. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 53(1):79-90.			
HERO ID:	4164912			
Conditions of Use:	Disposal - e-waste dismantling facility			
EXTRACTION				
Parameter	Data			
Exposure route:	ingestion			
Area sampling data:	DEHP conc in floor dust (ng/g): Facility - 550,000 (79,000-780,000), House 1 downwind - 900,000 (460,000-1,900,000), Temple downwind - 380,000 (39,000-590,000), House 2 no wind - 580,000 (200,000-2,700,000); Road dust (ng/g): Facility - 170,000 (36,000-670,000), House 1 downwind 26,000 (22,000-32,000), Temple downwind - 160,000 (31,000 - 640,000), House 2 no wind - 70,000 (42,000 - 110,000).			
Comments:	Facility is an e-waste dismantling facility. All other referenced data is gen pop data regarding phthalate exposure.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Unclear if source is peer reviewed. Appears to use high quality data that would not lead to lower quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from Thailand a non-OECD country.
	Metric 3:	Applicability	Low	Small portion of data is for an e-waste dismantling facility but majority is for gen pop exposure.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes media, exposure route and sampling location.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 8343, Bis(2-ethylhexyl) phthalate.		
HERO ID:	7681905		
Conditions of Use:	Commercial Use: Plastic and rubber products		
EXTRACTION			
Parameter	Data		
Worker activity description:	Workers in a boot factory and cable factory. Mixing and extruding process (5/149).		
Exposure route:	Occupational exposure to bis(2-ethylhexyl) phthalate may occur through inhalation of aerosols and dust, and dermal contact with this compound at workplaces where bis(2-ethylhexyl) phthalate is produced or used. (111/149)		
Physical form:	colorless oily liquid (2/149)		
Area sampling data:	In the boot factory, mean concentrations were 261 (100-1214) ug/cu m in the mixing area and 120 (48-278) ug/cu m in the extruding area. In the cable factory, mean concentrations were 180 (9-809) ug/cu m in the mixing area and 239 (10-1266) ug/cu m in the extruding area. (5/149)		
Number of workers:	9 workers in a boot factory and 6 workers in a cable factory,		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country. other than the U.S.
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The monitoring data were collected after the most recent PEL establishment or update but are generally more than 10 years old. If no PEL is established, the data are more than 10 years but generally, no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by comparing 2 plants but uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation:	Nielsen, J., Akesson, B., Skerfving, S. (1985). Phthalate ester exposure - Air levels and health of workers processing polyvinylchloride. AIHA Journal 46(11):643-647.			
HERO ID:	63456			
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing, plastics product manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	23 thin film department workers, 5 as calendaring operators, 8 machine attendants,1 repair men, 3 mixing worker, 6 reserve/other; 31 thick film department, 10 as combined calender operators/machine attendants, 5 repair men, 3 mixing workers, 6 reserves, 7 other.			
Exposure route:	inhalation			
Physical form:	solid			
Personal sampling data:	2 mg/m3 total PAE including DEHP, DIDP and BBP			
Number of workers:	54			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Uses Fisher’s exact test and mann-Whitney U-test.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from an OECD country other than the U.S. and likely to be representative of the industry, but may have unknown locality-specific factors impacting exposures.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Large sample size but statistics characterizing the sample distribution is limited.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents methods and results, but is not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Limited discussion of Variability and Uncertainty
Overall Quality Determination		Medium		

Study Citation:	Nielsen, J., Fahraeus, C., Bensryd, I., Akesson, B., Welinder, H., Linden, K., Skerfving, S. (1989). Small airways function in workers processing polyvinylchloride. International Archives of Occupational and Environmental Health 61(7):427-430.
HERO ID:	5175880
Conditions of Use:	Processing/industrial use - processing PVC/incorporation into articles for film and floor coverings.

EXTRACTION	
Parameter	Data
Worker activity description:	Machine attendants and calender operators
Exposure route:	inhalation
Physical form:	vapor, dust
Area sampling data:	Mean exposure level for machine attendants in the thin film department was 0.2 mg/m ³ of PAEs and for calender operators 2.0 mg/m ³ of PAEs. Machine attendants/calendar in the thick film department the level was 0.4 mg/m ³ of PAEs.
Number of workers:	20
Engineering control:	Local exhaust devices installed over calenders
Comments:	DEHP is mentioned being present but sampling data does not specify what percentage or how much of the total sampled is DEHP and does not specify if they were PBZ or area samples.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Data is peer reviewed so likely contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Sweden, an OECD country
	Metric 3:	Applicability	High	Data is for industrial use of turning PVC into film and floor coverings.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Low	Only the averages are provided from the worker activities and do not specify how much of the sampling is DEHP.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes worker activities, exposure route, some engineering controls, and number of workers.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling different departments that handle PVC differently. Does not address uncertainty.

Overall Quality Determination	Medium
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Study Citation:	NIOSH, (1983). Health hazard evaluation report: HETA 82-127-1370. Hoover Company, Industrial Park, North Canton, Ohio. 82-127-1370:1-31.
HERO ID:	3970584
Conditions of Use:	Commercial use

EXTRACTION	
Parameter	Data
Worker activity description:	Employees at Hoover Company located in North Canton, Ohio working with solvents and other substances in the facility - in particular, the Vinyl Blend department and the Hose department where DEHP is used. Activities include assembly, injection molding, plastic blending, and pelletizing, painting, metal fabrication, and plastic extrusion.
Exposure route:	inhalation
Physical form:	vapor
Personal sampling data:	Concentration of DEHP measured in the Hose department was less than 0.06 mg/m3. TWA for vinyl blend department was 0.04 mg/m3.
Area sampling data:	Concentrations of DEHP measured in the Hose dept were 14.9 and 29.55 mg/m3 (TWA - 21.8 mg/m3). TWA for vinyl blend department was less than 0.04 mg/m3.
Exposure duration:	8 - 10 hrs/day
Number of workers:	The North Canton, Ohio, plant employs approximately 3,000 workers.
Personal protective equipment:	NIOSH recommended furnishing respirators for the set-up operators for use when conducting purge operations. A chemical cartridge respirator with an organic vapor cartridge is recommended.
Engineering control:	General dilution ventilation is supplied via ten roof-mounted heating and ventilating units, each capable of supplying a maximum of 40,000 cubic feet/minute, in an "economizer" fashion. Also, numerous local exhaust systems are present, most notably in the Spray Painting Department.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Methodology is approved by NIOSH.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The data is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.

Overall Quality Determination

Medium

Study Citation:	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-n-octyl phthalate (DnOP). (6):i-III90.			
HERO ID:	679112			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Personal sampling data:	Exposure levels were estimated by the ACC using assumptions of a 10 m3/day inhalation rate and a 70 kg body weight. The resulting exposure estimates were 143 µg/kg bw/workday and 286 µg/kg bw/workday for workers employed in phthalate and flexible PVC manufacturing operations, respectively.			
Area sampling data:	Phthalate levels in air are generally less than 1 mg/m3 and 2 mg/m3 during the production of phthalates and flexible PVC, respectively.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Cannot access data source to determine methodology used.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Low	Not specifically DEHP that is mentioned, but rather phthalate exposure in general.
	Metric 4:	Temporal Representativeness	Low	Data is 18 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include critical metadata, but lacks additional metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The study addresses variability and uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Nuodex Inc, (1983). Di-(2-ethylhexyl) phthalate monitoring - Chestertown memo CHMD-83-002.			
HERO ID:	1335278			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	DEHP production, which includes cleanout of DEHP laden filter cake from a filter. Filter cake disposal, chemical operator.			
Exposure route:	inhalation			
Physical form:	dust, vapor			
Personal sampling data:	Sampling in mg/m^3. Samples <0.01, <0.12 and <0.13.			
Area sampling data:	Sampling in mg/m^3. Samples were <0.01, 0.02, 0.1 and 0.73.			
Exposure duration:	24-hr (3 shifts)			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Report and data was submitted in compliance with TSCA, so likely accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Data is for production of DEHP, so in-scope.
	Metric 4:	Temporal Representativeness	Low	Data is greater than 20 years old (1983)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes sample type, exposure type, worker activity.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling over various days and different worker activities, does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Okeme, J. O., Nguyen, L. V., Lorenzo, M., Dhal, S., Pico, Y., Arrandale, V. H., Diamond, M. L. (2018). Polydimethylsiloxane (silicone rubber) brooch as a personal passive air sampler for semi-volatile organic compounds. Chemosphere 208:1002-1007.			
HERO ID:	5017615			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Worker activity description:	Office workers			
Exposure route:	inhalation			
Personal sampling data:	Average personal air concentrations (ng/m3) +/- relative standard deviation (RSD) of phthalates measured for five study participants using personal low volume active air samplers (PLV-AAS) co-deployed with PDMS brooch passive air samplers (PPAS) for 8 hours daily during a four-day calibration study conducted indoors: Participant 1-2010+/-350; Participant 2-2230+/-390; Participant 3-1820+/-270, Participant 4-2190+/-970; Participant 5-1914+/-470			
Exposure duration:	8 hours daily for 4 days			
Number of workers:	5			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	methodology is well described
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country. other than the U.S.
	Metric 3:	Applicability	Medium	The data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability but none on uncertainty
Overall Quality Determination		High		

Study Citation:	OSHA, (2019). Chemical exposure health data (CEHD) sampling results: CASRNs 75-34-3, 85-68-7, 84-74-2, 78-87-5, 117-81-7, 106-93-4, 50-00-0, 95-50-1, 85-44-9, 106-46-7, 79-00-5, and 115-86-6.			
HERO ID:	6499659			
Conditions of Use:	OSHA data contains multiple industries			
EXTRACTION				
Parameter	Data			
Personal sampling data:	Samples range from ND to 84.7 mg/m3			
Area sampling data:	Samples range from ND to 7.1 mg/m3			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	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: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The 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	The operations, equipment, and worker activities associated with the data are expected to be representative of current operations, equipment, and activities. The monitoring data were collected after the most recent permissible exposure limit (PEL) establishment or update or are generally, no more than 10 years old, whichever is shorter. If no PEL is established, the data are no more than 10 years old. Metadata on the operations, equipment, and worker activities associated with the data show that the data should be representative of current operations, equipment, and activities.
	Metric 5:	Sample Size	High	Individual measurements are provided so the sample sets can be fully statistically characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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	OSHA data do not discuss variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	OSHA, (2020). Chemical Exposure Health Data (CEHD).			
HERO ID:	6983058			
Conditions of Use:	Plastic Material and Resin Manufacturing, Electric and Electronic Products, Plastic and Rubber Products, Furniture and Furnishings not covered elsewhere, Use of Paints and Coatings, Use of Adhesives, Toys, Playgrounds, and Sporting Equipment, Dyes/Pigments			
EXTRACTION				
Parameter	Data			
Personal sampling data:	0.0075 -2.75 mg/m3			
Area sampling data:	0.015 - 7.056 mg/m3			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	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: Representativeness	Metric 2:	Geographic Scope	High	U.S. based exposure data
	Metric 3:	Applicability	Medium	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 assigned to conditions of use within scope.
	Metric 4:	Temporal Representativeness	Medium	Includes monitoring data collected over 10 years ago but after the most recent PEL.
	Metric 5:	Sample Size	High	Individual measurements are provided so the sample sets can be fully statistically characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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	Medium	Variability can be reviewed due to the availability of discrete samples but the OSHA data do not discuss uncertainty.
Overall Quality Determination		High		

Study Citation:	Petrovicova, I., Kolena, B., Pilka, T. (2014). The human biomonitoring of occupational exposure to phthalates. Mediterranean Journal of Social Sciences 5(19):101-107.			
HERO ID:	5620073			
Conditions of Use:	Processing in plastics industry			
EXTRACTION				
Parameter	Data			
Worker activity description:	Workers in plastic manufactory with division of films and composites and injection molding.			
Exposure route:	inhalation, ingestion, dermal			
Personal sampling data:	MEHP metabolite concentration (ug/L): mean - 35.53, SD - 22.36, min - 4.54, max - 108.46			
Comments:	Personal sampling data is urinary metabolite data not PBZ.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Unclear if source is peer reviewed, however sampling methodology appears to be high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for Slovakia, a non-OECD country.
	Metric 3:	Applicability	High	Data is applicable to processing in the plastics industry.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Contains sample type, worker activity, and potential exposure routes.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Porras, S. P., Koponen, J., Hartonen, M., Kiviranta, H., Santonen, T. (2020). Non-occupational exposure to phthalates in Finland. Toxicology Letters 332:107-117.			
HERO ID:	6957499			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Personal sampling data:	Urinary metabolites were sampled in non-occupational populations.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Finland, an OECD country.
	Metric 3:	Applicability	Uninformative	Data are for non-occupational general population exposure.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by comparing results to literature values.
Overall Quality Determination		Uninformative		

Study Citation:	Pronk, J., M.E., Woutersen, M., Herremans, M., J.M. (2020). Synthetic turf pitches with rubber granulate infill: are there health risks for people playing sports on such pitches?. Journal of Exposure Science & Environmental Epidemiology 30(3):567-584.			
HERO ID:	5043594			
Conditions of Use:	Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Worker activity description:	Source of exposure for soccer players is synthetic turf pitches made of recycled car tires. (1/18)			
Exposure route:	dermal, inhalation, oral (6/18)			
Physical form:	rubber granulate (1/18)			
Area sampling data:	Maximum air concentrations for DEHP were 27.2 mg/kg. (10/18)			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the Netherlands, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of synthetic turf, which is similar to the in-scope occupational scenario of commercial use of toys, playground, and sporting equipment.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (maximums) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by analyzing different exposure scenarios based on duration of exposure.
Overall Quality Determination		High		

Study Citation:	Redacted (1982). Diethyl and dioctyl phthalate, redacted.			
HERO ID:	11327978			
Conditions of Use:	Waste Handling			
EXTRACTION				
Parameter	Data			
Worker activity description:	Filter press cleaning.			
Personal sampling data:	Concentrations averaged <0.68 mg/m^3.			
Area sampling data:	Concentrations averaged <0.07 mg/m^3 with a range of <0.04-0.17 mg/m^3.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for waste handling, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure frequency and duration.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in sampling/analytical methodology but variability is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Redacted (1988). Exposure to Di-octyl Phthalate (PM 401), Redacted 1988.			
HERO ID:	11327979			
Conditions of Use:	Plastic Compounding			
EXTRACTION				
Parameter	Data			
Worker activity description:	Weighing and carrying and dumping buckets into material mixers.			
Personal sampling data:	Operating Roll 37 (1/22/1988): <001 mg/m^3Operating Roll 33 (1/27/1988): 0.08 mg/m^3Operating Roll 37 (2/3/1988): <0.01 mg/m^3			
Area sampling data:	Roll 37 on table (1/22/1988): 0.9 mg/m^3Roll 33 control panel (1/27/1988): 0.05 mg/m^3Roll 37 control panel (2/3/1988): <0.01 mg/m^3			
Personal protective equipment:	Impervious gloves.			
Engineering control:	Dedicated hose use for dispensing PM 401. Closed system for weighing and metering PM 401. Installation of feed lines from the weigh station directly to the mixers.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic compounding, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling on multiple days.
Overall Quality Determination			Medium	

Study Citation:	Redacted (1990). Exposure to Di-octyl Phthalate (PM 401), Redacted, 1990.			
HERO ID:	11327980			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Worker activity description:	Operator vacuum charging.			
Personal sampling data:	Operator vacuum charging 1 drum of PM401 to still No. 54: <0.08 mg/m^3Operator vacuum charging 1 drum of PM 401 to still No. 54 and adding 1 gallon to pump seal: <0.03 mg/m^3			
Comments:	Use is unclear due to redaction in the full-text document.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for an unknown scenario which seems to be similar to use as a lubricant or degreasing chemical.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure duration, exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in sampling/analytical methodology but variability is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Rudel, R. A., Brody, J. G., Spengler, J. D., Vallarino, J., Geno, P. W., Sun, G., Yau, A. (2001). Identification of selected hormonally active agents and animal mammary carcinogens in commercial and residential air and dust samples. Journal of the Air and Waste Management Association (1990-1992) 51(4):499-513.		
HERO ID:	198234		
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing		
EXTRACTION			
Parameter	Data		
Worker activity description:	Melting plastics		
Exposure route:	Inhalation		
Physical form:	Liquid, solid in dust form		
Personal sampling data:	Max Detected: 11.5 ug/m3 in air samples 524 ug/g in dust samples (Unclear if this maximum detected occurrence is from the workplace described, as all samples are listed together. However, as th highest air detection level was from the workplace, it is presumed the highest dust detection level is as well.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods. Method provides adequate documentation of process followed.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations, exposure durations worker activities, and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector. The monitoring study provides only limited discussion of the uncertainty in the exposure estimates.
Overall Quality Determination		High	

Study Citation:	Salgueiro-Gonzalez, N., Alda, L.d., M. J., Muniategui-Lorenzo, S., Prada-Rodriguez, D., Barcelo, D. (2015). Analysis and occurrence of endocrine-disrupting chemicals in airborne particles. Trends in Analytical Chemistry 66:45-52.			
HERO ID:	2915827			
Conditions of Use:	Consumer use - personal or household uses.			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Physical form:	vapor			
Area sampling data:	Outdoor air samples (ng/m^3) urban area: first data set - 0.02-0.06; second data set - 4.63-45; urban,rural and suburban area: 0.375-1.259; Indoor air: Houses: first data set - 77-1000; second data set - 223-520; Houses and day care center: 220-540; Houses, day care center, offices: 15-530.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so likely to not contain errors in methodology and analytics.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Report from Spain, sampling data from various OECD countries.
	Metric 3:	Applicability	Uninformative	Sampled areas are not in applicable COUs mostly houses, urban areas, day care centers and offices.
	Metric 4:	Temporal Representativeness	High	Sampling data and report less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Includes little metadata, just sampling data and exposure route but does not provide information regarding those studies referenced.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by referencing multiple different monitoring studies. Does not address uncertainty.
Overall Quality Determination		Uninformative		

Study Citation:	Salisbury, S. (1984). Health hazard evalution report, No. HETA-79-034-1440, Intex Plastics, Corinth, Mississippi.			
HERO ID:	6558526			
Conditions of Use:	Processing into paints and inks			
EXTRACTION				
Parameter	Data			
Worker activity description:	Workers in Calender department - pre-mix operator, Banbury operator, calender operator, calender utility helpers, mill men, calender wind-up operators, general helpers and a chopper operator. Color department - color compounders. Laminating department, print department and print service department are stated but not specific worker activities.			
Exposure route:	inhalation			
Personal sampling data:	All personal samples were ND.			
Area sampling data:	Area sampling for DEHP were 0.12, 0.24 and 0.68 mg/m^3 for extruder and 2 calender operators.			
Exposure duration:	8 hr shifts			
Exposure frequency:	Workers operated three, 8 hour shifts per day, five days per week			
Number of workers:	375 workers and maintenance personnel.			
Personal protective equipment:	Disposable protective coveralls, dust caps, gloves and respirators.			
Engineering control:	Local exhaust ventilation applied in most departments where machinery was located.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study conducted by NIOSH
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data for US.
	Metric 3:	Applicability	High	Data is for processing in paints and inks.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old (1970)
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Includes sample type, exposure type, worker activity, exposure duration, exposure frequency, PPE, engineering controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different worker activities and sampling in different departments. Does not address uncertainty.
Overall Quality Determination		High		

Study Citation:	Schneider, K., Hoogd, de, M., Haxaire, P., Philipps, A., Bierwisch, A., Kaiser, E. (2020). ERASSTRI - european risk assessment study on synthetic turf rubber infill - Part 2: Migration and monitoring studies. Science of the Total Environment 718:137173.			
HERO ID:	7273960			
Conditions of Use:	Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Worker activity description:	Source of exposure for football and rugby players is synthetic turf rubber infill. (2/8)			
Exposure route:	dermal, inhalation (2/8)			
Physical form:	rubber granules (2/8)			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are for multiple European countries and analysis was done in Germany, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of synthetic turf, which is similar to the in-scope occupational scenario of commercial use of toys, playground, and sporting equipment.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata but missing exposure duration/frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by sampling turf from different countries. Uncertainty isn’t addressed.
Overall Quality Determination		Medium		

Study Citation:	Shi, W.,ei, Guo, J., Zhou, Y., Deng, D., Han, Z., Zhang, X., Yu, H., Giesy, J. P. (2017). Phthalate esters on hands of office workers: Estimating the influence of touching surfaces. Environmental Science & Technology Letters 4(1):1-5.			
HERO ID:	3520009			
Conditions of Use:	Office worker using computer			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	dust			
Area sampling data:	Separate link to a different site provided table of data. Wipes of hands (ug): mean - 381, GM - 37.5, range - 0.07-4298; Office dust (ug/g): mean - 566, GM - 148, range - 0.51-5698; Wipes of keyboard (ug): mean - 415, GM - 83.6, range - 0.27-2658; Wipes of mobile phones (ug): mean - 116, GM - 10.2, range - nd-1356			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Unclear if study is peer reviewed. Source uses reputable sources and analytical methodology will produce high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3:	Applicability	Uninformative	Data is for gen pop office space exposure.
	Metric 4:	Temporal Representativeness	High	Data is from 2017, less than 10 years old.
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes sample type, exposure route and duration.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by testing multiple different office spaces, does not address uncertainty.
Overall Quality Determination		Uninformative		

Study Citation:	Stewart, E. (2011). Air and wipe sampling for phthalates in a medical office building. 1:85-90.			
HERO ID:	7978848			
Conditions of Use:	Office work			
EXTRACTION				
Parameter	Data			
Worker activity description:	Source of exposure for office workers were roof-top walk-off mats that were removed and stored on the property. (3/7)			
Exposure route:	ingestion, dermal, inhalation (2/7)			
Area sampling data:	DEHP was detected in air samples from ND-10/8 ug/m3. (5/7)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling methodology is an EPA method.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	Low	Data are for office buildings, not in-scope but similar to occupational scenarios within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by comparing results to other studies done.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2021). Generic model for central tendency and high-end inhalation exposure to total and respirable Particulates Not Otherwise Regulated (PNOR).			
HERO ID:	11373482			
Conditions of Use:	Multiple OES			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Dust (solid)			
Personal sampling data:	Document gives a breakdown of # samples, # non-detects, min/max concentrations, mean concentration, 95th percentile concentration, and 50th percentile and 95th percentile PNOR for both total and respirable particulates. This data is given on PDF Pg. 11-16 for multiple industries.			
Exposure duration:	8 hr/day			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Medium	Monitoring data is from 2000 to 2020, so therefore spans recent data to data from more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (min, max, mean, 95th percentile) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing PPE, engineering controls, exposure frequency, worker activity, number of workers.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by providing both total and respirable PNOR.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2024). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 2: Exposure charac- terization, volume 1.			
HERO ID:	11845992			
Conditions of Use:	Commercial Use - Toys, Playground, and Sporting Equipment			
EXTRACTION				
Parameter	Data			
Area sampling data:	Table 4-33, Page 123: "Bis(2-ethylhexyl) phthalate; Background Air Sample Median = 7.5 ng/m^3; Field Air Sample Location 1 Median = 15 ng/m^3; Field Air Sample Location 2 Median = 11 ng/m^3; Field Air Sample Max = 77 ng/m^3"Table 4-37, Page 130: "Bis(2-ethylhexyl) phthalate; Field Dust Sample Mean = 24 mg/kg; Field Dust Sample Std Dev = 16 mg/kg; Field Dust Sample Maximum = 43 mg/kg"Table 4-38, Page 130: Exposure Pilot Study Field Surface Wipe Sampling SVOC Measurements; Surface Wipe Sample-Location S1 Mean = 0.18 ng/cm2, Surface Wipe Sample-Location S2 Mean = 0.15 ng/cm2, Surface Wipe Sample- Location S5 Mean = 0.13 ng/cm2, Surface Wipe Sample Maximum = 0.28 ng.cm2			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for fabrication of final product from articles, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (median) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in sampling/analytical methodology but variability is not ad- dressed.
Overall Quality Determination			High	

Study Citation:	Vainiotalo, S., Pfaffli, P. (1990). Air impurities in the PVC plastics processing industry. Annals of Occupational Hygiene 34(6):585-590.			
HERO ID:	5175697			
Conditions of Use:	Processing in PVC			
EXTRACTION				
Parameter	Data			
Worker activity description:	Extrusion, calendering, hot embossing, welding, injection molding, compounding, thermoforming, high frequency welding.			
Exposure route:	inhalation			
Physical form:	vapor, dust			
Area sampling data:	Table 2 provides sampling data (mg/mg^3). Extrusion: 0.05 +/- 0.03 and 0.3 +/- 0.2; calendering: 0.5+/-0.5; hot embossing: 0.05+/- 0.02; welding: 0.3 +/- 0.02; injection molding: 0.02 +/- 0.01; compounding: 0.02 +/- 0.01; thermoforming: 0.02+/-0.02; high frequency welding: <0.02.			
Exposure duration:	Sampling time varied from 1.5 - 3 hours.			
Engineering control:	Machines had local exhaust ventilation but performance of them were not investigated.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so likely high quality sampling data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Finland, an OECD country.
	Metric 3:	Applicability	High	Data is for processing of DEHP into PVC as a plasticizer.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes exposure type, sampling duration, worker activity, and some engineering controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling across multiple different plants with different processing methods. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	VI, (2025). Comment from Vinyl Institute regarding the Draft Risk Evaluation for Diethylhexyl Phthalate; EPA-HQ-OPPT2018-0433-0117.			
HERO ID:	13028213			
Conditions of Use:	Plastic Compounding, Plastic Converting			
EXTRACTION				
Parameter	Data			
Worker activity description:	Blender operator, extrusion operator (based on personal samples).			
Exposure route:	Inhalation, dermal			
Physical form:	Liquid			
Personal sampling data:	Sampling data given on PDF Pg. 15-18			
Area sampling data:	Sampling data given on PDF Pg. 31-32			
Particle size characterization:	PDF Pg. 10”As a matter of record, PVC suspension resin has practically no particle size content below 10 microns; the typical mean particle size for PVC suspension resins is approximately 150 microns or greater with a narrow particle size range.”			
Exposure duration:	182-468 mins/day (based on sample times taken)			
Exposure frequency:	PDF Pg. 3”EPA should consider using a number such as 180 days per year of manufacturing DEHP which would be similar to what is used in its DINP Risk Evaluation. EPA should consider that the U.S. market for DEHP has significantly declined, and as a result, the facility producing DEHP domestically will correspondingly have reduced operating days for this substance.”			
Comments:	Document mentions improved controls to prevent worker exposure but does not specify engineering controls.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic compounding, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling multiple worker activities.
Overall Quality Determination		High		

Study Citation:	Wang, L., Gong, M., Xu, Y., Zhang, Y. (2017). Phthalates in dust collected from various indoor environments in Beijing, China and resulting non-dietary human exposure. Building and Environment 124(Elsevier):315-322.			
HERO ID:	4176702			
Conditions of Use:	Consumer use - local dust in offices, classrooms and homes.			
EXTRACTION				
Parameter	Data			
Worker activity description:	Some locations were school teachers, office workers, gym employees, restaurant employees, library employees, and museum employees.			
Exposure route:	inhalation, ingestion			
Physical form:	dust			
Area sampling data:	Samples (ug/g). Home: median - 231, range (46.3-23,300); office: median - 1310, range (327-7740); Kindergarten: median - 202, range (17.0-3910); Public place: median - 320, range (85.0 - 3140). DEHP dust on specific surfaces in environments (ug/g): office: floor: median - 908, range (160 - 7330); furniture: median - 730, range (nd-4210); molding: median - 351, range (nd - 15900); Kindergarten: floor: median - 144, range (nd-1900); molding: median - 181, range (nd-4430); PVC flooring: median - 190, range (nd-10200).			
Comments:	not sure if the exposed populations are in any of occupational COU			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Unclear if source is peer reviewed but it appears to use high quality data and sound methods of analysis.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3:	Applicability	Uninformative	Data is for non-occupational scenarios and only for gen pop.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Includes media and sampling location.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by sampling across many different locations. Addresses uncertainty by conducting an uncertainty analysis.
Overall Quality Determination		Uninformative		

Study Citation:	Wang, W., Xu, X., Fan, C. Q. (2014). Health hazard assessment of occupationally di-(2-ethylhexyl)-phthalate-exposed workers in China. Chemosphere 120:37-44.		
HERO ID:	2345920		
Conditions of Use:	Processing as plasticizer in PVC		
EXTRACTION			
Parameter	Data		
Worker activity description:	Worksite where DEHP added as plasticizer, where the work processes during the sampling included mixing procedure and compression molding.		
Exposure route:	inhalation, ingestion		
Physical form:	vapor, dust		
Area sampling data:	S3 (small site) had highest ambient DEHP level of 707 ug/m^3. Median concentration (291 ug/m^3) of DEHP at S2 was slightly higher than at S1 (233 ug/m^3). Figure 1A shows levels.		
Particle size characterization:	Sample inlet head less than 10 um so particles are less than 10 um.		
Number of workers:	S1 - 9100; S2 - 4645; S3 - 888 (S1 is large sized; S2 is medium sized; S3 is small sized)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Data is peer reviewed so likely does not contain errors and is accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for China, a non-OECD country.
	Metric 3: Applicability	High	Data is directly applicable for DEHP used as a plasticizer in PVC manufacturing
	Metric 4: Temporal Representativeness	High	Data is from 2014, less than 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Includes sample type, exposure type, worker activity, particle size, and number of workers.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by sampling for many years (2009 - 2012) and sampling at different sites conducting the same process. Does not address uncertainty.
Overall Quality Determination		High	

Study Citation:	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
HERO ID:	5547263			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Exposure route:	Human exposure to phthalates arises mainly from ingestion (food and dust), inhalation, and dermal absorption. Diet has been a major source of exposure to high molecular weight phthalates, especially DEHP. In particular, foods packaged in plastic/PVC materials contribute to exposure to DEHP in humans. In fact, among various contaminants measured in indoor dust, phthalates, especially DEHP and DEP, are the major contaminants in indoor dust and air. Medical devices that are suspected to contain DEHP include intravenous (IV) storage bags, ventilator tubing, IV infusion sets, endotracheal tubes, IV infusion catheters, nasogastric tubes, blood storage bags, enteral and parenteral nutrition storage bags, blood administration sets, urinary catheters, PVC exam gloves, suction catheters, chest tubes, nasal cannula tubing, hemodialysis tubing, syringes, extracorporeal membrane oxygenation tubing, and cardiopulmonary bypass tubing.			
Dermal exposure data:	Dermal exposure data			
Comments:	This is bio monitoring data for populations across the world. This references relates more with gen pop exposure. US specific data includes exposure by age groups.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Xia, M., Ouyang, X., Wang, X., Shen, X., Zhan, Y. (2018). Occupational exposure assessment of phthalate esters in indoor and outdoor microenvironments. Journal of Environmental Sciences 72:75-88.			
HERO ID:	5043519			
Conditions of Use:	Gen Pop Exposure to plasticizers in consumer products.			
EXTRACTION				
Parameter	Data			
Worker activity description:	Occupational groups were doctors, college teachers, cab drivers, bus drivers, tube drivers and other drivers in public transportation.			
Area sampling data:	Table 7 gives area sampling data for total phthalates while Figure gives % contributions for each environment tested in. DEHP contributed anywhere from 11% to 42% in the gas phase and from 20% to 54%. Table 3 gives total phthalate concentrations with mean and SD in ng/m3 for both gas and particles: ordinary offices: 2859.8 +/- 478 and 1888.5 +/- 464; Classrooms: 3730.4 +/- 2098 and 2465.1 +/-1489; Doctor offices: 11555 +/- 1967 and 5362 +/- 1559; Wards: 14441 +/- 3416 and 5566 +/- 1021; Busses: 14001 +/- 3262 and 10492 +/- 2693; Tubes: 12284.7 +/- 1630 and 9107.4 +/- 1975; Cabs: 12548 +/- 2542 and 10836 +/- 4005. More sampling data is in the table but is for residential sampling.			
Exposure duration:	Table 4 gives work times. Doctors: mean - 7.7 +/- 1.5 hrs; college teachers: mean - 7.7 +/- 3.2; drivers: mean - 7 +/- 1.5.			
Comments:	Data is for occupational scenario to general population such as drivers, doctors, and teachers which is not in scope for the engineers. Data might be relevant to the exposure assessors.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so sampling and analytical methodology likely equivalent and contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country
	Metric 3:	Applicability	Uninformative	Data is for occupational scenario to general population such as drivers, doctors, and teachers which is not in scope for the engineers.
	Metric 4:	Temporal Representativeness	High	Data is sampled from 2011 to 2017, less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes worker activities, exposure duration, sample type.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses uncertainty within article through its calculation of estimated exposure and addresses variability by sampling multiple years and different locations.
Overall Quality Determination		Uninformative		

Study Citation:	Yang, M., Park, M. S., Lee, H. S. (2006). Endocrine disrupting chemicals: Human exposure and health risks. Journal of Environmental Science and Health, Part C: Environmental Carcinogenesis & Ecotoxicology Reviews 24(2):183-224.			
HERO ID:	198597			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Exposure route:	ingestion, dermal			
Area sampling data:	in the range of 3 to 30 ug/kg of body weight/day excluding occupational exposure, medical exposures, and non-dietary ingestions in children			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country. other than the U.S.	
	Metric 3: Applicability	Low	The data are for a non-occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Data is between 10 and 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Frasch, H. F., Bunge, A. L. (2015). The transient dermal exposure II: post-exposure absorption and evaporation of volatile compounds. Journal of Pharmaceutical Sciences 104(4):1499-1507.			
HERO ID:	3230538			
Conditions of Use:	All COU’s			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	Liquid, vapor			
Dermal exposure data:	Dermal exposure data			
Comments:	Model is good for transient exposures and skin contact of a finite dose such as a splash exposure and pharmaceutical and cosmetic product applications. (QC Note: Original reviewer listed Accidental splashing and Pharmaceutical and cosmetic products as the COU’s. Pharmaceutical and cosmetic products are not in scope because they are not believed to occur domestically and it is unclear if accidental splashes will be evaluated. Since this is a model to calculate dermal exposures I changed it to all COUs)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Model is peer reviewed and is mathematically sound with no errors.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Model can be applied to any type of dermal exposure as long as it is contact with skin of a volatile or semi-volatile compound of which phthalates fall into semi-volatile.
	Metric 4:	Temporal Representativeness	High	Model is less than 10 years old.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations and parameter values are provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Medium	Addresses variability by testing model on various chemicals, does not address uncertainty.
Overall Quality Determination			High	

Study Citation:	Gong, M., Zhang, Y., Weschler, C. J. (2014). Predicting dermal absorption of gas-phase chemicals: Transient model development, evaluation, and application. Indoor Air 24(3):292-306.			
HERO ID:	2241693			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	gas			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	24 hours/day			
Exposure frequency:	7 days/week			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Model is peer-reviewed and free of mathematical errors, based on sound approaches/methods, and uses appropriate equations and parameters.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the U.S., Denmark (OECD), and China (non-OECD).
	Metric 3:	Applicability	High	Model can be applied to commercial use of plastic and rubber products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Model is based on current industry conditions and based on data no more than 10 years old.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	High	Uncertainty is addressed by discussing uncertainties in parameter values. Variability addressed by doing a sensitivity analysis to four model parameters.
Overall Quality Determination		High		

Study Citation:	Lu, J., Zhang, J., Wang, Z. T., Fan, Y. X. (2014). An estimation of the daily intake of di (2-ethylhexyl) phthalate (DEHP) among workers in flavoring factories. Biomedical and Environmental Sciences 27(6):419-425.
HERO ID:	2345972
Conditions of Use:	Processing in food manufacturing.

EXTRACTION	
Parameter	Data
Worker activity description:	Preparing raw materials, mixing, filling, and deploying the flavorings. 2 control groups, 27 administrators who did not participate in the flavoring manufacturing. Control group 2 recruited 31 laboratory technicians.
Exposure route:	inhalation, ingestion, dermal
Personal sampling data:	Urine samples estimated daily intake of DEHP from the urinary metabolites. Mean +/- SD (ug/g): For main exposure group mean: 9.63 +/- 6.68, Max - 40.89, min - 1.98 for MEHP; mean - 14.98 +/- 13.79, max - 102.58, min - 3.63 all for MEHHP; mean - 10.18 +/- 7.56, max - 52.48, min - 2.26. Figure 4 provides estimated daily DEHP intake (ug/kg/bw/d) vs. Cumulative Frequency (%) with max intake around ~10 ug/kg/bw/day.
Number of workers:	71 workers in two flavoring manufacturers recruited, could be more workers.

EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	Source is peer reviewed, based on sufficiently sound equations and choice of parameter values.
Domain 2: Representativeness		Metric 2: Geographic Scope	Low	Data for China, a non-OECD country.
		Metric 3: Applicability	Uninformative	Food manufacturing is not in scope. Data is for processing urinary metabolite DEHP data in food flavoring to determine exposure. Is not for airborne exposure.
		Metric 4: Temporal Representativeness	High	Data is less than 10 years old.
Domain 3: Accessibility/ Clarity		Metric 5: Metadata Completeness	High	Parameter values are transparent and clear and can be evaluated. Rationale for approach is elaborated on and explained.
Domain 4: Variability and Uncertainty		Metric 6: Metadata Completeness	Low	Does not address uncertainty or variability

Overall Quality Determination	Uninformative
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Study Citation:	Pelletier, M., Bonvallot, N., Ramalho, O., Blanchard, O., Mercier, F., Mandin, C., Bot, Le, B., Glorennec, P. (2017). Dermal absorption of semivolatile organic compounds from the gas phase: Sensitivity of exposure assessment by steady state modeling to key parameters. Environment International 102:106-113.
HERO ID:	3602893
Conditions of Use:	Industrial and commercial use

EXTRACTION	
Parameter	Data
Exposure route:	dermal
Physical form:	gas
Dermal exposure data:	Dermal exposure data

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Model is peer-reviewed and free of mathematical errors, based on sound approaches/methods, and uses appropriate equations and parameters.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from France, an OECD country.
	Metric 3: Applicability	High	Model can be applied to commercial use of fabric product, furniture and furnishings, and personal care products, in-scope occupational scenarios.
	Metric 4: Temporal Representativeness	High	Model is based on current industry conditions and based on data no more than 10 years old.
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	Uncertainty is addressed with respect to chosen parameters. Variability addressed by running a sensitivity analysis to 6 key parameters.

Overall Quality Determination	High
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Study Citation:	Wormuth, M., Scheringer, M., Vollenweider, M., Hungerbühler, K. (2006). What are the sources of exposure to eight frequently used phthalic acid esters in Europeans?. Risk Analysis 26(3):803-824.
HERO ID:	680214
Conditions of Use:	Consumer use

EXTRACTION	
Parameter	Data
Exposure route:	Inhalation, dermal, oral
Area sampling data:	Table 5 has min, median, mean, and max in indoor and outdoor ambient air: 200 ng/m (median) in indoor air; 2.8 ng/m ³ (median) in outdoor air.// For spray painting, a typical fingertip dispenser generates 25 grams of spray per minute and the fraction of particles that are available for inhalation is 0.005.
Dermal exposure data:	Dermal exposure data
Exposure duration:	For spray paints, the mean duration of spraying is 4 minutes and the mean contact time with aerosols is 15 minutes.
Exposure frequency:	Table 7 has frequency of use of personal care products: 0.29-2/day for deodorant; 0.12-1.5/day for perfume; 0.14-1/day for aftershave; 0.05-2/day for hair styling; 0.43-2/day for shampoo; 0.16-2/day for skin care; 0.11-1/day for nail care; 0.18-1/day for makeup; 0.11-8.43/day for baby products. // Spray paints are infrequently used by teenagers and adults (two times per year, which is 0.0055 per day).

EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are appropriate for the model's application (note: peer review may address appropriate application).
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The model can be appropriately applied to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The model is based on data that are generally more than 10 years but no more than 20 years old. However, the model is based on operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	High	The model characterizes variability and uncertainty in the results.

Overall Quality Determination

High

Study Citation:	Xu, Y., Hubal, Cohen, E. A., Little, J. C. (2010). Predicting residential exposure to phthalate plasticizer emitted from vinyl flooring: Sensitivity, uncertainty, and implications for biomonitoring. Environmental Health Perspectives 118(2):253-258.			
HERO ID:	387965			
Conditions of Use:	commercial use - vinyl flooring			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal absorption, and oral ingestion of dust			
Physical form:	gas and dust			
Area sampling data:	Gas phase concentration - 0.1–0.18 ug/m3; Dust-phase concentration - 2,000–3,500 ug/g			
Engineering control:	ventilation			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are appropriate for the model’s application.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	Medium	Not for an occupational use, but for household. Model can be utilized in commercial settings.	
	Metric 4: Temporal Representativeness	Medium	The model is based on data that are generally more than 10 years but no more than 20 years old.	
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided.	
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	The model characterizes variability and uncertainty in the results.	
Overall Quality Determination		High		

Study Citation:	ATSDR, (2019). Toxicological profile for di(2-ethylhexyl)phthalate (DEHP): draft for public comment.			
HERO ID:	5926020			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	PVC production workers			
Exposure route:	oral and inhalation			
Physical form:	liquid			
Personal sampling data:	Chromosomal aberrations in leucocytes			
Area sampling data:	0.0006–0.01 ppm in one study			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	at least 1 year			
Number of workers:	82 male in one study and 74 male in another study			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within scope
	Metric 4:	Temporal Representativeness	Low	The data is more than 20 years old
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty
Overall Quality Determination		Medium		

Study Citation:	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.			
HERO ID:	1267867			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal			
Physical form:	particles of powder, solvent vapors, solvents			
Particle size characterization:	Basecoat applications by air atomization had a MMAD of 4-14 um. Application by rotary atomizer generated particles of 25-35 um. In another study, the MMAD of lacquer mist was 6.4+-3.4 um and enamel had a MMAD of 5.7+-2.0 um.			
Number of workers:	Half a million workers in the U.S. are included in the application of paint products. Of this number, 200,000 are employed in autobody shops.			
Personal protective equipment:	The minimum respirator for all paint applications should be a combination mist-organic vapor air-purifying device. Higher levels of protection including air-supplied hoods or helmets may be necessary on certain systems such as spray application.			
Engineering control:	All storage and mixing vessels should be provided with close fitting covers designed with access ports. It should be normal to equip these tanks with integral agitators. All dispensing stations should be provided with collection trays and safety cans. Transfer of solvent should be done by closed-pump systems not by open pouring. Controls in the application of paint systems must include excellent housekeeping, effective ventilation control, and protective clothing. Adequate washing facilities should be available, and eating and drinking should be prohibited.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	Medium	Data are for the use of paints and coatings, but are a general model, and not for one specific chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (means, standard deviations) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including different paint application techniques. Uncertainty isn't addressed.	
Overall Quality Determination		High		

Study Citation:	Chung, B. Y., Choi, S. M., Roh, T. H., Lim, D. S., Ahn, M. Y., Kim, Y. J., Kim, H. S., Lee, B. M. (2019). Risk assessment of phthalates in pharmaceuticals. Journal of Toxicology and Environmental Health, Part A: Current Issues 82(5):351-360.			
HERO ID:	5432993			
Conditions of Use:	Pharmaceutical drugs			
EXTRACTION				
Parameter	Data			
Exposure route:	ingestion			
Physical form:	solid, liquid			
Comments:	About concentration in pharmaceuticals and relates to consumer exposure.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Data is peer reviewed so likely contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for South Korea, an OECD country.
	Metric 3:	Applicability	Low	Data is risk assessment of phthalates present in ingestible pharmaceutical drugs, which is not in scope but identifies potential contamination route in overall drug process
	Metric 4:	Temporal Representativeness	High	Source is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Documents results and methods, identifies potential contamination route and identifies exposure routes and physical forms and types of medication.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different drug delivery methods. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.		
HERO ID:	675060		
Conditions of Use:	Use (general use, not differentiated)		
EXTRACTION			
Parameter	Data		
Area sampling data:	See Fig 4 and Table A3 - air concentrations near industry point sources were <1 to 3 ng/m3		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:		CPSC, (2010). Toxicity review of Di(2-ethylhexyl) Phthalate (DEHP).		
HERO ID:		2525689		
Conditions of Use:		All (dermal exposure data)		
		EXTRACTION		
Parameter		Data		
Dermal exposure data:		Dermal exposure data		
		EVALUATION		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:		CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).			
HERO ID:		679920			
Conditions of Use:		Consumer use of plastics			
		EXTRACTION			
Parameter		Data			
Dermal exposure data:		Dermal exposure data			
		EVALUATION			
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
		Metric 3:	Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
		Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
		Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High			

Study Citation: EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.
HERO ID: 5353181
Conditions of Use: Indoor air in residential homes

EXTRACTION	
Parameter	Data
Exposure route:	oral, inhalation, dermal
Physical form:	dust
Area sampling data:	Recently, DEHP has also been measured in indoor air inhomes in the United States (detected in 100% of 20 samples from homes in Albany,NY, method quantifi- cation limit = 0.10 ng/m3, median: 17.4 ng/m3, maximum: 132 ng/m3 (74/228)
Comments:	Biomonitoring daily intake: For adults 20-49, mean daily intakes were 1.6 ug/kg bw/day for males and 1.4 ug/kg bw/day for females (74/228)

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	Uninformative	Data is for indoor residential air concentration which is not in scope.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty.

Overall Quality Determination **Uninformative**

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Use: Plastics		
EXTRACTION			
Parameter	Data		
Area sampling data:	Table 23 has steady state concentrations in indoor air: 0.16 to 0.81 ug/m3 depending on room of the house.		
Dermal exposure data:	Dermal exposure data		
Exposure duration:	See table 12 for dermal exposure duration for various plastic articles (non-occupational exposure)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Low	Exposure estimates are for non-occupational use of plastics.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		Medium	

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Processing: Plastics		
EXTRACTION			
Parameter	Data		
Worker activity description:	Other occupational exposures can come from different job situations in private households, nurseries, offices, hospitals, kindergardens etc.		
Exposure route:	Workers can be exposed to the four phthalates during manufacturing of articles – not only due to direct “hands on” contact, but also due to the emissions from e.g. industrial extrusion processes or the presence of articles like e.g. PVC flooring at the production site. Other occupational exposures can come from different job situations in private households, nurseries, offices, hospitals, kindergardens etc.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	manufacture: exposures may occur during system leaks, drumming and filling of road and rail tankers, cleaning of tanks used for production, storage or transport, during service and maintenance, transfer, and process sampling.processing: exposed workers may be working close to processes emitting DEHP, drumming the substance, handling products containing the substance or transferring the substance or the products to other systems. Much of the gas emitted from the hot processes with DEHP will rapidly condense to form an aerosol with the consequence that workers will be exposed to both gas and aerosol			
Exposure route:	inhalation of gaseous DEHP and liquid aerosols, and dermal uptake of liquid DEHP, vapour and aerosols			
Physical form:	gaseous DEHP and liquid aerosols, liquid DEHP, vapour and aerosols			
Personal sampling data:	manufacture: worst case for exposure via inhalation is estimated at 5 mg/m3 (aerosol) based on measurements			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3:	Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by reporting both dermal and inhalation exposures but uncertainty is not addressed.
Overall Quality Determination		High		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	processing: exposed workers may be working close to processes emitting DEHP, drumming the substance, handling products containing the substance or transferring the substance or the products to other systems. Much of the gas emitted from the hot processes with DEHP will rapidly condense to form an aerosol with the consequence that workers will be exposed to both gas and aerosol			
Physical form:	Gas and aerosol			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).	
	Metric 3: Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di-"isodecyl"phthalate (DIDP).
HERO ID:	1588746
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Personal sampling data:	Literature data: Liss et al. (1985) presented data on 50 personal exposure measurements (with sampling on 37 mm diameter filter cassettes at 1 l/min) to DEHP for the duration of the workshift; 6 only showed levels above the analytical limit of detection. The maximum measured concentration was 4.1 mg/m3. // Unpublished data: King (1996) reported data from different producers and from the HSE (Table 4.1). Sampling times are not indicated. Table 4.1 shows DEHP concentration of <0.1 mg/m3 during unknown production activity, <0.016-4.3 mg/m3 during production, <0.013-0.09 mg/m3 during tanker filling, 0.03-1.56 mg/m3 during unknown production activities.

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

Overall Quality Determination

High

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di- "isodecyl"phthalate (DIDP).		
HERO ID:	1588746		
Conditions of Use:	Production of plastics		
EXTRACTION			
Parameter	Data		
Personal sampling data:	Literature data: In a study on the health status of workers exposed to phthalate plasticisers in the manufacture of artificial leather and films based on PVC resins, Milkov et al. (1973) reported “ambient levels of vapours or aerosols of the plasticisers (mixed esters) at the working zone of the primers ranging from 10 to 66 mg/m3. Similar results were obtained at the workstations of the mill operators and calendar operators. In the mixture preparation section, the plasticiser level was found to be 1.7-40 mg/m3”. Nielsen et al. (1985) measured exposure to phthalic acid esters (mainly DEHP, DIDP and BBP) in a PVC processing industry (2-hour sampling times) and found atmospheric concentrations ranging from 0.01 to 2.8 mg/m3. Hagmar et al. (1990) give results of the same order of magnitude (0.5 to 3 mg/m3 among “highly” exposed workers (calendering, mainly exposed to DEHP, DIDP and BBP). They give no detail, however, on sampling techniques. Vainiotalo and Pfäffli (1990) measured exposures (static, not personal samplings) to DEHP in 9 plants in the range < 0.02 to 1.1 mg/m3 (this highest single value was measured during calendering). They sampled on Florisil adsorption tubes at a flow rate of 0.5 l/min, and analysed by HPLC on a reversed phase C18 column with a 95:5 acetonitrile-water eluent. Dirven et al. (1993) measured DEHP concentrations in the ambient air of PVC-processing industries (Table 4.2). Two-hour samplings were performed on mixed cellulose ester membranes at 1 l/min. After extraction, analysis was performed with a gas chromatograph. // Unpublished data: King (1996) reported data collected in the UK by the HSE and by industry. They are of particular interest since they include an idea of data repartition (Table 4.3). Table 4.3 shows DEHP concentrations <1.0 mg/m3. RIVM (1997) collected exposure data to various phthalates during processing of polymers. Table 4.4 summarises the data – 0.02 – 2.0 mg/m3 DEHP. KEMI (1997) indicates that exposure to phthalates is in the range of 0.1-0.3 mg/m3 (8 hours) during manufacture of flooring material (mixture of DEHP, BBP and DIDP) and up to 2 mg/m3 during calendering of PVC film. Other data have been collected from databases in the UK (Table 4.5), Germany (Table 4.6) and France (Table 4.7) – ND – 26.7 mg/m3 (activities include mixing, milling, operator, packing, transforming, rubber calendering, pharmaceuticals, and metallic hoses).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
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Study Citation:		ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di- "isodecyl"phthalate (DIDP).	
HERO ID:		1588746	
Conditions of Use:		Production of plastics	
Domain		Metric	
		EVALUATION	
		Rating	Comments
Domain 4: Variability and Uncertainty			
Metric 7:		Metadata Completeness	
		High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di-”isodecyl”phthalate (DIDP).		
HERO ID:	1588746		
Conditions of Use:	Use of formulations containing DIDP (coatings, adhesives or inks)		
EXTRACTION			
Parameter	Data		
Worker activity description:	Use of end products can be distinguished in aerosol non-forming and aerosol-forming activities. During non aerosol-forming activities (e.g. normal use of paint, adhesive, ink...), inhalation exposure will be negligible because of the low vapour pressure of DIDP. Significant exposures can occur during aerosol-forming activities when the use of the products involves elevated temperature or spraying technique (e.g. application of hot-melt adhesives, coating using a bath, spray painting or printing, textile spread coating, car underbody spray coating).		
Personal sampling data:	See Table 4.8 for DEHP measurements: Use in inks and office equipment is undetected; use in commercial vehicles if <0.1 mg/m3; use in boiler making is 0.083 and 0.046 mg/m3 ; and use in carpets is <0.1 mg/m3. // Industry (King, 1996) reported some measurements made in 1995 on exposure to DEHP and DIDP during spray coating or spread coating in an automobile factory. Atmospheric concentrations were in the range 0-0.11 mg/m3.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECJRC, (2008). European Union risk assessment report: Bis(2-ethylhexyl)phthalate (DEHP).
HERO ID:	1614673
Conditions of Use:	Manufacturing, processing, industrial and commercial uses.

EXTRACTION	
Parameter	Data
Worker activity description:	Occupational worker activities within production of DEHP and Industrial uses of DEHP. Involve maintenance, repair of DEHP esterifier, chemical operators, tanker filling, drumming, shipping.
Exposure route:	inhalation and dermal for production and industrial use
Physical form:	gas, vapor, aerosol and airborne particles
Area sampling data:	See Table 4.1, pg 247: USA production, maintenance: 0.02-4.1 w/ avg of 0.07 mg/m ³ . Europe tanker filling: <0.013 - 0.09 with average <0.11 mg/m ³ . Drumming sample was 0.14 mg/m ³ . Another drumming sample was 0.23 - 0.52 with average 0.32 mg/m ³ . Various other samples with workplace not specified in Table 4.1 DEHP extrusion had samples at average of 0.05, 0.3 mg/m ³ . Calendaring had sample at 0.5 mg/m ³ . Hot embossing at 0.05 mg/m ³ . Welding at 0.3 mg/m ³ . Injection molding at 0.02 mg/m ³ . Compounding at 0.02 mg/m ³ . Thermoforming at 0.02 mg/m ³ and high-frequency welding at 0.02 mg/m ³ . Pigment manufacture <0.25 mg/m ³ . Manufacture of floor tiles <0.5 mg/m ³ . Manufacture of flexible floor coverings < 0.5 mg/m ³ . Calendar operators 1.0-2.8 with average of 2.0 mg/m ³ . All data given in Table 4.2
Particle size characterization:	0.1 - 0.3 um from neat substance as gas or an aerosol. DEHP as a component in spray mist of neat DEHP or a mixture of substances eg. paints. In general this particle can be assumed to be 2-20 um.
Exposure duration:	Table 4.1 says "full shift"
Number of workers:	pg 27: In the USA approximately 340,790 employees at 19,400 facilities may be exposed to DEHP (US EPA, 1996).

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data and sound methods from EU.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for EU, all OECD countries.
	Metric 3:	Applicability	High	Data is directly applicable to manufacture, processing, and industrial use of DEHP.
	Metric 4:	Temporal Representativeness	Low	Most data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Clearly documents its data sources, methods, results and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability across different industries and manufacturing sites. Addresses uncertainty by stating the ability of being able to report all DEHP use in end-products.

Overall Quality Determination

High

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
HERO ID:	679933		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Personal sampling data:	Liss et al. (1985) presented data on 50 personal exposure measurements (with sampling on 37 mm diameter filter cassettes at 1 l/min) to DEHP for the duration of the workshift; 6 only showed levels above the analytical limit of detection. The maximum measured concentration was 4.1 mg/m3. King (1996) reported data from different producers and from the HSE (Table 4.1). Range <0.01 to 4.3 mg/m. Sampling times are not indicated.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-“isononyl” phthalate (DINP).		
HERO ID:	679933		
Conditions of Use:	Manufacturing of products containing DEHP		
EXTRACTION			
Parameter	Data		
Personal sampling data:	King (1996) reported data collected in UK by the HSE and by industry. They are of particular interest since they include an idea of data repartition (Table 4.3). Range of 0.25 to 10 mg/m3. // RIVM (1997) provides data in Table 4.4. Range 0.02-0.5 mg/m3 for extrusion, injection, molding, calendaring, compounding. Range 1.46-1.95 mg/m3 for calendaring from one study. Range of 0.3-2 mg/m for calendaring from another study. 1.23 mg/m3 for waste processing at polymer processing plant. // KEMI (1997) indicates that exposure to phthalates is in the range of 0.1-0.3 mg/m3 (8 hours) during manufacture of flooring material (mixture of DEHP, BBP and DIDP) and up to 2 mg/m3 during calendaring of PVC film.		
Area sampling data:	Nielsen et al. (1985) measured exposure to phthalic acid esters (mainly DEHP, DIDP and BBP) in a PVC processing industry (2 hour sampling times) and found atmospheric concentrations ranging from 0.01 to 2.8 mg/m3. // Hagmar et al. (1990) give results of the same order of magnitude (0.5 to 3 mg/m3 among ‘highly’ exposed workers (calendering, mainly exposed to DEHP, DIDP and BBP). They give no detail, however, on sampling techniques. // Vainiotalo and Pfäffli (1990) measured exposures (static, not personal samplings) to DEHP in 9 plants in the range < 0.02 to 1.1 mg/m3 (this highest single value was measured during calendaring). They sampled on Florisil adsorption tubes at a flow rate of 0.5 l/min, and analysed by HPLC on a reversed phase C18 column with a 95:5 acetonitrile-water eluent. // Dirven et al. (1993) measured DEHP concentrations in the ambient air of PVC-processing industries (Table 4.2). Two-hour samplings were performed on mixed cellulose ester membranes at 1 l/min. After extraction, analysis was performed with a gas chromatograph. // During transforming with (50th %tile = 0.08 mg/m3, 95th %tile = 5.93 mg/m3) and without control measures (50th %tile = 0.15 mg/m3, 95th %tile = 7.0 mg/m3) in Table 4.6.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty			
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Study Citation:		ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
HERO ID:		679933		
Conditions of Use:		Manufacturing of products containing DEHP		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
HERO ID:	679933			
Conditions of Use:	Spray coating or spread coating in an automobile factory			
EXTRACTION				
Parameter	Data			
Area sampling data: Industry (King, 1996) reported some measurements made in 1995 on exposure to DEHP and DINP during spray coating or spread coating in an automobile factory. Atmospheric concentrations were in the range 0-0.11 mg/m3.				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:	7265437		
Conditions of Use:	Use: Plastics		
EXTRACTION			
Parameter	Data		
Area sampling data:	Table 24 has steady state concentrations in indoor air: 0.16 to 0.81 ug/m3 depending on room of the house.		
Dermal exposure data:	Dermal exposure data		
Exposure duration:	See table 18 for dermal exposure duration for various plastic articles (non-occupational exposure)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Low	Exposures are non-occupational.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		Medium	

Study Citation:	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).			
HERO ID:	7265437			
Conditions of Use:	Processing: Plastics			
EXTRACTION				
Parameter	Data			
Worker activity description: Workers can be exposed to the four phthalates during manufacturing of articles – not only due to direct “hands on” contact, but also due to the emissions from e.g. industrial extrusion processes or the presence of articles like e.g. PVC flooring at the production site.				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	Kang, Y., Man, Y. B., Cheung, K. C., Wong, M. H. (2012). Risk assessment of human exposure to bioaccessible phthalate esters via indoor dust around the Pearl River Delta. Environmental Science & Technology 46(15):8422-8430.		
HERO ID:	1311700		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Life cycle description:	Plasticizer in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing.		
Number of sites:	55		
Exposure route:	Inhalation		
Physical form:	Dust		
Area sampling data:	'Workplace median is 720 ug/g, range of 82.3 - 1500 ug/g		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S. or the country of origin is not specified.
	Metric 3: Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
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Study Citation: Kang, Y., Man, Y. B., Cheung, K. C., Wong, M. H. (2012). Risk assessment of human exposure to bioaccessible phthalate esters via indoor dust around the Pearl River Delta. Environmental Science & Technology 46(15):8422-8430.			
HERO ID: 1311700			
Conditions of Use: Processing			
Domain		Metric	EVALUATION
			Rating
Overall Quality Determination			High
			Comments

Study Citation:	Kim, H. Y. (2016). Risk assessment of di(2-ethylhexyl) phthalate in the workplace. Environmental Health and Toxicology 31:e2016011.			
HERO ID:	3230363			
Conditions of Use:	Manufacturing and handling of DEHP.			
EXTRACTION				
Parameter	Data			
Number of sites:	229 workplaces handling or manufacturing DEHP			
Worker activity description:	Manufacturing or handling of DEHP, does not specifically mention what workers were doing.			
Exposure route:	inhalation, ingestion			
Physical form:	vapor			
Area sampling data:	See Table 2 on page 4. As shown in Table 2, the DEHP manufacturing workplaces had an average exposure level of 0.158±0.306 mg/ m3, while DEHP handling workplaces had an average exposure level of 0.210±0.257 mg/m3			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Risk assessment report uses high quality data from reputable government agencies such as the EPA and NIOSH.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Data is for occupational manufacturing and handling of DEHP.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides data sources, methods, results and assumptions but is not transparent in worker activities to identify specific exposures. Provides physical form and exposure route.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by addressing both manufacturing and handling of DEHP. Does not address uncertainty.
Overall Quality Determination			High	

Study Citation:	Lee, M., Kim, J. H., Lee, D., Kim, J., Lim, H., Seo, J., Park, Y. K. (2018). Health risk assessment on hazardous ingredients in household deodorizing products. International Journal of Environmental Research and Public Health 15(4):744.		
HERO ID:	4730751		
Conditions of Use:	Use of deodorizing products (auto care products)		
EXTRACTION			
Parameter	Data		
Area sampling data:	Table 5, 0.0099 mg/m3		
Dermal exposure data:	Dermal exposure data		
Exposure duration:	See Table 4 for various use scenarios		
Exposure frequency:	See Table 4 for various use scenarios		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation. (There is commercial and consumer auto care products COU)
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Miao, Y., Wang, R., Lu, C., Zhao, J., Deng, Q. (2016). Lifetime cancer risk assessment for inhalation exposure to di(2-ethylhexyl) phthalate (DEHP). Environmental Science and Pollution Research 24(1):312-320.		
HERO ID:	3455686		
Conditions of Use:	Processing for PVC & gen pop ambient air and indoor air exposure.		
EXTRACTION			
Parameter	Data		
Exposure route:	inhalation		
Area sampling data:	Ambient air exposure less than 0.05 ug/m^3. High concentrations of DEHP (more than 1 ug/m^3) found in newly decorated apartments. Two studies in China found that the concentration of DEHP in ambient air was 277 ng/m^3 and 260 ng/m^3. Indoor air found to be 2437 ng/m^3 in newly decorated apartments and 1700 ng/m^3 in residential buildings. Occupational exposure level of DEHP in the air was high up to 23,700-71,000 ng/m^3 in PVC plants.		
Comments:	All of the monitoring data in this paper was found in other literature. Other info in source is estimation of body intake of DEHP.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so methodology is likely highly accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Reported data is from China, a non-OECD country
	Metric 3: Applicability	High	Most data is for gen pop some is for PVC processing exposure.
	Metric 4: Temporal Representativeness	High	Less than 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range of values.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Provides results but underlying methods of sampling, sources and assumptions not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	NICNAS, (2008). Existing chemical hazard assessment report: Diethylhexyl phthalate.			
HERO ID:	5178600			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal (15/78)			
Physical form:	oily liquid (12/78)			
Area sampling data:	Exposure levels in the sampled plant ranged from 0.0006 to 0.01 ppm. (27/78)			
Exposure frequency:	Workers were exposed for a mean of 11.5 years (27/78)			
Number of workers:	In one cohort study, 221 workers were exposed to DEHP. (27/78)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by comparing results to different studies. Uncertainty isn't addressed.
Overall Quality Determination			High	

Study Citation:	NICNAS, (2015). Priority existing chemical draft assessment report: Diisodecyl Phthalate & Di-n-octyl Phthalate.			
HERO ID:	6836808			
Conditions of Use:	Use in children’s toys and cosmetics			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Dermal exposure data:	Dermal exposure data			
Comments:	The article does contain some info about how DEHP can be used as a surrogate for dermal absorption of other phthalates, it could be potentially useful for human health.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	Uninformative	Data are for use in children’s toys which is not in-scope or similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated (1998)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by considering a ”worst-case” scenario but uncertainty is not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	NTP, (2000). NTP-CERHR expert panel report on di(2-ethylhexyl) phthalate. GRA and I(GRA and I):120.			
HERO ID:	679847			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	The major route of exposure is inhalation			
Area sampling data:	The American Chemistry Council cites six studies that indicate that exposures in the US are generally below 1 mg/m3 during production of phthalates and below 2 mg/m3 during production of PVC.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	NTP, (2000). NTP-CERHR expert panel report on di(2-ethylhexyl) phthalate. GRA and I(GRA and I):120.		
HERO ID:	679847		
Conditions of Use:	PVC Manufacturing		
EXTRACTION			
Parameter	Data		
Exposure route:	The major route of exposure is inhalation		
Area sampling data:	The American Chemistry Council cites six studies that indicate that exposures in the US are generally below 1 mg/m3 during production of phthalates and below 2 mg/m3 during production of PVC.		
Dermal exposure data:	Dermal exposure data		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-isononyl phthalate (DINP). Center for the Evaluation of Risks to Human ReproductionVol(2):i-III90.			
HERO ID:	680097			
Conditions of Use:	General population			
EXTRACTION				
Parameter	Data			
Worker activity description:	production of PVC			
Exposure route:	oral and dermal			
Personal sampling data:	The range of exposures estimated for the DEHP is 3-30 ug/kg bw/day.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The data are for general population exposure, which may inform occupational exposure
	Metric 4:	Temporal Representativeness	Medium	The data are more than 10 years but no more than 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty
Overall Quality Determination			Medium	

Study Citation:	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.		
HERO ID:	3808976		
Conditions of Use:	Use		
EXTRACTION			
Parameter	Data		
Life cycle description:	Automotive Coating Application		
Worker activity description:	transferring and mixing liquid products, container cleaning, transferring mixed coating to application equipment, overspray		
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to non-volatile liquids Inhalation: Provides methods for modeling exposures to mists. dermal: surrogate measured skin loading conditions inhalation: 8-hr TWA surrogate data		
Exposure frequency:	250 days/yr		
Number of workers:	8 workers/site		
Personal protective equipment:	air-purifying respirators or air-supplied respirators, Gloves (typically latex or nitrile), paint suits, and face masks/eye protection		
Comments:	PBZ sampling.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (min, max, mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating types.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2009). Emission scenario document on adhesive formulation.			
HERO ID:	3827299			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Formulation of Adhesives			
Worker activity description:	Unloading, container cleaning, mixing operations, sampling, equipment cleaning, packaging			
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	days/yr equal to number of bt/yr			
Number of workers:	22 workers/site			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Model results characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of adhesives.	
Overall Quality Determination		Medium		

Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.		
HERO ID:	3827300		
Conditions of Use:	Use		
EXTRACTION			
Parameter	Data		
Life cycle description:	Adhesive Application		
Worker activity description:	unloading, container cleaning, adhesive application, equipment cleaning, curing/drying		
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to mists and volatile liquids		
Exposure frequency:	50-250 days/yr		
Number of workers:	26-106 workers/site		
Personal protective equipment:	chemical-resistant gloves and safety glasses. Heat-resistant gloves are used when applying hot-melt adhesives		
Engineering control:	Spray booths		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.
Overall Quality Determination		High	

Study Citation:	OECD, (2017). Emission scenario document (ESD) on the use of textile dyes.			
HERO ID:	3828838			
Conditions of Use:	Textile Dyes			
EXTRACTION				
Parameter	Data			
Worker activity description:	unloading, container cleaning, dyeing machine operation.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids and solids.			
Dermal exposure data:	nan			
Exposure frequency:	31-250 days/yr			
Number of workers:	1-6 workers/site			
Personal protective equipment:	safety glasses, goggles, aprons, respirators, and/or masks			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2015 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical functions.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2015). Emission scenario document on use of adhesives.			
HERO ID:	3833136			
Conditions of Use:	Adhesive Application			
EXTRACTION				
Parameter	Data			
Worker activity description:	unloading, container cleaning, adhesive application, equipment cleaning, curing/drying.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to mists and volatile liquids.			
Dermal exposure data:	nan			
Exposure frequency:	50-250 days/yr			
Number of workers:	26-106 workers/site			
Personal protective equipment:	chemical-resistant gloves and safety glasses. Heat-resistant gloves are used when applying hot-melt adhesives.			
Engineering control:	Spray booths			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.	
Overall Quality Determination		High		

Study Citation:	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.			
HERO ID:	3840003			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Formulation of Coatings, inks, and adhesives			
Worker activity description:	Unloading, container cleaning, sampling, equipment cleaning, filter media changeout, packaging			
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	250 days/yr			
Number of workers:	18-39 workers/site			
Personal protective equipment:	”fabric or non-woven long sleeved shirts and pants, coveralls, and neoprene or rubber gloves. Barrier creams may be used to facilitate hand washing when materials or products penetrate gloves or other PPE. A rubber apron or rubber suit and rubber boots may also be worn in cases where there is potential for splashing on or penetration through clothing”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Hydraulic Fracturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	unloading, container cleaning, equipment/storage tank cleaning			
Exposure route:	dermal			
Dermal exposure data:	nan			
Exposure frequency:	250 days/yr			
Number of workers:	8 workers/site			
Personal protective equipment:	impervious gloves, clothing, safety glasses, masks or respirators			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering on- and off-shore wells and chemical functions.	
Overall Quality Determination		High		

Study Citation:	OECD, (2011). Emission Scenario Document on the application of radiation curable coatings, inks, and adhesives via spray, vacuum, roll, and curtain coating.		
HERO ID:	6568745		
Conditions of Use:	Coating, Ink, and Adhesive Application		
EXTRACTION			
Parameter	Data		
Worker activity description:	unloading, container cleaning, sampling, application, equipment cleaning.		
Exposure route:	dermal and inhalation		
Personal sampling data:	Dermal: Provides methods for modeling exposures to non-volatile liquids.		
Dermal exposure data:	nan		
Exposure frequency:	250 days/yr		
Number of workers:	7-85 workers/site		
Personal protective equipment:	fabric or non-woven long sleeved shirts and pants, coveralls, and neoprene or rubber gloves. Barrier creams may be used to facilitate hand washing when materials or products penetrate gloves or other PPE. A rubber apron or rubber suit and rubber boots may also be worn in cases where there is potential for splashing on or penetration through clothing. Respiratory protection is used when necessary, especially when escape of spray particles into the work environment is unavoidable.		
Engineering control:	Spray booths.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
Overall Quality Determination		Medium	

Study Citation:	U.S. EPA, (2021). Use of additives in plastic compounding – Generic scenario for estimating occupational exposures and environmental releases (Revised draft).			
HERO ID:	10366192			
Conditions of Use:	Plastics Compounding			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids.			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	148-264 days/yr			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2022). Emission scenario document on chemicals used in hydraulic fracturing (draft).			
HERO ID:	10366193			
Conditions of Use:	Hydraulic Fracturing Fluids			
EXTRACTION				
Parameter	Data			
Worker activity description:	container unloading, equipment cleaning, container cleaning,			
Exposure route:	Dermal, Inhalation			
Physical form:	Liquid			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids.			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	14 days/yr			
Number of workers:	9 workers/well			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality information/data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering range of release quantities based on multiple sources.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2022). Commercial use of automotive detailing products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).			
HERO ID:	10480464			
Conditions of Use:	Automotive detailing products			
EXTRACTION				
Parameter	Data			
Worker activity description:	Container unloading (liquids and solids), application and use of automotive detailing products.			
Exposure route:	Dermal, Inhalation			
Physical form:	liquids, pastes, or clays/waxes			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
Dermal exposure data:	nan			
Exposure duration:	8 hr/day			
Exposure frequency:	260 days/yr			
Number of workers:	3-4 workers/detailing facility.			
Personal protective equipment:	Particle respirators, ear plugs, safety glasses, aprons, knee pads, nitrile gloves, cooling towels, and face masks (page 37).			
Engineering control:	Miscellaneous control technologies include performing vehicle detailing in areas where there are no floor drains, keeping container lids closed, avoiding the use of detergents, using sloping pavement around drains, using high-pressure and low-volume sprays, and labeling all containers. Industrial and commercial facilities often collect dust emissions in ventilation filters.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality information/data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
HERO ID:	10480466			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Worker activity description:	Container unloading (liquids and solids), container cleaning, equipment cleaning, laboratory analyses, disposal of laboratory chemicals.			
Exposure route:	Dermal, Inhalation.			
Physical form:	Liquid or solid.			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	8-12 hr/day.			
Exposure frequency:	250 days/yr.			
Number of workers:	3 workers/facility and 3 ONUs/facility.			
Personal protective equipment:	Basic PPE includes wearing long sleeves (lab coats), long pants, closed-toe shoes, safety glasses or goggles, and gloves during the use of laboratory chemicals. Additional PPE may be worn depending on the level of hazard or specifics of the process.			
Engineering control:	Fume hood.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11182966			
Conditions of Use:	Repackaging			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading transport containers, container cleaning, equipment cleaning, loading of transport containers.			
Exposure route:	Dermal, Inhalation			
Physical form:	Liquid or solid.			
Area sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	8-12 hr/day.			
Exposure frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr.			
Number of workers:	3 workers/facility and 1 ONUs/facility (total number of employees and facilities given in Table 5-3)			
Personal protective equipment:	Commonly used PPE includes safety glasses, face shields, aprons, and gloves.			
Engineering control:	Local exhaust ventilation.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete use amounts provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple worker activities.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11373493			
Conditions of Use:	Plastics Converting			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging compounded resins to process, converting processes, converting equipment cleaning, trimming processes.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids.			
Dermal exposure data:	nan			
Exposure frequency:	137-254 days/yr			
Number of workers:	19 workers/site, 5 ONUs per site			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Model results characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.			
HERO ID:	3827195			
Conditions of Use:	Processing: Plastic material and resin manufacturing (compounding)			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes, loading			
Exposure route:	dermal and inhalation			
Personal sampling data:	Provides methods for modeling exposures to both solids and volatile liquids			
Dermal exposure data:	nan			
Exposure frequency:	148-264 days/yr			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2014). Formulation of waterborne coatings - Generic scenario for estimating occupational exposures and environmental releases -Draft.		
HERO ID:	3827197		
Conditions of Use:	Formulation of Coatings		
EXTRACTION			
Parameter	Data		
Worker activity description:	Unloading, container cleaning, sampling, equipment cleaning, filter media changeout, packaging.		
Exposure route:	dermal and inhalation		
Personal sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids and solids.		
Dermal exposure data:	nan		
Exposure frequency:	235-350 days/yr		
Number of workers:	25-40 workers/site		
Personal protective equipment:	PPE depends on the type of potential exposure. Typically, PPE used in the workplace include safety glasses and gloves. Face shields and a particulate respirator may also be required in cases where there is a potential for dust exposure.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating applications, and multiple chemical functions
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.			
HERO ID:	6311218			
Conditions of Use:	Incorporation into article Plastic material and resin manufacturing; Incorporation into formulation, mixture, or reaction product Plasticizer in plastics material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes (page 10 of 18)			
Exposure route:	dermal and inhalation (page 15 of 18)			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids (page 15-17 of 18)			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	250 days/yr (page 11 of 18)			
Number of workers:	24 workers/site (see page 15 of 18 for this rough estimate calculation)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	6311221			
Conditions of Use:	Formulation and Use of Dyes and pigments (printing Inks)			
EXTRACTION				
Parameter	Data			
Worker activity description:	PROC: unloading, cleaning, packaging (page 31 of 54)USE: Printing operations, unloading (page 39 of 54)			
Exposure route:	dermal and inhalation			
Personal sampling data:	PROC: Inhalation: Provides methods for modeling exposures to volatile liquids and solids (page 31 of 54)USE: Inhalation: Provides methods for modeling exposures to volatile liquids and solids (page 39 of 54)			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	PROC: 250 days/yrUSE: 250 days/yr (page 30 and 39 of 54)			
Number of workers:	PROC: 13-22 workers/siteUSE: 16-43 workers/site(Table 8, page 38 of 54)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple printing applications, and multiple chemical functions	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385709			
Conditions of Use:	Flexographic Printing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Transferring and mixing inks, adjusting ink cans at the press, operating the press.			
Exposure route:	dermal and inhalation.			
Area sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids.			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	4-7.5 hrs/shift.			
Exposure frequency:	300 days/yr.			
Number of workers:	27 workers/site.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple worker activities.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385710
Conditions of Use:	Formulation and use of dyes and pigments (printing inks)

EXTRACTION	
Parameter	Data
Worker activity description:	PROC: Unloading, formulation (dispersion and milling), equipment cleaning, packaging. Workers are likely to encounter both inhalation and dermal exposure during handling of raw materials and ink products as well as equipment cleaning. (page 9 of 23)USE: Unloading, printing operations and ink drying, equipment cleaning. Inhalation exposure among production workers is likely to occur as a result of potential emissions with major contributions coming from ink handling and ink mist generation from printing equipment. Dermal exposure to inks and cleaning solvents are expected during material unloading and cleaning of the printing equipment. (page 13 and 15 of 23)
Exposure route:	Inhalation and dermal (page 9 of 23)
Physical form:	PROC: Liquid, solid particulate (page 9)USE: Liquid, mist (page 15)
Number of workers:	See Table 2-2 on page 6: Total number of workers is 64,973, with the number of workers for each printing type varying from ~13,000 to ~225,000

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

Overall Quality Determination	Medium
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Study Citation:	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.			
HERO ID:	6385711			
Conditions of Use:	Plastics Converting			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging compounded resins to process, converting processes, converting equipment cleaning, trimming processes (page 25 of 96). See page 25-27 for more detailed descriptions of possible exposures within the context of the process.			
Exposure route:	dermal and inhalation (page 52)			
Physical form:	EPA expects most plastics additives to be non-volatile liquids or solids (page 25 of 96)			
Personal sampling data:	Provides methods for modeling exposures to both solids and volatile liquids (See Table 5-1 on page 52 for the various models). Detailed descriptions of the models can be found from page 54-60 of 96.			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	137-254 days/yr (see page 30-31 for thorough descriptions and page 61)			
Number of workers:	30-69 workers/site (page 53-54 of 96)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic, additive types, and worker activities.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385719			
Conditions of Use:	Furniture Coating Application			
EXTRACTION				
Parameter	Data			
Worker activity description:	unloading, spray application, equipment cleaning			
Exposure route:	dermal and inhalation			
Physical form:	liquid			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to mists and volatile liquids			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	250 days/yr			
Number of workers:	12-98 workers/site			
Personal protective equipment:	Air-supplied full face piece respirator; Disposable overalls and head covering; Gloves specific to the chemicals used; and boots and boot coverings			
Engineering control:	Spray booths			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples related to spray application is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and wood vs metal furniture uses
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385748			
Conditions of Use:	Plastics Compounding			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes			
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	264 days/yr (exposure concerns only), or 148 days/yr (both concerns)) (See Section 3.2)			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
Comments:	Exposure Frequency: 148-264 days/yr			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Model results characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.	
Overall Quality Determination		Medium		

Study Citation:	Wypych, G. (2020). Health and safety and environmental impact. :431-458.			
HERO ID:	7978600			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Worker activity description: Exposure route:	Workers at PVC production plants (6/28) dermal, oral (7/28)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted	
Overall Quality Determination		High		

Study Citation:	3M Company (2010). Material Safety Data Sheet: 3M™ Vinyl Tape 764, 766, 767, & 3903.				
HERO ID:	6302180				
Conditions of Use:	Plastic Compounding				
EXTRACTION					
Parameter	Data				
Physical form:	Solid (tape)				
EVALUATION					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.	
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old.	
	Metric 5:	Sample Size	N/A	N/A - Physical form.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Physical form.	
Overall Quality Determination			High		

Study Citation:	3M Company (2018). 3M Scotchcast Poly Plus (Colors).			
HERO ID:	6302183			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Physical form:	Solid (tape)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - physical form.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - physical form.	
Overall Quality Determination		High		

Study Citation:	ANAMET Electrical Inc. (2012). Anaconda Type MTC Blk 1-1/4.			
HERO ID:	6302189			
Conditions of Use:	Plastic Compounding			
EXTRACTION				
Parameter	Data			
Physical form:	Solid (cover with metal core).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	More than 10 but less than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - Physical form..	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Source is clear and extracted data is not applicable to having methods or assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - Physical form.	
Overall Quality Determination		High		

Study Citation:	Baο, J., Wang, M., Ning, X., Zhou, Y., He, Y., Yang, J., Gao, X., Li, S., Ding, Z., Chen, B. (2015). Phthalate concentrations in personal care products and the cumulative exposure to female adults and infants in Shanghai. Journal of Toxicology and Environmental Health, Part A: Current Issues 78(5):325-341.			
HERO ID:	2816857			
Conditions of Use:	Use of Personal Care Products			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	nan			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	Uninformative	The report is from an occupational or non-occupationalscenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			Uninformative	

Study Citation:	Barber, E. D., Teetsel, N. M., Kolberg, K. F., Guest, D. (1992). A comparative study of the rates of in vitro percutaneous absorption of eight chemicals using rat and human skin. Fundamental and Applied Toxicology 19(4):493-497.			
HERO ID:	679215			
Conditions of Use:	All dermal exposure OES			
EXTRACTION				
Parameter	Data			
Exposure route:	In vitro dermal, both human and rat skin			
Physical form:	Liquid			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	32 hours			
Comments:	The permeability constants for DEHP in Table 1 are slower by a factor of about 50 for both the rat and the human than the data presented by Scott et al. (1987), in which both rat and human skin preparations were also used. One reason for this difference may be that Scott et al. used 50% ethanol: water as receptor solution. Bronaugh and Stewart (1984) have reported large differences in the absorption rate of several hydrophobic compounds when different receptor fluids were employed.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Low	In vitro dermal absorption testing considers only the neat solution. Also, exposure was maintained for greater than 24 hours, which is not recommended by OECD 428 due to deterioration of the skin sample beyond 24 hours. Though the data provides potentially useful permeability data, several assumptions would be necessary to apply these data to risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures an in vitro dermal absorption testing protocol that is expected to be outdated.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability was addressed by using several skin samples for each in vitro dermal absorption test. However, uncertainty of testing protocol was not mentioned.

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Study Citation: Barber, E. D., Teetsel, N. M., Kolberg, K. F., Guest, D. (1992). A comparative study of the rates of in vitro percutaneous absorption of eight chemicals using rat and human skin. Fundamental and Applied Toxicology 19(4):493-497.			
HERO ID: 679215			
Conditions of Use: All dermal exposure OES			
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	Bruck, S. D. (1982). The need for better plastic materials for disposable medical applications: Public health benefits and industrial developments. International Journal of Artificial Organs 5(2):85-86.			
HERO ID:	5753581			
Conditions of Use:	Commercial Use - Plasticizer in Medical devices			
EXTRACTION				
Parameter	Data			
Exposure route:	IV injection due to medical equipment in hemodialysis			
Comments:	Estimated that in aqueous IV fluid infusion a patient receives 1 to 3 mg of leaching DEHP/day while in whole blood transfusions 10 to 15 mg/day. During open heart surgery and for each hemodialysis, up to 30 mg or more of the plasticizers is transferred into the blood stream of patients.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Unclear if source is peer reviewed. Appears to use high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	Low	Data is for medical device exposures during treatment and surgery. Not an occupational scenario outlined but could be applied to some commercial uses.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old (1982)
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents results and data, provides exposure route and estimates of exposure during treatment/surgery.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Canada,, G.o. (2020). Phthalate substance grouping – Information sheet.		
HERO ID:	7349060		
Conditions of Use:	General population exposure		
EXTRACTION			
Parameter	Data		
Exposure route:	Canadians may be exposed to these substances from food, including breast milk, environmental sources (for example, dust and for certain phthalates, indoor air), and contact with plastic items. Canadians may also be exposed to some of these substances as a result of using certain cosmetics and natural health care products (for example, diaper creams, body lotions, and hairsprays). Exposure to DIBP and DINP may also occur from the use of certain plastic toys and children’s articles (for example, from mouthing these objects). (p. 4).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Report is from Canada.
	Metric 3: Applicability	Uninformative	Exposure routes are for the general population and do not translate to occupational setting.
	Metric 4: Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5: Sample Size	N/A	Data is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination		Uninformative	

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	Commercial use			
EXTRACTION				
Parameter	Data			
Exposure route:	People are exposed through ingestion, inhalation, and, to a lesser extent, dermal contact with products that contain phthalates. Ingestion and inhalation are the prominent exposure path for DEHP.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Chang, C. T., Chiou, C. S. (2006). Assessment of control strategies for reducing volatile organic compound emissions from the polyvinyl chloride wallpaper production industry in Taiwan. Journal of the Air and Waste Management Association 56(5):611-617.			
HERO ID:	1333868			
Conditions of Use:	Processing: Plasticizer in all other basic organic chemical manufacturing; custom compounding of purchased resins; miscellaneous manufacturing; paint and coating manufacturing; plastics material and resin manufacturing; plastics product manufacturing.			
EXTRACTION				
Parameter	Data			
Engineering control:	Reduce solvent content, adsorbers, electrostatic precipitators, scrubber.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors may impact exposures or releases relative to the U.S., or the country of origin is not specified.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 yearsbut no more than 20 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		Medium		

Study Citation:	Chao, K., Huang, C. S., Wei, C. Y. (2013). Extraction and percolation of PAEs from chemical protective gloves. Polymer Testing 32(8):1551-1557.			
HERO ID:	2346103			
Conditions of Use:	Chemical protective gloves.			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Dermal exposure data:	Dermal exposure data			
Personal protective equipment:	Neoprene, nitrile and PVC gloves			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Unclear if source is peer reviewed, source is controlled lab study and appears to be high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3:	Applicability	Medium	Data is not explicitly for an occupational scenario but could be applied to one where workers are required to wear neoprene, nitrile or PVC protective gloves.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old (2013)
	Metric 5:	Sample Size	Medium	Characterized by a range of data with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides data sources, methods, results and assumptions and are generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different protective gloves and evaluating extraction of DEHP at different temperatures with different solvents. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Chem., HB (2015). Safety Data Sheet (SDS): VINOPRENE 647.			
HERO ID:	6302450			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Personal protective equipment:	PDF Pg. 4-5Use of an air-purifying respirator with organic vapor cartridges, natural rubber gloves (neoprene or leather), goggles in areas where steam is generated.			
Engineering control:	PDF Pg. 5”Local exhaust ventilation is strongly recommended for all hot processing operations”.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for rubber manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - PPE and engineering controls.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - PPE and engineering controls.
Overall Quality Determination			High	

Study Citation:	Cornak, S., Jarosova, A. (2013). The screening of phthalic acid esters in operating fluids of vehicles. Applied Mechanics and Materials 436:153-157.		
HERO ID:	2346094		
Conditions of Use:	Industrial use of automotive care products (lubricant and oils)		
EXTRACTION			
Parameter	Data		
Exposure route:	inhalation, dermal, and oral.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data and sound methods not from frequently used sources but does not indicate flaws or issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for Switzerland, an OECD country.
	Metric 3: Applicability	High	Data is directly applicable to COU of automobile care products.
	Metric 4: Temporal Representativeness	High	Report is less than 10 years old, chemical concentration data is less than 10 years old. PV data is over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range of data based on the sample.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Sources, methods and results are documented and sources are generally apparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by testing various different automobile care products. Does not address uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Eagle, (2015). Safety Data Sheet (SDS): Eagle Supreme Seal & Eagle Gloss Coat.			
HERO ID:	6302432			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Physical form:	clear liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is about 10 years old.
	Metric 5:	Sample Size	N/A	N/A- physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source provides sufficient information for the physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- physical form.
Overall Quality Determination			High	

Study Citation:	Easter, E., Lander, D., Huston, T. (2016). Risk assessment of soils identified on firefighter turnout gear. Journal of Occupational and Environmental Hygiene 13(9):1-38.		
HERO ID:	3159225		
Conditions of Use:	Firefighting		
EXTRACTION			
Parameter	Data		
Worker activity description:	Depending on the assignment, tasks, and time spent at the fire, a firefighter may be exposed to the products of combustion at varying levels. Today, firefighters also spend a considerable amount of time in the “post-fire,” or overhaul, environment, and their gear often becomes covered/contaminated with post-fire combustion products.[12] Although routine cleaning procedures are recommended to ensure proper care and maintenance of firefighter turnout gear, procedures are often ignored, leading to increased exposure of hazardous chemicals and cross contamination.		
Dermal exposure data:	Dermal exposure data		
Personal protective equipment:	The purpose of protective clothing is to create a physical barrier between the wearer and the hazardous environment.[13] The firefighter’s turnout gear includes a coat and trousers or overalls. The coat and trousers are made up of three different layers: the outer shell provides flame resistance, a water-resistant middle layer is referred to as the moisture barrier, and an inner thermal liner provides protection for the skin against radiation, convection, and conduction which are types of heat transfer.[14] For head and neck protection, a hood, or balaclava, is worn. The hood’s knit structure and placement in direct contact with the skin allows for an increased risk of dermal absorption of soils.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	The report is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4: Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty			
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Study Citation:		Easter, E., Lander, D., Huston, T. (2016). Risk assessment of soils identified on firefighter turnout gear. Journal of Occupational and Environmental Hygiene 13(9):1-38.		
HERO ID:		3159225		
Conditions of Use:		Firefighting		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	ECHA, (2017). Opinion on an Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP).			
HERO ID:	10112937			
Conditions of Use:	General			
EXTRACTION				
Parameter	Data			
Worker activity description:	Workers are exposed to DEHP during manufacturing of DEHP, the formulation of DEHP (compounds, dry-blends and plastisol formulations) and the production of articles (polymer processing by calendaring, spread coating, extrusion, injection moulding). Workers are furthermore exposed to the substance during formulation of recycled soft PVC containing DEHP in compounds and dry-blends. During the service life stage of articles worker exposure may also occur (professional handling of PVC articles during installation of building materials and workers wearing PVC work clothes and footwear). (pdf pg. 16)			
Exposure route:	Inhalation, Dermal			
Physical form:	article(solid)			
Comments:	Exposure duration was tagged during full-text but was not identified during Data Extraction/EvaluationQC note: COU changed to "General" from "Manufacture" because the data is general to all stages			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for general occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Report published in 2017, no more than 10 years old.
	Metric 5:	Sample Size	N/A	no sampling data extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Datasources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is not addressed. Variability is considered in the information extracted.
Overall Quality Determination			Medium	

Study Citation:	Fragrance, Wellington (2014). Chocolate.			
HERO ID:	6302311			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Physical form:	Liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - Physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear on the physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Physical form.
Overall Quality Determination			High	

Study Citation:	Gao, C. J., Kannan, K. (2020). Phthalates, bisphenols, parabens, and triclocarban in feminine hygiene products from the United States and their implications for human exposure. Environment International 136:105465.				
HERO ID:	6957637				
Conditions of Use:	Consumer use				
EXTRACTION					
Parameter		Data			
Exposure route:		The estimated exposure doses of phthalates through the dermal absorption pathway from the use of pads, panty liners, and tampons were significant. The dermal absorption doses from the use of feminine hygiene products, under different exposure scenarios were 0.19–27.9% of the total exposure doses of phthalates.			
Dermal exposure data:					
EVALUATION					
Domain		Metric	Rating		Comments
Domain 1: Reliability		Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	The data are from the United States
		Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
		Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
		Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty
Overall Quality Determination			High		

Study Citation:	Gaudin, R., Marsan, P., Ndaw, S., Robert, A., Ducos, P. (2011). Biological monitoring of exposure to di(2-ethylhexyl) phthalate in six French factories: a field study. International Archives of Occupational and Environmental Health 84(5):523-531.		
HERO ID:	697297		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Life cycle description:	Plasticizer in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing		
Worker activity description:	16 workers were assigned to oversee production and to check the reactors and pipes regularly. Two workers were involved in the preparation of plastisols, while three others oversee the automatic line and feed tanks with plastisols as required. 9 workers produce PVC compound pellets by adding DEHP plasticizers to fillers, stabilisers, additives and pigments 9 employees working with polymers with 8-10% DeHP moulded to produce pipes 18 employees making wall coverings by screen printing with inks containing 20-30% DEHP		
Exposure route:	Inhalation, dermal		
Physical form:	Liquid, vapor, solid		
Personal sampling data:	Urinary levels		
Number of workers:	655		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Source provides blood levels.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Gaudin, R., Marsan, P., Robert, A., Ducos, P., Pruvost, A., Lévi, M., Bouscaillou, P. (2008). Biological monitoring of occupational exposure to di(2-ethylhexyl) phthalate: Survey of workers exposed to plastisols. International Archives of Occupational and Environmental Health 81(8):959-966.			
HERO ID:	698237			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizer in all other basic organic chemical manufacturing; custom compounding of purchased resins; miscellaneous manufacturing; paint and coating manufacturing; plastics material and resin manufacturing; plastics product manufacturing.			
Worker activity description:	Workers were preparing and using plastisols for the coating of glass Xasks and containing 33% of DEHP. Plastisols are prepared in a closed workshop where PVC resins are blended with DEHP and other ingredients in containers, then routed to the neighbouring workshop where glass bottles are automatically dipped into vats filled with plastisols. Bottles are then dried after passage in an oven. Workers had to survey the automatic chain and feed with plastisols where flasks were dipped.			
Exposure route:	dermal			
Physical form:	liquid/resin			
Personal protective equipment:	gloves and protective clothing			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The data is presented as industry data. Sampling and methods not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
HERO ID:	8338316			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Physical form:	DEHP is predominant in the dust phase			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Primary writers are from Italy - OECD country.
	Metric 3:	Applicability	High	General information is applicable for occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/a- physical form.
Overall Quality Determination			High	

Study Citation:	Giulivo, M., Alda, L.d., M., Capri, E., Barceló, D. (2016). Human exposure to endocrine disrupting compounds: Their role in reproductive systems, metabolic syndrome and breast cancer. A review. Environmental Research 151:251-264.			
HERO ID:	3469349			
Conditions of Use:	General population exposure			
EXTRACTION				
Parameter	Data			
Area sampling data: Table 1: 3.44-106 ng/g total PHTs in indoor dust; 1.246-839 ng/m3 total PHTs in indoor air				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	Group,, Identity (2016). Safety Data Sheet (SDS): Red Stamp-Ever stamp.			
HERO ID:	6302424			
Conditions of Use:	Use of Dyes, Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Physical form:	Red flexible gel saturated with ink			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- physical form extracted only.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear on physical form of the product.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- physical form.
Overall Quality Determination			High	

Study Citation:	Haz-Map, (n.d.). Haz-Map: Hazardous Agents: Di-sec-octyl phthalate.			
HERO ID:	8486307			
Conditions of Use:	Plastic Composites Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation, DEHP is not readily absorbed by skin.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic composite manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - exposure route.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - exposure route.
Overall Quality Determination			High	

Study Citation:	Haz-Map, (2021). Hazardous agents: Diisobutyl phthalate.			
HERO ID:	8486308			
Conditions of Use:	As a reactant-Plasticizer in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing; Incorporation into article-Plasticizer in all other basic organic chemical manufacturing, plastics product manufacturing, Plastic material and resin manufacturing, Plasticizer in custom compounding of purchased resin			
EXTRACTION				
Parameter	Data			
Worker activity description:	Plastic Composites Manufacturing, Sculpting plastics (pdf pg 2)			
Exposure route:	inhalation, DEHP is not readily absorbed through the skin (pdf pg 1)			
Physical form:	Colorless, oily liquid with a slight odor (pdf pg 1)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The source relies on content from textbooks of occupational medicine.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Source includes links to an article over 20 years old, as well as a website dated 2021.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted	
Overall Quality Determination		High		

Study Citation:	Henrotin, J. B., Feigerlova, E.,va, Robert, A., Dziurla, M., Burgart, M., Lambert-Xolin, A. M., Jeandel, F., Weryha, G. (2020). Decrease in serum testosterone levels after short-term occupational exposure to diisononyl phthalate in male workers. Occupational and Environmental Medicine 77(4):214-222.			
HERO ID:	7978431			
Conditions of Use:	PVC Compounding (Plastics production)			
EXTRACTION				
Parameter	Data			
Worker activity description:	Activities at the factories included PVC compound manufacturing (1 factory, 7.6% of workers), plastisol coating on bottles (1 factory, 10.5% of workers) and manufacturing of coated fabrics (4 factories, 81.9% of workers). These activities were all characterized by the presence of heating phases at temperatures between 130°C and 180°C in the industrial process, with the exception of activities at one compounding factory (p. 6).			
Number of workers:	Six factories ranged in size from 20 to 200 workers (p. 6).			
Personal protective equipment:	Workers worked without special personal protective equipment except for wearing gloves during direct contact with a liquid plasticiser (eg, in mixing activities) (p. 6).			
Engineering control:	All factories were equipped with local exhaust systems to reduce vapour exposure at the workstation (p. 6).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	If no PEL is established, the data are no more than 10 years old. Metadata on the operations, equipment, and worker activities associated with the data show that the data should be representative of current operations, equipment, and activities.	
	Metric 5: Sample Size	N/A	Qualitative data, no sampling required.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Information on worker activities and exposure points provided; however, source is lacking information on exposure duration and frequency.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by discussing various worker activities.	
Overall Quality Determination		High		

Study Citation:	Hopf, N. B., Berthet, A., Vernez, D., Langard, E., Spring, P., Gaudin, R. (2014). Skin permeation and metabolism of di(2-ethylhexyl) phthalate (DEHP). Toxicology Letters 224(1):47-53.			
HERO ID:	2215406			
Conditions of Use:	Lab study - could be applied to some processing COUs			
EXTRACTION				
Parameter		Data		
Dermal exposure data:		Dermal exposure data		
Exposure duration:		DEHP absorption through the dermis (Tlag = 2.5 h; Kp = 4.76 x 10^-5 cm/h) was 3.7 times faster than through the epidermis (Tlag = 0.9 h; Kp = 1.3 x 10^-5 cm/h).		
Comments:		Dermally absorbed dose was calculated using surgically removed skin from patients in Switzerland.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data and techniques but are not from frequently used sources but does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Switzerland, an OECD country.
	Metric 3:	Applicability	Medium	Report is a lab study with intentions to be used to help evaluate occupational exposure via dermal exposure.
	Metric 4:	Temporal Representativeness	High	Data is from 2014, less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Clearly documents data sources, assessment methods, results and assumptions in its analytical technique.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Hutter, H. P., Moshammer, H., Wallner, P., Damberger, B., Tappler, P., Kundi, M. (2006). Health complaints and annoyances after moving into a new office building: a multidisciplinary approach including analysis of questionnaires, air and house dust samples. International Journal of Hygiene and Environmental Health 209(1):65-68.			
HERO ID:	1313723			
Conditions of Use:	Building/construction materials not covered elsewhere, Furniture and furnishings not covered elsewhere			
EXTRACTION				
Parameter	Data			
Worker activity description:	Office work			
Exposure route:	inhalation			
Personal sampling data:	980-3000 mg/kg in dust			
Number of workers:	65			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Koch, H. M., Haller, A., Weiß, T., Käßlerlein, H. U., Stork, J., Brüning, T. (2012). Phthalate exposure during cold plastisol application - A human biomonitoring study. Toxicology Letters 213(1):100-106.			
HERO ID:	787918			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	checking and refinishing plastisol seam sealants that had been sprayed by robots on the welding seams of the raw car bodies			
Exposure route:	Inhalation, dermal, oral			
Number of workers:	5 production workers and 10 administrative			
Personal protective equipment:	none or cotton gloves			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journalarticles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted	
Overall Quality Determination		High		

Study Citation:	Kolena, B., Petrovicova, I., Pilka, T., Pucherova, Z., Munk, M., Matula, B., Vankova, V., Petlus, P., Jenisova, Z., Rozova, Z., Wimmerova, S., Trnovec, T. (2014). Phthalate exposure and health-related outcomes in specific types of work environment. International Journal of Environmental Research and Public Health 11(6):5628-5639.		
HERO ID:	2345960		
Conditions of Use:	Disposal		
EXTRACTION			
Parameter	Data		
Worker activity description:	Waste management workers		
Exposure route:	Inhalation, dermal		
Exposure duration:	Day shift: 8hr/day		
Number of workers:	30		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality [data/techniques/methods] that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Slovakia, an OECD country.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	N/A	Not applicable - no sample data
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Not applicable - no sample data
Overall Quality Determination		High	

Study Citation:	Lacey, S., Alexander, B. M., Baxter, C. S. (2014). Plasticizer contamination of firefighter personal protective clothing - a potential factor in increased health risks in firefighters. Journal of Occupational and Environmental Hygiene 11(5):D43-D48.			
HERO ID:	2345987			
Conditions of Use:	Processing or commercial use of DEHP in textiles (firefighter clothing)			
EXTRACTION				
Parameter	Data			
Worker activity description:	Fire fighter			
Exposure route:	inhalation, dermal			
Personal protective equipment:	Protective hood, coat, and structural gloves.			
Comments:	Analyzed by EPA method 8270. While Fire fighters are not a COU they may still be considered a PESS, occupationally.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed and appears to use high quality data and sound methods of analysis.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data from US.
	Metric 3:	Applicability	N/A	While fire fighters are not a COU they may be considered a PESS for occupational exposure(s)
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Multiple samples from the same type of material, and characterizes a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides worker activity, exposure route, and PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by testing across unused and used firefighter clothes. Addresses uncertainty in addressing quantifying samples below the LOD.
Overall Quality Determination			High	

Study Citation:	Latini, G. (2005). Monitoring phthalate exposure in humans. Clinica Chimica Acta 361(1-2):20-29.		
HERO ID:	789380		
Conditions of Use:	General		
EXTRACTION			
Parameter	Data		
Exposure route:	Humans are exposed to these compounds through ingestion, inhalation, and dermal exposure for their whole lifetime, since the intrauterine life.		
Area sampling data:	Higher exposures occur occupationally (up to about 700 ug/kg body weight/day, mainly by inhalation, based on current workplace standards)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Low	No specified condition of use, only general occupational exposure mentioned.
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Low	

Study Citation:	Lee, S. A., Chen, Y. L., Hwang, D. C., Wu, C. C., Chen, J. K. (2017). Performance evaluation of full facepiece respirators with cartridges. Aerosol and Air Quality Research 17(5):1316-1328.			
HERO ID:	3868342			
Conditions of Use:	PPE worn in industrial uses			
EXTRACTION				
Parameter	Data			
Personal protective equipment:	Full facepiece respirators (FFRs) with charcoal cartridges were tested against DEHP particles under 85 L/min and had a filtration efficiency (FE) of 99.89%. For 42.5 L/min, the FE was 99.95%.			
Comments:	Source is for DOP which is a constitutional isomer of DEHP and various DOP type of compounds were searched in the scoping document.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so likely contains high quality data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for Taiwan, a non-OECD country.	
	Metric 3: Applicability	Medium	Data is applicable to PPE worn in industrial processes and uses DOP to evaluate its filtration efficiency	
	Metric 4: Temporal Representativeness	High	Data is from 2017 so less than 10 years old.	
	Metric 5: Sample Size	Low	Data is stated and not given over a range.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents results, methods, and assumptions and sources are generally described.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Liang, Y., Xu, Y. (2014). Emission of phthalates and phthalate alternatives from vinyl flooring and crib mattress covers: The influence of temperature. Environmental Science & Technology 48(24):14228-14237.			
HERO ID:	3015875			
Conditions of Use:	Vinyl flooring			
EXTRACTION				
Parameter		Data		
Area sampling data:		Gas phase concentrations immediately adjacent to the vinyl flooring surface are provided in Table 1 for temperatures ranging from 25C to 55C. Ambient concentrations range from 0.02 ug/cm3 to 4146 ug/cm3.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and techniques that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by sampling phthalate concentrations in gas phase at various temperatures, but measurement uncertainty is not characterized.
Overall Quality Determination			High	

Study Citation:	Lott, S. (2014). Phthalate-free Plasticizers in PVC.			
HERO ID:	7323639			
Conditions of Use:	commercial use in Building/construction materials			
EXTRACTION				
Parameter	Data			
Exposure route:	Building occupants are exposed to toxic chemicals in building materials through numerous pathways. For example, phthalates, as semi-volatile organic compounds, can migrate from PVC into the air as a gas, but more often attach to dust particles which in turn can be inhaled, ingested, or absorbed into the body through skin contact. Once exposed, chemicals can lead to a variety adverse health effects.			
Physical form:				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for use of DEHP in building materials, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. Environmental Science and Pollution Research 25(21):20550-20561.			
HERO ID:	4728432			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Exposure route:	ingestion, inhalation, and dermal			
Personal sampling data:	A Canadian study estimated that the daily exposure dose to DEHP through multiple sources, such as plasticizers, food packaging, plastic toys, and adhesives, was up to 9 ug/kg body mass/day in infants, 19 ug/kg body mass/day in toddlers, 14 ug/kg body mass/day in school-age children, and 6 ug/kg body mass/day in adults			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Ng, M. G., Tongeren, van, M., Semple, S. (2014). Simulated transfer of liquids and powders from hands and clothing to the mouth. Journal of Occupational and Environmental Hygiene 11(10):633-644.		
HERO ID:	3222353		
Conditions of Use:	Various (Oral Exposure)		
EXTRACTION			
Parameter	Data		
Exposure route:	oral		
Physical form:	solids, liquids		
Dermal exposure data:	Dermal exposure data		
Comments:	Study is on inadvertent oral exposure via dermal exposure pathway(i.e., hand to mouth contact)Task 1: Direct and Indirect TEs From Hand-to-mouth ContactTask 2: Direct and Indirect TEs From Glove-to-mouth ContactTask 3: Transfer While Putting a Respirator on and Taking it offTask 4: Transfer When Wiping the Mouth with the ArmTask 5: Object-to-mouth Transfe		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods. Analyzed using amodification of NIOSH 7903 “Acids Inorganic”.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	Medium	The report is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Not specific to DEHP.
	Metric 4: Temporal Representativeness	High	Data was published in 2014, so generally no more than 10 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently rep- representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The model characterizes variability (e.g., study tests several different factors in varying transfer efficiencies) and uncertainty in the results(contains a limitation section).
Overall Quality Determination		High	

Study Citation:	NICNAS, (2013). 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester: Human health tier II assessment.			
HERO ID:	5155529			
Conditions of Use:	Consumer Use			
EXTRACTION				
Parameter	Data			
Exposure route:	oral, inhalation, dermal			
Dermal exposure data:	Dermal exposure data			
Comments:	No separate sampling inhalation data provided. Article just states that exposure levels to the chemical have been determined for indoor air and dusts and gives calculated mean value (64 µg of the chemical ingested per day; equivalent to 0.91 µg/kg bw/day based on a 70 kg adult).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Australia.
	Metric 3:	Applicability	Low	Data are for consumer use, which is similar to the in-scope occupational scenario fabrication of final product from article.
	Metric 4:	Temporal Representativeness	High	The report is no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NIOSH, (2007). NIOSH pocket guide to chemical hazards.			
HERO ID:	192177			
Conditions of Use:	General			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, ingestion, dermal, ocular (pg. 150/454)			
Physical form:	Colorless, oily liquid with a slight odor (pg. 150/454)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHES, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	Report is general information on neat chemical, not associated with a COU but may be applicable across COUs.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- no sampling data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	NIOSH, (2019). NIOSH pocket guide to chemical hazards: Di-sec octyl phthalate.			
HERO ID:	8407718			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, ingestion, skin and/or eye contact (pdf pg 2)			
Physical form:	Colorless, oily liquid with a slight odor. (pdf pg 1)			
Personal protective equipment:	At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatusEscape:(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 lter. (pdf pg 2)			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from a U.S. government institute.
	Metric 3:	Applicability	High	The report is for any condition of use involving the chemical.
	Metric 4:	Temporal Representativeness	High	The report is from 2019.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			Medium	

Study Citation:	NIOSH, (1988). Occupational safety and health guideline for di-2-ethylhexyl phthalate (DEHP) potential human carcinogen.			
HERO ID:	8435182			
Conditions of Use:	Applies to all COUs			
EXTRACTION				
Parameter	Data			
Exposure route:	DEHP may cause adverse health effects following exposure via inhalation, ingestion, or dermal or eye contact. (pdf pg 2)			
Physical form:	Clear to slightly colored, oily odorless liquid			
Personal protective equipment:	Workers should be provided with and required to use Chemical protective clothing, gloves, and other appropriate protective clothing necessary to prevent skin contact with DEHP. (pdf pg 3)...use of respirators is the least preferred method of controlling worker exposure and should not normally be used as the only means of preventing or minimizing exposure during routine operations. (pdf pg 4)			
Engineering control:	Local exhaust ventilation			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source of data well documented and provided by a U.S. Department.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report applies to all COUs.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	NIOSH, (1983). Health hazard evaluation report: HETA 82-223-1340. Rubbermaid, Incorporated, Wooster, OH.			
HERO ID:	8632596			
Conditions of Use:	Commercial Use: Plastic and rubber products			
EXTRACTION				
Parameter	Data			
Worker activity description:	Employees in the Wire Line division of Rubbermaid Inc. in Wooster, OH - manufacturer of plastic and synthetic rubber items for household use			
Exposure route:	Not mentioned in the article			
Physical form:	Not mentioned in the article			
Personal sampling data:	no analysis was done for DEHP			
Area sampling data:	no analysis was done for DEHP			
Exposure duration:	8- to 10-hour workday			
Number of workers:	The plant employs 1820 workers, 59% of whom are productionworkers. The Wire Line operates fully staffed (16 workers) duringthe first shift and a half-shift (with 9 workers) during the secondshift.			
Personal protective equipment:	Although respirators were provided to workers if they requested them, some workers using respirators had beards (which makes a good fit impossible) and the issuance of a respirator by the employer to an employee, even if only because of the worker’s request, necessitates including that individual in an established and acceptable respiratory protection program.			
Engineering control:	exhaust ventilation equipment present on the curing oven of the Wire Line			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	Low	Information specific to DEHP was not found but some of the information like PPE and engineering controls can be used for other occupational scenarios.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-isodecyl phthalate (DIDP). (3):i-III90.			
HERO ID:	679108			
Conditions of Use:	Consumer use			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal, inhalation, oral			
Personal sampling data:	estimated at 3-30 $\mu\text{g/kg}$ bw/day for adult general population			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	NYSDEC, (2011). Revised draft. Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program: Well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs.
HERO ID:	1777818
Conditions of Use:	Use in hydraulic fracturing

EXTRACTION	
Parameter	Data
Worker activity description:	PDF Pg. 490"Fluid pumping, and use of wireline equipment between pumping stages to raise and lower tools used for downhole well preparation and measurements. Computerized monitoring. Continued water and additive delivery."
Exposure route:	Skin contact
Physical form:	Liquid
Exposure duration:	PDF Pg. 140"The average work week for all workers aged over 16 in the nonagricultural industries was 38.1 hours long, while the average work week for those in the mining, quarrying, and oil and gas extraction industry was 49.4 hours long (i.e., an almost 30% longer average work week) (BLS 2010)."
Number of workers:	Table 2.6 on PDF Pg. 133Total of 9,102,596 jobs.
Engineering control:	Secondary containment structures for spills.
Comments:	No area sampling for DEHP.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for use in hydraulic fracturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by giving number of workers for multiple industry sectors or job types but uncertainty is not addressed.

Overall Quality Determination

High

Study Citation:	OEHHA, (1997). Public health goal for di(2-ethylhexyl)phthalate (DEHP) in drinking water.			
HERO ID:	5155636			
Conditions of Use:	Production and processing of DEHP.			
EXTRACTION				
Parameter	Data			
Number of workers:	Estimate by NIOSH that 340,000 workers were exposed to DEHP in 1990			
Comments:	Environmental release data is TRI. Majority of study regards cancer risk of DEHP. Sampling data is on animals in animal studies.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source uses frequently used sources and is from a government agency.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Data is applicable to processing and releases during production for or using DEHP.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Low	Data is not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sources and results are provided and generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Ohlson, C. G., Hardell, L. (2000). Testicular cancer and occupational exposures with a focus on xenoestrogens in polyvinyl chloride plastics. Chemosphere 40(9-11):1277-1282.			
HERO ID:	1415211			
Conditions of Use:	Processing/consumer Use of plastics			
EXTRACTION				
Parameter	Data			
Worker activity description:	Plastic workers, Amateur radio operator, Electrician, Engineer Electronics/telecommunication, Mechanics, Radar worker, Road worker, Telephone assembler, Welder, Video display unit work			
Exposure route:	not indicated			
Number of workers:	44 subjects reported exposure to plastics, mostly to styrene			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data not specific to DEHP.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Pak, V. M., Mccauley, L. A. (2007). Risks of phthalate exposure among the general population: Implications for occupational health nurses. American Association of Occupational Health Nurses Journal 55(1):12-17.			
HERO ID:	1598544			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Exposure route:	Phthalates can be ingested, inhaled, or absorbed through the skin. Individuals can be exposed to more than one phthalate, from multiple routes of exposure.			
Physical form:	Can exist in vapor form in air. Can also exist in other forms in drinking water, air, and food			
Number of workers:	According to a 1997 U.S. economic census, more than 407,000 individuals are employed in approximately 81,000 beauty salons across the country, and more than 93% of U.S. nail salon workers are female.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Pan, T. L., Wang, P. W., Aljuffali, I. A., Hung, Y. Y., Lin, C. F., Fang, J. Y. (2014). Dermal toxicity elicited by phthalates: Evaluation of skin absorption, immunohistology, and functional proteomics. Food and Chemical Toxicology 65:105-114.
HERO ID:	2219803
Conditions of Use:	Lab study - animal study.

EXTRACTION	
Parameter	Data
Exposure route:	dermal
Physical form:	vapor
Dermal exposure data:	Dermal exposure data
Comments:	Study is an animal study. Skin accumulation of phthalates on nude mouse: 12.0 +/- 4.82 nmol/mg and for Pig it was 0.82 +/- 0.22. Flux was zero for both cases.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium
			Report uses high quality data but not from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low
	Metric 3:	Applicability	Uninformative
	Metric 4:	Temporal Representativeness	High
	Metric 5:	Sample Size	Medium
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium
			Report clearly documents results, data, and assessment methods.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium
			Variability by testing different animal skins, does not address uncertainty.

Overall Quality DeterminationUninformative

Study Citation:	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.			
HERO ID:	6580284			
Conditions of Use:	Formulation of paint and varnish			
EXTRACTION				
Parameter	Data			
Number of workers:	This Bureau of Census publication lists the number of plants in various size ranges such as 1 to 3 employees, 4 to 7 employees, etc. The total number of employees in any plant size can also be computed and expressed as a percentage of total employment in the Paint and Varnish Industry. For example, as shown by arrows on Figure 31, 30% of the plants in the industry employ less than 8 people, 30% of the industry employees work in plants that have a plant employee size of less than 50, and this plant size accounts for 78% of the industry plants. // Page 196: 66,100 total employees.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results
Overall Quality Determination		Medium		

Study Citation:	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.			
HERO ID:	10472417			
Conditions of Use:	Vinyl flooring installation			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation and Dermal			
Exposure duration:	Mentions the life span of vinyl flooring (30 - 50 years), but exposure duration is not provided.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Frequently used sources were used to identify routes of exposure.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, exposure to DEHP is not specifically investigated.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	N/A	Sample size not applicable to qualitative data relating to exposure route.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Variability and uncertainty not applicable to qualitative data relating to exposure route.	
Overall Quality Determination		High		

Study Citation:	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.		
HERO ID:	6311222		
Conditions of Use:	Industrial/Commercial Use: Paints and coatings		
EXTRACTION			
Parameter	Data		
Worker activity description:	Auto OEM: robotics operations, paint mixing, paint booth cleaning, inspection, and manual ""touch-up"" paintingAuto refinish: wet sanding, car washing, stripping (paint removal), machine sanding, blowing, buffing, polishing, paint spraying, paint and primer mixing, and inspection		
Exposure route:	dermal and inhalation. Inhalation: Provides methods for modeling exposures to mists.		
Dermal exposure data:	Dermal exposure data		
Exposure frequency:	Auto OEM: 250 days/yrAuto refinish: 170 days/yr		
Number of workers:	Auto OEM: 17 workers/siteAuto-refinish: 2-10 workers/site		
Personal protective equipment:	Respirator		
Engineering control:	Spray booths, LEV		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering OEM and refinish applications.
Overall Quality Determination		Medium	

Study Citation:	Scott, R. C., Dugard, P. H., Ramsey, J. D., Rhodes, C. (1987). In vitro absorption of some o-phthalate diesters through human and rat skin. Environmental Health Perspectives 74(0):223-227.			
HERO ID:	674473			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Physical form:	liquid			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	72 hr			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	Sealants,, T.C. (2015). Safety Data Sheet (SDS): Universal C/P Eggshell Cream.			
HERO ID:	6302286			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Physical form:	off-white liquid paste			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- physical form
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- physical form
Overall Quality Determination			High	

Study Citation:	Sealants,, Tremco (2015). Safety Data Sheet (SDS): Universal C/P Mint.			
HERO ID:	6302289			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Physical form:	liquid paste			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- physical form only.
Overall Quality Determination			High	

Study Citation:	Sealants,, Tremco (2016). Safety data sheet: Universal C/P Sunset Yellow. :1-15.			
HERO ID:	6302292			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Physical form:	Liquid (paste)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016, which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Physical Form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Physical Form.
Overall Quality Determination			High	

Study Citation:	Sealants., Tremco (2015). Safety Data Sheet (SDS): Universal C/P Super White.			
HERO ID:	6302293			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Physical form:	liquid paste			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- physical form
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear on physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- physical form.
Overall Quality Determination			High	

Study Citation:	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.				
HERO ID:	675435				
Conditions of Use:	commercial use				
EXTRACTION					
Parameter		Data			
Exposure route:		Inhalation and dermal			
Physical form:		nearly colorless viscous liquid			
Area sampling data:		Atmospheric levels of 0.0006 to 0.01 ppm for 12 years showed no significant health effects. The ACGIH (1981) currently recommends and OSHA (1976) has promulgated a TWA exposure limit of 5 mg/m3 for occupational exposure to DEHP; a STEL of 10 mg/m3 has also been recommended by the ACGIH.			
Dermal exposure data:		Dermal exposure data			
Number of workers:		As indicated in the report, the National Occupational Hazard Survey indicates that 612,106 workers are potentially exposed to DEHP.			
Engineering control:		As indicated in the report, specific factors that may contribute to or prevent employee exposure to DEHP were not found in the literature searched.			
EVALUATION					
Domain		Metric	Rating	Comments	
Domain 1: Reliability		Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evalu- ated.
		Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
		Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
		Metric 5:	Sample Size	Low	characterized by no statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium		

Study Citation:	Summers, J. W. (2006). Vinyl chloride polymers. :1-41.			
HERO ID:	7322451			
Conditions of Use:	Production of polyvinyl chloride (PVC) plastic			
EXTRACTION				
Parameter	Data			
Physical form:	At processing temperatures, most polymers emit fumes and vapors that may be irritating to the respiratory tract. (p. 12).			
Particle size characterization:	Although most of the discussion has been on rigid PVC, plasticized PVC has the same structures as rigid PVC, except that plasticizer enters the amorphous phase of PVC and makes the tie molecules elastomeric. The grains break down to 1-mm primary particles which become the melt flow units (44). The crystallites are not destroyed by plasticizer (21). Partial melting allows entanglement at the flow unit boundaries, followed by recrystallization upon cooling to form a strong three-dimensional elastomeric structure (38,45). (p. 4).			
Personal protective equipment:	The use of an approved dust respirator is recommended where adequate ventilation may be unavailable. (p. 12).			
Engineering control:	Because routine inhalation of dust of any kind should be avoided, reduction of exposure to poly(vinyl chloride) dust may be accomplished through the utilization of care when dumping bags, sweeping, mixing, or performing other tasks that can create dust. Processing emissions exposure can also be greatly reduced or eliminated by the use of properly designed and maintained exhaust ventilation. (p. 12).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	SUNY, (2019). Phthalates in infant cotton clothing: Occurrence and implications for human exposure. Science of the Total Environment 683:109-115.			
HERO ID:	5432967			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal and ingestion			
Dermal exposure data:	Dermal exposure data			
Comments:	Calculations are based on behaviors and physical characteristics of infants. Model assumptions should be modified to adults for use.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Systems., Ultraflex (2018). Material Safety Data Sheet (MSDS): BriteLine Banner.			
HERO ID:	6302301			
Conditions of Use:	Fabrication of Final Product from Articles			
EXTRACTION				
Parameter	Data			
Physical form:	glossy/matte sheet			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2018 which is less than 10 years old.	
	Metric 5: Sample Size	N/A	N/A- physical form	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Source is clear on the physical form.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A- physical form.	
Overall Quality Determination		High		

Study Citation:	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
HERO ID:	11138808			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of workers:	Used to develop a method to estimate number of sites and workers.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	BLS is expected to use reliable survey methods.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	U.S. based economic data.	
	Metric 3: Applicability	High	These economic data cover all industry and occupation types in scope for all chemicals.	
	Metric 4: Temporal Representativeness	High	The BLS OES data are from 2021.	
	Metric 5: Sample Size	High	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	BLS documents results and methods, but underlying survey results not accessible.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Limited discussion of variability and uncertainty in results.	
Overall Quality Determination		High		

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

Study Citation:	U.S. EPA, (2013). Updating CEB’s method for screening-level estimates of dermal exposure.			
HERO ID:	11224653			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Document published by EPA CEB.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are applicable to all COUs involving dermal contact.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	N/A - Document describes general dermal exposure parameters. Sample size is not applicable.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by describing dermal exposure parameters for different exposure scenarios but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2012). Phthalates action plan.			
HERO ID:	4565597			
Conditions of Use:	General industrial manufacturing, processing, or use			
EXTRACTION				
Parameter	Data			
Exposure route:	Available information indicates that workers may be exposed to phthalates by inhalation and dermal routes, with the dermal route seeming to be more prevalent.			
Number of workers:	According to the IUR data, industrial workers exposed to these phthalates number in the thousands.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2011). Exposure factors handbook: 2011 edition.			
HERO ID:	786546			
Conditions of Use:	All			
		EXTRACTION		
Parameter	Data			
Dermal exposure data:	Dermal exposure data			
		EVALUATION		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from the National Health and Nutrition Examination Survey and the U.S. EPA.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data is applicable to the dermal exposure assessment for all of the occupational scenarios.
	Metric 4:	Temporal Representativeness	Medium	The report is based on data that is up to 40 years old; however, it is unlikely that data on hand size has significantly changed in that timeframe.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty and variability are addressed by the mean of the dataset.
Overall Quality Determination		High		

Study Citation:	Valero, (2014). Safety Data Sheet (SDS): Modified Asphalt.			
HERO ID:	6302304			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Physical form:	Dark brown to black liquid at normal use temperatures above 300F. Semi-solid at 70F.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Source is from 2014 which is more than 10 but less than 20 years old	
	Metric 5: Sample Size	N/A	N/A- physical form	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Source is clear on physical form.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A- physical form	
Overall Quality Determination		High		

Study Citation:	Wasser, (2009). Material Safety Data Sheet (MSDS): MC-Luster 100 White.			
HERO ID:	6302305			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Source is from 2009 which is more than 10 but less than 20 years old	
	Metric 5: Sample Size	N/A	N/A- physical form.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Source is clear on physical form.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A- physical form	
Overall Quality Determination		High		

Study Citation:	Wasser, (2021). Material Safety Data Sheet (MSDS): Polyflex 411A Iso-Catalyst.			
HERO ID:	6302307			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2021 which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Source is clear on physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- physical form.
Overall Quality Determination			High	

Study Citation:	Wasser, (2021). Safety Data Sheet (SDS): MC-Shieldcoat 100.			
HERO ID:	6302308			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Physical form:	Fluid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2021 which is less than 10 years old	
	Metric 5: Sample Size	N/A	N/A- Physical form extracted only.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Source is clear on physical form.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A- physical form not applicable to this domain.	
Overall Quality Determination		High		

Study Citation:	Wester, R. C., Melendres, J., Sedik, L., Maibach, H., Riviere, J. E. (1998). Percutaneous absorption of salicylic acid, theophylline, 2, 4-dimethylamine, diethyl hexyl phthalic acid, and p-aminobenzoic acid in the isolated perfused porcine skin flap compared to man in vivo. Toxicology and Applied Pharmacology 151(1):159-165.			
HERO ID:	1333947			
Conditions of Use:	All uses considering dermal exposure			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journalarticles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	Medium	The report is for a lab-based occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	High	tatistical distribution of samples is fully characterized. Sample size is sufficiently representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	Wright, S. L., Kelly, F. J. (2017). Plastic and Human Health: A Micro Issue?. Environmental Science & Technology 51(12):6634-6647.		
HERO ID:	3862800		
Conditions of Use:	Use		
EXTRACTION			
Parameter	Data		
Exposure route:	ingestion and inhalation		
Physical form:	can exist as dust		
Personal sampling data:	no data for DEHP available		
Particle size characterization:	Degraded plastic fragments can be microsized (0.1 – 1000 um) and potentially nanosized ($\leq 0.1 \mu\text{m}$) particles		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	the data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Young, A. S., Allen, J. G., Kim, U. J., Seller, S., Webster, T. F., Kannan, K., Ceballos, D. M. (2018). Phthalate and Organophosphate Plasticizers in Nail Polish: Evaluation of Labels and Ingredients. Environmental Science & Technology 52(21):12841-12850. [Environmental science & technology].			
HERO ID:	5164231			
Conditions of Use:	Commercial Use - Nail Polish			
EXTRACTION				
Parameter	Data			
Worker activity description:	Nail salon technician			
Exposure frequency:	At least 45% of the technicians work over 30 h per week and have worked in the field for over eight years.			
Number of workers:	There are about 400,000 active licensed nail technicians in the U.S., mostly female (97%), Vietnamese (56%), and aged 45 years or younger (54%).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so generally accepted and contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from US
	Metric 3:	Applicability	High	Data is for nail salon technicians in scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Study is less than 10 years old (2018) as well as referenced studies.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents results, methods and assumptions. Sources generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Aparicio, I., Santos, J., Alonso, E. (2009). Limitation of the concentration of organic pollutants in sewage sludge for agricultural purposes: A case study in South Spain. Waste Management 29(5):1747-1753.			
HERO ID:	697741			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Sewage sludge			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Data is between 10 and 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The release data study addresses uncertainty in the release results.
Overall Quality Determination			Medium	

Study Citation:	ATSDR, (2002). Toxicological profile for di(2-ethylhexyl) phthalate.			
HERO ID:	679117			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity:	DEHP disposal in 1998 estimated to be about 0.96 MMlbs of waste DEHP transported from production facilities or points of usage for disposal including POTW (This is TRI data).			
Comments:	DOP include DEHP, Diisooctyl phthalate and di-n-octyl phthalate. All production, processing, and release data is TRI.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed and uses frequently common sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	More than 20 years old.	
	Metric 5: Sample Size	High	Data obtained from TRI and highly reputable sources.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Addresses variability by showing data from different years and distributed by certain states. Addresses uncertainty by stating how some companies are not required to report TRI data.	
Overall Quality Determination		High		

Study Citation:	Beauchesne, I., Barnabe, S., Cooper, D. G., Nicell, J. A. (2008). Plasticizers and related toxic degradation products in wastewater sludges. Water Science and Technology 57(3):367-374.			
HERO ID:	5750094			
Conditions of Use:	Waste treatment - disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Various sewage treatment plants with different treatment methods			
Release quantity:	Table 2 provides concentrations of plasticizers in sewage treatment plant sludges (mg/kg sludge): Primary - 80, 89, 53; Secondary - 346, 71, 47, 39, 65; Thickened - 86, 54, 44; Digested - 40, 26, 54; Dewatered - 90, 46, 65, 63, 119; Dried - 15			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Unclear if source is peer reviewed, methodology expected to be accurate though.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Canada, an OECD country.
	Metric 3:	Applicability	Low	Data is waste treatment methods and unclear if it is municipal or industrial waste treatment data. Could be applied to industrial.
	Metric 4:	Temporal Representativeness	Medium	Data is over 10 years old (2008).
	Metric 5:	Sample Size	Medium	Characterized by a range of different data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes release source, waste methods, and emission factors.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling different waste treatment sites and their various treatment methods. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Berge, A., Gasperi, J., Rocher, V., Coursimault, A., Moilleron, R. (2012). Phthalate and alkylphenol removal within wastewater treatment plants using physicochemical lamellar clarification and biofiltration. WIT Transactions on Ecology and the Environment 164:357-368.			
HERO ID:	2816494			
Conditions of Use:	Disposal - waste treatment			
EXTRACTION				
Parameter	Data			
Description of release source:	Wastewater treatment plant of Seine Centre (Colombes, France) treats about 240,000 m^3 of urban wastewater per day. World wide approximately 6,000,000 tons of phthalates produced per year and been at a constant level for 20 years (2007).			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Source is not peer reviewed and does not use sources commonly known.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for France, an OECD country.
	Metric 3:	Applicability	Uninformative	Data is for municipal waste treatment.
	Metric 4:	Temporal Representativeness	High	Data is from 2012, less than 10 years old
	Metric 5:	Sample Size	Medium	Characterized by range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides waste treatment methods but not clarity on the specific operations. Includes release media.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by testing different phthalates and addressing different removal rates for different processes. Does not address uncertainty.
Overall Quality Determination		Uninformative		

Study Citation:	Brown, S. L., Chan, F. Y., Jones, J. L., Liu, D. H., McCaleb, K. E., Mill, T., Sapios, K. N., Schendel, D. E. (1975). Research program on hazard priority ranking of manufactured chemicals: Phase II - Final report (chemicals 41-60).			
HERO ID:	17495			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter		Data		
Release quantity:		6.5 mil lbs/yr		
Release or emission factors:		nan		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing and processing, in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Low	1975: Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	High	Provides industry data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Cadogan, D., Howick, C. (2000). Plasticizers.			
HERO ID:	6311430			
Conditions of Use:	Emission			
EXTRACTION				
Parameter	Data			
Description of release source:	Phthalates may be emitted to the environment during their incorporation into PVC and from the finished PVC article during its use or after its final disposal.			
Release quantity:	Estimated phthalate emissions in Western Europe are provided in this article. As for example, emissions during production is 220 t/yr, during processing is 950 t/yr, during distribution is 80 t/yr, and others.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Release data is expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	Release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old
	Metric 5:	Sample Size	Low	Characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation: Carbide,, Union (1988). Feasibility study on six chemicals with attachments and cover letter dated 081588.
HERO ID: 1332988
Conditions of Use: Disposal - landfill

EXTRACTION

Parameter	Data
Description of release source:	landfill dumpsite
Release quantity:	0.10 - 28.06 ppm of phthalates found in soil from 0 to 2 feet.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	Phthalates were detected in soil samples but does not identify which phthalates. Exposure is for gen pop exposure.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Data is for TSCA submission.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US
	Metric 3: Applicability	Low	Data is for gen pop exposure but could be applied to other disposal methods that could be in scope
	Metric 4: Temporal Representativeness	Low	Greater than 20 years old
	Metric 5: Sample Size	Medium	Range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Includes release media.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.

Overall Quality Determination**Low**

Study Citation:	Castaldi, F. J., Ford, D. L. (1992). Slurry bioremediation of petrochemical waste sludges. Water Science and Technology 25(3):207-212.
HERO ID:	657949
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from the United States but may not be highly representative of the industry being evaluated.
	Metric 3: Applicability	Low	The release data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update and are more than 20 years old if no federal regulation is established.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Metadata focuses on out-of-scope chemicals.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the uncertainty in the release results.

Overall Quality Determination**Low**

Study Citation:	Castillo, M., Oubiña, A., Barceló, D. (1998). Evaluation of ELISA kits followed by liquid chromatography-atmospheric pressure chemical ionization-mass spectrometry for the determination of organic pollutants in industrial effluents. Environmental Science & Technology 32(14):2180-2184.
HERO ID:	629069
Conditions of Use:	Processing

EXTRACTION

Parameter	Data
Description of release source:	Monitoring of Wastewaters from a Petrochemical Plant in July 1996 (Sample A1), January 1997 (Sample A2), and March 1997 (Sample A3) and of an Industrial Landfill Leachate during December 1996 (Sample B1) and March 1997 (Sample B2)
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	High	Data cites US and OECD countries
	Metric 3:	Medium	The release data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities
	Metric 4:	Low	More than 20 years old.
	Metric 5:	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Medium	The release data study provides only limited discussion of the variability in the determinants of release. The release data study provides only limited discussion of the uncertainty in the release results.

Overall Quality Determination**Medium**

Study Citation:	Chang, C. T., Chiou, C. S. (2006). Assessment of control strategies for reducing volatile organic compound emissions from the polyvinyl chloride wallpaper production industry in Taiwan. Journal of the Air and Waste Management Association 56(5):611-617.
HERO ID:	1333868
Conditions of Use:	Processing: Plasticizer in all other basic organic chemical manufacturing; custom compounding of purchased resins; miscellaneous manufacturing; paint and coating manufacturing; plastics material and resin manufacturing; plastics product manufacturing.

EXTRACTION

Parameter	Data
Description of release source:	emission sources included coating, drying, and surface treating (printing) processes
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors may impact (e.g., potentially greater differences in regulatory emission limits, industry/ process technologies) releases relative to the U.S., or the country of origin is not specified.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data indicate that the data should to be representative of current operations, equipment, and activities. The releasedata were collected after the most recent federal regulatory action (e.g., NESHAP for air release or effluent limit guideline (ELG) for water release) or update or are no more than 10 years old, whichever is shorter. If no federal regulation is established, the data are generally no more than 10 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release. The release data study provides only limited discussion of the uncertainty in the release results.

Overall Quality Determination**High**

Study Citation:	Clement Associates., Inc. (1989). Human health risk assessment for the Ciba-Geigy St Gabriel, LA incineration project with cover letter dated 042789.
HERO ID:	890000189:#86-890000189.
Conditions of Use:	1335586
	Disposal - incineration

EXTRACTION

Parameter	Data
Description of release source:	Vent stack from incinerators.
Release quantity:	Average emission of DEHP were 6.04×10^{-4} , 1.21×10^{-3} and 1.19×10^{-3} lb/hr (specifically stated to be DEHP). Estimated emission rates for liquid incinerator phthalates (g/sec): 8.68×10^{-4} .
Release frequency:	Assume 24 hours a day 365 days.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	All data characterized as simply "phthalates" but in trial burns, DEHP consisted of 28% of total phthalates so it was selected as the "surrogate" phthalate for the assessment.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is a TSCA submission so likely to be accurate and cover all release sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.
	Metric 3: Applicability	Medium	Data is for on-site disposal of DEHP however does not state what the waste is a result of.
	Metric 4: Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Includes description of release source, exposure frequency, duration, waste treatment, and emission factors,
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Address variability by studying two different incinerator methods, address uncertainty through an uncertainty analysis.

Overall Quality Determination**High**

Study Citation:	Consultants,, Woodward-Clyde (1993). BFGoodrich Akron plant risk assessment with cover letter dated 01/06/1994.
HERO ID:	1333013
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Release or emission factors:	nan
Waste treatment methods and pollution control:	nan
Comments:	This study was conducted for BFGoodrich Akron Plant. it is not clear if the information is relevant for COUs identified in the scope.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

Overall Quality Determination**High**

Study Citation:	Corea-Téllez, K., Bustamante-Montes, P., García-Fábila, M., Hernández-Valero, M., Vázquez-Moreno, F. (2008). Estimated risks of water and saliva contamination by phthalate diffusion from plasticized polyvinyl chloride. Journal of Environmental Health 71(3):34-9, 45.
HERO ID:	697766
Conditions of Use:	Use of plastic products

EXTRACTION	
Parameter	Data
Description of release source:	Phthalate molecules are very small and are not bound chemically to the plastic; therefore, they can diffuse out of the plastic over a period of time. // DEHP diffuses poorly in water. In this experiment, from hour 4 onward, the diffusion increased continuously until the DEHP concentration reached the saturation point in water after 12 hours.
Release or emission factors:	nan

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country. and locality-specific factors may impact (e.g., potentially greater differences in regulatory emission limits, industry/ process technologies) releases relative to the U.S., or the country of origin is not specified.
	Metric 3: Applicability	Low	The release data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4: Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release. The release data study provides only limited discussion of the uncertainty in the release results.

Overall Quality Determination

Low

Study Citation:	Deng, Y., Bonilla, M., Ren, H., Zhang, Y. (2018). Health risk assessment of reclaimed wastewater: A case study of a conventional water reclamation plant in Nanjing, China. Environment International 112:235-242.			
HERO ID:	4728647			
Conditions of Use:	Disposal - wastewater			
EXTRACTION				
Parameter	Data			
Description of release source:	water reclamation plant in Nanjing, China			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty in the results.
Overall Quality Determination		Medium		

Study Citation:	Dixit, S., Yadav, A., Dwivedi, P. D., Das, M. (2015). Toxic hazards of leather industry and technologies to combat threat: a review. Journal of Cleaner Production 87(Elsevier):39-49.
HERO ID:	2952861
Conditions of Use:	Processing or industrial use in leather. Disposal.

EXTRACTION

Parameter	Data
Description of release source:	Conventional pre-tanning and tanning processes accounts for nearly 90% of the total pollution from a tannery.
Release quantity:	Waste water generated in each process in Table 1 (kg/ton of hide): soaking: 9.0-12.0, unhairing/liming: 4.0-6.0, deliming and bating: 1.5-2.0, Chrome tanning: 1.0-2.0, Post tanning: 1.0-1.5, finishing: 1.0-2.0.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	High	Journal article is peer reviewed so data is highly accurate.
Domain 2: Representativeness	Metric 2:	Low	Non-OECD country.
	Metric 3:	Medium	Data is similar to what would be employed in a waste facility that produces leather products.
	Metric 4:	Medium	Data is a mix of information the 90s, 2000s, and 2010s.
	Metric 5:	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Medium	Provides process descriptions of the leather process but does not provide all specific unit operations. Provides a series of waste treatment methods as well.
Domain 4: Variability and Uncertainty	Metric 7:	Medium	Addresses variability by looking at all the methods of creating leather products and the waste methods. Does not address uncertainty.

Overall Quality Determination**Medium**

Study Citation:	Earthjustice, (2020). Exhibit 1 to comments of rubbertown emergency action et al., re: TSCA risk evaluations for high-priority substances and substances undergoing manufacturer-requested risk evaluations.		
HERO ID:	10385015		
Conditions of Use:	Disposal		
EXTRACTION			
Parameter	Data		
Description of release source:	Disposal from chemical plants, refineries, paper mills, and waste treatment facilities in concentrated regions in Texas.		
Release quantity:	Releases & Transfers of High Priority Chemicals (Port Arthur, TX Area) 2012-2018 (lbs): Air = 20, Total = 20, Offsite Transfer = 1080, % of Nationwide Total (releases) = 0.004, % Nationwide Total (Offsite Transfers) = 0.005Releases & Transfers of High Priority Chemicals (Houston, TX Area) 2012-2018 (lbs): Air = 553.10, Total = 553.10, Offsite Transfer = 28,649.31, Incoming waste transfer = 994,637.99, % of Nationwide Total (releases) = 0.11, % Nationwide Total (Offsite Transfers) = 0.134, % Nationwide Total (Incoming Waste Transfers) = 4.7Releases & Transfers of High Priority Chemicals (Mossville, LA Area) 2012-2018 (lbs): NoneReleases & Transfers of High Priority Chemicals in Cancer Alley, 2012-2018 (lbs): Offsite Transfer = 147.03, % Nationwide Total (Offsite Transfers) = 0.001		
Release or emission factors:	Release or emission factors		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Releases are reported from Toxics Release Inventory (TRI) and expected to cover all release sources reported to TRI.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Release data are from the past 10 years.
	Metric 5: Sample Size	High	Discrete release data provided.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Provides annual release data for various media, but additional metadata is not provided.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability throughout various facilities and regions are considered. However, measurement uncertainty is not addressed.
Overall Quality Determination		High	

Study Citation: ECCC/HC, (2020). Science assessment of plastic pollution.
HERO ID: 7330238
Conditions of Use: disposal

EXTRACTION

Parameter	Data
Description of release source:	Road traffic-related releases of particles from tire wear and tear are a source of microplastics to outdoor air. Additional sources of microplastics in outdoor air are thought to include airplane tires, artificial turf, thermoplastic road markings, waste incineration, construction, landfills, industrial emissions, and tumble dryer exhaust. Deposition and dispersion of all airborne plastic particles from the air may result in accumulations of microplastics in water. The primary source of microplastic particles in indoor air is thought to be the shedding of polymeric textile fibers from clothing, furniture, carpeting, and household goods due to wear and tear or abrasion.
Release quantity:	Of the 4 667 kt of plastics that entered the Canadian market in 2016, an estimated 3 268 kt were discarded as waste. Of that plastic waste, an estimated 29 kt (or 1%) were discarded outside of the normal waste stream (i.e., not landfilled, recycled or incinerated) in 2016, through direct release to the environment or through dumps or leaks. An estimated 9% of the remaining plastic waste was recycled, 86% was landfilled, and 4% was incinerated for energy recovery. In a global context, it is estimated that only 30% (2,500,000 kt) of all plastics ever produced are still in use. This means that 6,300,000 kt of global cumulative plastic waste was created between 1950 and 2015. If plastic manufacturing continues at its current pace, the accumulation of plastics will continue to accelerate. It is estimated that by 2050, 12,000,000 kt of plastic waste will have been discarded globally to landfills or the environment.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	data are generally no more than 10 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	ECHA, (2009). Background document for bis(2-ethylhexyl) phthalate (DEHP): Document developed in the context of ECHA’s first Recommendation for the inclusion of substances in Annex XIV.			
HERO ID:	7325009			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Release quantity:	The estimated releases to the environment from manufacturing of DEHP in the EU in 2007 are as follows (COWI, IOM & Entec, 2009):Air: 1 t/ySoil: 4 t/yWaste water: 220 t/yTable 3 provides table of estimated releases to the environment from all activities including manufacture			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Background document for bis(2-ethylhexyl) phthalate (DEHP): Document developed in the context of ECHA’s first Recommendation for the inclusion of substances in Annex XIV.			
HERO ID:	7325009			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 3 provides table of estimated releases to the environment from all activities including processing in the EU in 2007.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Background document for bis(2-ethylhexyl) phthalate (DEHP): Document developed in the context of ECHA’s first Recommendation for the inclusion of substances in Annex XIV.			
HERO ID:	7325009			
Conditions of Use:	Disposal and Recycling			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 3 provides table of estimated releases to the environment from all activities including Disposal and Recycling.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source ofthe release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Background document for bis(2-ethylhexyl) phthalate (DEHP): Document developed in the context of ECHA’s first Recommendation for the inclusion of substances in Annex XIV.			
HERO ID:	7325009			
Conditions of Use:	Industrial/Commercial Use			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 3 provides table of estimated releases to the environment from all activities including industrial/commercial uses.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source ofthe release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of benzyl butyl phthalate (BBP) as well as information on potential alternatives to its use.			
HERO ID:	7325021			
Conditions of Use:	Disposal of plastics			
EXTRACTION				
Parameter	Data			
Description of release source:	Incineration of plastic wastes.			
Release quantity:	Total emissions from waste incinerating is 118 kg in Denmark in 1994. (32/87)			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the U.K., an OECD country.
	Metric 3:	Applicability	High	Data are for waste handling, treatment, and disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, ranges) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Ejlertsson, J., Karlsson, A., Lagerkvist, A., Hjertberg, T., Svensson, B. H. (2003). Effects of co-disposal of wastes containing organic pollutants with municipal solid waste - a landfill simulation reactor study. Advances in Environmental Research 7(4):949-960.		
HERO ID:	4263232		
Conditions of Use:	Disposal		
EXTRACTION			
Parameter	Data		
Description of release source:	The biotic and abiotic transformation processes of different wastes in a landfill give rise to pools of organic and inorganic compounds in the gaseous and liquid phases. Such compounds may be emitted to the atmosphere or surface and groundwater basins in the drainage area of the landfill. Most of these compounds are of anthropogenic origin and are brought to the landfill as components of building refuse, plastics, paints, materials treated with flame-retardants, cryogenic media, isolation materials, pesticides, and solvents.		
Release quantity:	In this experiment. after 1122 days (3.07 years), landfill simulator LiU2 released 1.5 g of DEHP. After 1640 days (4.49 years), simulator LiU4 released 5.7 g DEHP.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Sweden, an OECD country.
	Metric 3: Applicability	High	Data are for the disposal of phthalate wastes, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (total losses, percentages) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by discussing possible confounding factors in the study. Variability is not addressed.
Overall Quality Determination		Medium	

Study Citation:	El-Hadj, Benabdallah, T., Dosta, J., Mata-Alvarez, J. (2006). Biodegradation of PAH and DEHP micro-pollutants in mesophilic and thermophilic anaerobic sewage sludge digestion. Water Science and Technology 53(8):99-107.
HERO ID:	679120
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Release or emission factors:	nan
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	<p>DEHP aerobic removal was verified by different studies. Martinen et al. (2004) reported 4%, 33–41% and 50–62% as elimination percentage at a retention time of 1, 7 and 28 d, respectively. Likewise, Banat et al. (1999) observed a 30–40% of DEHP elimination in an activated sludge system at 20 8C. However, from various studies carried out on DEHP monitoring in anaerobic systems, anaerobic DEHP removal was not confirmed (Horowitz et al., 1982; Shelton et al., 1984; O’Conner et al., 1989; Ziogou et al., 1989; Ejlertsson et al., 1996; Ejlertsson and Svensson, 1996). Ejlertsson et al. (1997) observed a removal efficiency within a range of 87–91% for some phthalates with high solubility water index (11.2–50 mg/L) at incubation time ranging from 35 to 100 d, but no removal index was detected for DEHP, whose solubility coefficient was estimated as 3mg/L. On the other hand, Reinhart and Pohland (1991) experienced the total disappearance of DEHP from municipal solid waste incubated in a methanogenic lysimeter after 4 years. Madsen et al. (1999) estimated a mineralization portion of 32% of the initial DEHP content (1.6 mg/kg dw) in sludge-amended soil after 1 year of incubation period under anaerobic conditions at 20C. The anaerobic degradation of DEHP was reported to depend on the inoculum used. The use of landfill leachate was verified as an efficient seed for phthalates biodegradation T. Benabdallah El-Hadj et al. 100 including DEHP (Angelidaki et al., 2000). Gavala et al. (2003), estimated DEHP anaerobic degradation adsorbed in primary sludge between 0.0035 and 0.0099 d21 with half-life time in the range of 198–70 d after anaerobic mesophilic digestion. Recently, the temperature effect on DEHP biodegradation was investigated by Banat et al. (1999), who observed an increase of DEHP biodegradation from 22% to 31% and 44% with temperature increase from 20 8C to 528C and 62 8C, respectively, in activated sludge aerobic treatment. On the other hand, Martinen et al. (2004) recorded DEHP elimination rate in the range of 30–60% in composting process for primary, activated and anaerobic sludge treatment with initial content between 57–77 mg/kg dw. The use of hyperthermophilic processes (68 8C and 5 d as HRT) for treating thermophilic anaerobic digester effluent enhanced DEHP elimination by an increase from 9.6% to 34–53% (Hartmann and Ahring, 2003).</p>

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium The data are from an OECD country other than the U.S., and locality-specific factors may impact releases relative to the U.S.
	Metric 3:	Applicability	Low The release data are for an unknown occupational scenario.
	Metric 4:	Temporal Representativeness	Medium The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old.
	Metric 5:	Sample Size	Medium Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low Release data include release media but no other metadata.

Domain 4: Variability and Uncertainty

Continued on next page ...

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Study Citation:	El-Hadj, Benabdallah, T., Dosta, J., Mata-Alvarez, J. (2006). Biodegradation of PAH and DEHP micro-pollutants in mesophilic and thermophilic anaerobic sewage sludge digestion. Water Science and Technology 53(8):99-107.		
HERO ID:	679120		
Conditions of Use:	Disposal		
		EVALUATION	
Domain	Metric	Rating	Comments
	Metric 7:	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination		Low	

Study Citation:	Enwright Associates, (1985). Groundwater & wastewater monitoring report with cover letter dated 120385.			
HERO ID:	1335577			
Conditions of Use:	wastewater effluent - unclear what COU			
EXTRACTION				
Parameter	Data			
Description of release source:	Does not specify source of effluent wastewater. Various sewage waste and chemical ponds.			
Release quantity:	Detection limit of 2 ppb. Nearly all testing had samples below the detection limit except for one at 11.5 ppb for raw water.			
Comments:	Source is municipal wastewater and chemical ponds.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is not peer reviewed but sampling methodology followed "Sampling and Analysis Procedures for Screening Industrial Effluents for Priority Pollutants" published by the Environmental Protection Agency in March, 1977
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for the US.
	Metric 3:	Applicability	Low	Release data is unclear what occupational scenario it could result from.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Includes release media.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Address variability by testing multiple times over multiple weeks/months. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
HERO ID:	7349020			
Conditions of Use:	Processing: Plastic Product Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	The primary sources of emissions at plastic products manufacturing facilities are the pieces of equipment (e.g., extruder hopper, die head, sander) used to handle raw materials and produce the final product. These are typically the locations where chemical reactions occur, liquid solvents and solvent blends are exposed to the atmosphere, solid resin is heated and melted, and additives are introduced.In addition to emissions generated directly from primary production processes associated with plastic products manufacturing, there may be additional emissions produced by secondary processes at these facilities. Emission sources from these secondary processes include storage tanks, equipment leaks, wastewater treatment, combustion sources, and cleaning and surface coating operations. (pdf pg 17)VOC and HAP emissions that result from secondary process materials, such as blowing agents, additives, and lubricants (mold release compounds) (pdf pg 18)Table 11.7-1 (pg 52)			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation, but data is general and not specific to DEHP.
	Metric 4:	Temporal Representativeness	Low	Data is from more than 20 years ago.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Evenset, A., Leknes, H., Christensen, G. N., Warner, N., Remberger, M., Gabrielsen, G. W. (2009). Screening of new contaminants in samples from the Norwegian Arctic: Silver, platinum, sucralose, bisphenol A, tetrabrombisphenol A, siloxanes, phtalates (DEHP), phosphororganic flame retardants.		
HERO ID:	6992056		
Conditions of Use:	Use - releases		
EXTRACTION			
Parameter	Data		
Description of release source:	DEHP uses from local sources likely include hydraulic fluids, dielectric fluid in capacitors, solvent in lightsticks, plasticizer in medical devices. Source is sampling of DEHP in a location far from release sources of DEHP so it is carried by the atmosphere and deposits in the ocean water up in the Arctic near Norway.		
Release or emission factors:	nan		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is from Norwegian Pollution Control Authority so likely contains high quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is from Norway, an OECD country.
	Metric 3: Applicability	Uninformative	Data provides general measurements in the arctic but does not identify any known re-leases of DEHP to this environment.
	Metric 4: Temporal Representativeness	Medium	Data is from 2009, so it is over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Provides concentration and sampling methodology but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by sampling sediment, fish, and birds. Does not address uncer-tainty.
Overall Quality Determination		Uninformative	

Study Citation:	Fischer, J., Ventura, K., Prokes, B., Jandera, P. (1993). Method for determination of plasticizers in industrial emissions. Chromatographia 37(1-2):47-50.			
HERO ID:	5432720			
Conditions of Use:	Processing in PVC with DOP or DEHP.			
EXTRACTION				
Parameter	Data			
Description of release source:	Releases measured came from production lines, exhaust pipeline before and after air filters and 2 chimneys of exhaust gas.			
Release quantity:	DOP release (mg/m^3): productions lines 1 through 3 - 58.4, 56.6 and 35.2; Exhaust pipeline before air filter: 39.9; After air filter: 25.7; Chimney 1: 4.2; Chimney 2: 28.9.			
Comments:	Source analyzes DOP as DEHP. In experimental section it states it measured for di-(2-ethylhexyl) phthalate (DOP, dioctyl phthalate). Unclear what chemical the true measurements are. Unclear why source was marked for occupational exposure, study is of industrial emissions of PVC plant and contains no occupational data.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so data is likely highly accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Source is from Czech Republic, an OECD country. (Joined in 1995 but source is from 1993?)
	Metric 3:	Applicability	Medium	Data is for processing of "DOP" in the plastics industry but there is confusion about whether it is actually for DEHP or not.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Medium	Data is characterized by a range over sampling locations
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes release media, and description of release source.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling across different locations in the processing plant. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Gu, Z., Feng, J., Han, W., Wu, M., Fu, J., Sheng, G. (2010). Characteristics of organic matter in PM2.5 from an e-waste dismantling area in Taizhou, China. Chemosphere 80(7):800-806.			
HERO ID:	1256038			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	e-waste dismantling area			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country.	
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Between 10 and 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Hepler, H., Wolpin, B. (1994). Classification affects disposal of DEHP ballasts. World Wastes 37(10):20-22.
HERO ID:	5631453
Conditions of Use:	Disposal of DEHP ballasts

EXTRACTION

Parameter	Data
Description of release source:	First PCBs, Now DEHP Ballasts, suggests that units with 15 million pounds DEHP are still in use, compared to a-bout 40 million pounds of PCBs in light ballasts. DEHP present in 4 ft and 8 ft light ballasts being disposed. Releases can come from leak of ballast capsule with liquid DEHP in landfills. Solid metal mass en-casing may not burn during incineration so ash can contaminate soil and groundwater if not properly incinerated.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is not peer reviewed and is a general description of various different DEHP ballast removal methods.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.
	Metric 3: Applicability	Low	Data is for disposal of DEHP ballasts (light fixtures) in typical municipal landfilling or incineration.
	Metric 4: Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5: Sample Size	Low	Mostly qualitative and no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Includes description of release source, waste treatment methods and potential release amount.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.

Overall Quality Determination**Low**

Study Citation:	IARC, (2013). Some chemicals present in industrial and consumer products, food and drinking-water. IARC monographs on the evaluation of carcinogenic risks to humans 101:9-549.
HERO ID:	2525812
Conditions of Use:	All COUs.

EXTRACTION

Parameter	Data
Description of release source:	Principal route by which DEHP enters the environments is via transport in air or via leaching from plastics and plasticizer plants or other sources such as sewage treatment plants, paper and textile mills and refuse incinerators.
Release quantity:	Release quantity is TRI (86 tons of DEHP released into the environment in the USA in 2008, of which 72 tons were released into the air from 215 facilities that manufactured and used this chemical, combined with 1588.6 tons that were transferred offsite). In 1997, air emissions of DEHP from 312 industrial facilities in the USA amounted to 110.5 tons. In Canada, 27 tons of DEHP were released into the air in 1995, according to the Canadian National Pollutant Release Inventory. DEHP conc. of up to 300 ng/m ³ have been found in urban and polluted air, and levels between 0.5 and 5 ng/m ³ have been reported in the air of oceanic areas. Table 1.4 in DEHP section has TRI 2008 data for air release (159,506 lbs), water release (4,163 lbs), underground injection release (0 lbs), total land release (25,830 lbs), total publicly owned treatment works transfer (4,222 lbs), total other off-site locations transfer (3,502,285 lbs).
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High
			Release data is TRI so known to be accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High
	Metric 3:	Applicability	High
	Metric 4:	Temporal Representativeness	Medium
	Metric 5:	Sample Size	Medium
			Range of values depending on the release.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium
			Includes release media, assume release frequency is per year, and encompasses a majority of all COUs but does not cover any specific process or unit operation.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium
			Addresses variability by showing data depending on the type of release. Does not address uncertainty.

Overall Quality Determination**High**

Study Citation:	Ishikawa, S., Sakazaki, Y., Eguchi, Y., Suetomi, R., Nakamura, E. (2005). Identification of chemical substances in industrial wastes and their pyrolytic decomposition products. Chemosphere 59(9):1343-1353.			
HERO ID:	2889692			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Release or emission factors:	nan			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	Jo, S. H., Lee, M. H., Kim, K. H., Kumar, P. (2018). Characterization and flux assessment of airborne phthalates released from polyvinyl chloride consumer goods. Environmental Research 165:81-90.			
HERO ID:	4683362			
Conditions of Use:	Consumer use of plastics			
EXTRACTION				
Parameter	Data			
Description of release source:	Emissions from consumer plastics in an emission chamber			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory emission limits, industry/ process technologies) may impact releases relative to the U.S.
	Metric 3:	Applicability	Low	The release data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4:	Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data indicate that the data should be representative of current operations, equipment, and activities. The release data were collected after the most recent federal regulatory action (e.g., NE-SHAP for air release or effluent limit guideline (ELG) for water release) or update or are no more than 10 years old, whichever is shorter. If no federal regulation is established, the data are generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.
Overall Quality Determination			High	

Study Citation:	Jonsson, A., Fridén, U., Thuresson, K., Sörme, L. (2008). Substance flow analyses of organic pollutants in Stockholm. Water, Air, and Soil Pollution: Focus 8(5-6):433-443.
HERO ID:	5765660
Conditions of Use:	Processing and industrial use of DEHP or DEHP containing materials.

EXTRACTION

Parameter	Data
Release quantity:	Releases are given in throughput tab as part of the material flow analysis. Overall emissions 8.5 tons/yr are estimated to be emitted to the urban water. Amount of DEHP in sludge in 2002 was approximately 1.5 tonnes.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Source is not peer reviewed however the data appears to be high quality.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is from Sweden an OECD country.
	Metric 3: Applicability	High	Data is applicable to processing of DEHP or industrial use of DEHP products.
	Metric 4: Temporal Representativeness	Medium	Data is over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range of data depending on the industry.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Provides industry sector, throughput and release media.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by looking at throughput and releases of specific industry sectors. Does not address uncertainty.

Overall Quality Determination**Medium**

Study Citation:	Kim, H., Tanabe, S. I., Koganei, M. (2019). The emission rate of newly regulated chemical substances from building materials. IOP Conference Series: Materials Science and Engineering 609(4):042046.			
HERO ID:	7978640			
Conditions of Use:	Building/construction materials			
EXTRACTION				
Parameter		Data		
Description of release source:		Building materials such as carpet, PVC flooring, water paint, and insulation. (2/7)		
Release or emission factors:		Release or emission factors		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3:	Applicability	Medium	Data are for building and constructions materials, which may be useful in assessing some conditions of use.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in the sampling method and detection ranges. Variability is addressed by sampling multiple building products multiple times.
Overall Quality Determination			High	

Study Citation:	Koszelnik, P., Ziembowicz, S., Kida, M. (2020). Analysis of concentrations of selected phthalic acid esters in aquatic ecosystems - Poland's case study.
HERO ID:	Desalination and Water Treatment 186:56-64.
Conditions of Use:	6825427
	Disposal

EXTRACTION

Parameter	Data
Description of release source:	"The three main sources of phthalates passing into aquatic ecosystems are considered to be atmospheric precipitation, treated effluent discharged from industrial and municipal wastewater treatment plants, and landfill leachate (3/10)"
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Poland, an OECD country.
	Metric 3: Applicability	High	Data are for the disposal of phthalates, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata, including release media and emission factor, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including data from different sources. Uncertainty isn't addressed.

Overall Quality Determination**Medium**

Study Citation:	Kruopiene, J., Dvarioniene, J., Dudutyte, Z., Stance, L., Buzelyte, J. (2014). The use of hazardous chemical substances in Lithuanian industry: how sound is it?. Journal of Cleaner Production 72:89-95.			
HERO ID:	5631621			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	DEHP detected in substances: paint production, plastic, shipyards, production of building materials, car washing, regeneration of used oil, leakage from landfills, supermarkets, and household effluents. DEHP identified in industry discharges (does not say what industries), in households and supermarkets, sludge from WWTPs, found in water bodies (water and/or sediments) all based on Table 8.			
Release quantity:	Paint production effluents: 3.5 - 26 ug/L; car washing: 20 and 71 ug/L; leakage from landfills (2.3-59 ug/L); household effluents: 2.3 - 12 ug/L; supermarkets: 2.3 - 59 ug/L.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed, likely contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Lithuania, an OECD country.
	Metric 3:	Applicability	High	Data is for emissions or emission factors of industry sources.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Lee, Y. S., Lee, S., Lim, J. E., Moon, H. B. (2019). Occurrence and emission of phthalates and non-phthalate plasticizers in sludge from wastewater treatment plants in Korea. Science of the Total Environment 692:354-360.
HERO ID:	6959335
Conditions of Use:	commercial use

EXTRACTION

Parameter	Data
Description of release source:	commercial products
Release quantity:	Average emission fluxes of DEHP through discharges of sludge (kg/day/WWTP) and effluent (kg/day/WWTP), and per-capita discharge (g capita/day/WWTP) from wastewater treatment plants (WWTPs) in Korea; domestic WWTPs – 1920 in sludge, 124 in effluent, 4.52 per-capita; mixed WWTPs – 970 in sludge, 62.5 in effluent, 6.87 per-capita; industrial WWTPs – 878 in sludge, 56.6 in effluent, 3730 per-capita.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High
			The release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium
	Metric 3:	Applicability	High
	Metric 4:	Temporal Representativeness	High
	Metric 5:	Sample Size	High
			Statistical distribution of samples is fully characterized
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low
			Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium
			limited discussion on variability but none on uncertainty

Overall Quality Determination**High**

Study Citation:	Liang, J., Ning, X. A., Kong, M., Liu, D., Wang, G., Cai, H., Sun, J., Zhang, Y., Lu, X., Yuan, Y. (2017). Elimination and ecotoxicity evaluation of phthalic acid esters from textile-dyeing wastewater. Environmental Pollution 231(Pt 1):115-122.
HERO ID:	4259743
Conditions of Use:	Disposal - textile dying plants

EXTRACTION

Parameter	Data
Description of release source:	Textile dyeing plants (TDP): Table 1 gives basic info, process design paraments and operating parameters of 4 TDPs. TDP1 - design capacity is 13,000 m ³ /d operating capacity is the same. TDP2 - design capacity is 14,000 m ³ /day, operating capacity is 10,000 m ³ /d. TDP3 - design capacity is 13,000 m ³ /d and operating capacity is the same. TDP4 - design capacity is 11,000 m ³ /d and operating capacity is the same.
Release quantity:	Approximately 1.84 billion metric tons of textile-dyeing wastewater was produced in 2015 in China. Mean quantity of DEHP in effluent of TDPs was 2.23 ug/L
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so likely does not contain errors in methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for China, a non-OECD country.
	Metric 3:	Applicability	High	Data is for emission of DEHP from textile dying plants.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Low	Not characterized by statistics, mostly qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes release media, waste treatment methods, a throughput.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling multiple plants and through its sampling methodology. Does not address uncertainty.

Overall Quality Determination**Medium**

Study Citation:	Liang, Y., Xu, Y. (2014). Improved method for measuring and characterizing phthalate emissions from building materials and its application to exposure assessment. Environmental Science & Technology 48(8):4475-4484.			
HERO ID:	2346023			
Conditions of Use:	Incorporation into article/Use (vinyl floors)			
EXTRACTION				
Parameter	Data			
Description of release source:	Gas off from Vinyl Floorings			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	methodology is well described	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability but none on uncertainty	
Overall Quality Determination		High		

Study Citation:	Lundberg, G., Nilsson, C. (1994). Phthalic acid esters used as plastic additives: Volume 1. Ecotoxicological risk assessment, Volume 2. Comparisons of toxicological effects. GRA and I(GRA and I):284.			
HERO ID:	680058			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Coal-fired utility boilers			
Release quantity:	860-41,000 mg/hr			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	Methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Sweden, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	Markiewicz, A., Björklund, K., Eriksson, E., Kalmykova, Y., Strömvall, A. M., Siopi, A. (2017). Emissions of organic pollutants from traffic and roads: Priority pollutants selection and substance flow analysis. Science of the Total Environment 580:1162-1174.			
HERO ID:	3867109			
Conditions of Use:	emissions			
EXTRACTION				
Parameter	Data			
Description of release source:	Vehicles and traffic-related activities			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The data is less than 10 years old
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Marx, J. L. (1972). Phthalic acid esters: Biological impact uncertain. Science 46(4056):46-47.			
HERO ID:	1335811			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Pesticides that contain phthalate carriers may release them directly into air, soil, and water; volatilization and leaching of plasticizers from PVC is another source of undetermined magnitude. In addition, some bacteria, fungi, and plants have the ability to synthesize phthalates.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by discussing differences between studies. Variability isn't addressed.
Overall Quality Determination		Medium		

Study Citation:	Mersiowsky, N. (2002). Long-term fate of PVC products and their additives in landfills. Progress in Polymer Science 27(10):2227-2277.			
HERO ID:	6826007			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Phthalates leach from consumer PVC products in landfills			
Release quantity:	In Western Europe, 1,874,000 tons/year of PVC waste are disposed of. 29 ktons/year of phthalates are disposed of from cables, and 116 kton/year of phthalates are disposed of from floorings.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	High	Data are for the disposal of phthalate wastes, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (medians, minimums and maximums, percentages) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in the life cycle assessment methods. Variability is not addressed.
Overall Quality Determination			High	

Study Citation:	Midwest Research Institute, (1984). Performance evaluation of full-scale hazardous waste incinerators - Volume I (excutive summary) contract no. 68-02-3177 (43).
HERO ID:	1269556
Conditions of Use:	Disposal- incineration

EXTRACTION

Parameter	Data
Description of release source:	Hazardous Waste Incinerator
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	this is a contractor prepared report to US EPA OTS.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	The release data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and workactivities.
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

Overall Quality Determination**High**

Study Citation:	Milbrandt, A., Coney, K., Badgett, A., Beckham, G. T. (2022). Quantification and evaluation of plastic waste in the United States. Resources, Conservation and Recycling 183:106363.
HERO ID:	11360398
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Release quantity:	PDF PG. 4 "We estimate approximately 44 million tons (Mt) of plastic waste was managed through landfilling, combustion, and recycling in 2019."
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for disposal, an in-scope occupational scenario; however, the data are not chemical specific.
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Medium	Statistical distribution of samples is characterized with some statistics but not fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by discussing multiple plastic waste types, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Miller, C., Srivastava, R. K., Ryan, J. V. (1994). Emissions of organic hazardous air pollutants from the combustion of pulverized coal in a small-scale combustor. Environmental Science & Technology 28(6):1150.			
HERO ID:	5705544			
Conditions of Use:	Coal combustion			
EXTRACTION				
Parameter	Data			
Description of release source:	Coal combustion plants. Figure 1 has schematic of innovate furnace reactor, figure 2 has schematic of coal burner used.			
Release quantity:	DEHP baseline averages (lb/10^6 BTU): max - 6.433 x 10^-8, min - 6.433 x 10^-8 (they're the same).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so methodology is likely accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	Low	Data is for emission of coal combustion, which is not a use of DEHP but constitutes emission.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old (1994).
	Metric 5:	Sample Size	Low	Data not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes release media, emission factor and process.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Low		

Study Citation:	Muchangos, L. D., Xue, M., Zhou, L., Kojima, N., Machimura, T., Tokai, A. (2019). Flows, stocks, and emissions of DEHP products in Japan. Science of the Total Environment 650(Pt 1):1007-1018.
HERO ID:	5043426
Conditions of Use:	Disposal, Recycling

EXTRACTION

Parameter	Data
Description of release source:	Releases come from the actual processes of generating DEHP, using DEHP or release of DEHP through waste treatment via incineration, recycling or landfills.
Release quantity:	Flow of waste generated is shown in Fig 3. It peaked in the year 2006 with approximately 200,00 tons followed by a four-year period of reductions under 10,000 tons. Significant contributions derived from General-purpose films with 45,139 tons, industrial raw materials with 36,199 tons, and building materials with 32,802 tons. Fig 5 shows emissions by waste treatment release media and then release by lifecycle stage. Total emissions to environment are shown in Fig 5. Emissions to air are low and do not get above around 1,000 tons/yr. Emissions to soil peaked around 42,000 tons/yr in 1997. Emissions to water peaked around 7,500 tons/yr in 1997. Emissions from phases are in figure 5 as well. Emissions from use phase peaked at 49,000 tons/yr in 1997 and decreased steadily after. Emissions from production phase peaked at 35,000 tons/yr in 1995/96 and decreased steadily. Emissions from Treatment and Disposal phase peaked around 4,500 tons/yr and plateaued at that amount around 2000 to 2017.
Release or emission factors:	nan
Release frequency:	Release frequencies are on a yearly basis.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Source is peer reviewed so likely contains all exposures and data is of high quality.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Medium	Data is for Japan, an OECD country.
Metric 3:	Applicability	High	Data is for multiple different COUs.
Metric 4:	Temporal Representativeness	Medium	Data Source is from 2019 but data covers 1950s to 2030s. with most recordable data coming from 90s and 2000s.
Metric 5:	Sample Size	Medium	Characterized by a range of values.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	Includes release media, life cycle stage of release, general activity of source release and release frequency is on a yearly basis.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	High	Address uncertainty by conducting uncertainty analyses as well as taking into account and attempting to quantify illegal landfill disposals of DEHP. Addresses variability by looking at releases from the entire life cycle of the chemical over many years.

Overall Quality Determination**High**

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 8343, Bis(2-ethylhexyl) phthalate.			
HERO ID:	7681905			
Conditions of Use:	Processing and Use			
EXTRACTION				
Parameter	Data			
Description of release source:	DEHPs production and use as a plasticizer in polyvinyl chloride (PVC) resins for fabricating flexible vinyl products may result in its release to the environment through various waste streams. DEHP is found in table cloths, shower curtains, furniture and automobile upholstery, imitation leather, garden hoses, floor tiles, swimming-pool liners, sheathing for wire and cable, rainwear, shoes, toys, dolls, baby pants, food packaging materials, tubing used in commercial milking equipment, and weather stripping. Disposal of these products may release DEHP into the environment. (112/149)			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The release data are for occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data from more than 20 years ago.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and emission per unit kg, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including different industries but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	NYSDEC, (1984). 2-Chlorotoluene in Niagara R. effluents with transmittal letter dated 090784 (draft rept, incompl).			
HERO ID:	1335412			
Conditions of Use:	Chemical manufacturing plant (unknown use of DEHP)			
EXTRACTION				
Parameter	Data			
Release or emission factors:	nan			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The occupational scenario is unknown but expected to be in scope (chemical manufacturing plant).
	Metric 4:	Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	OECD, (2019). Complementing document to the emission scenario document on plastic additives: Plastic additives during the use of end products.			
HERO ID:	6306751			
Conditions of Use:	Use of plastic products			
EXTRACTION				
Parameter	Data			
Description of release source:	Release during product use. Releases to air.			
Release or emission factors:	Release or emission factors			
Comments:	No plasticizer was detected during the emission-collection process, but much was detected during the thermal desorption process. Therefore, during use, it can be assumed that, after its emission from the surface of the plastic, most of the plasticizer adheres to the dust attached to the surface and is not diffused in the air. The plasticizer/dust can then be airborne by ventilation, removed by vacuuming or transferred through surface cleaning into water.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data indicate that the data should to be representative of current operations, equipment, and activities.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release. The release data study provides only limited discussion of the uncertainty in the release results.
Overall Quality Determination			High	

Study Citation:	Oppelt, E. T. (1991). Air emissions from the incineration of hazardous waste. Advances in Modern Environmental Toxicology XIX:1-26.		
HERO ID:	1267868		
Conditions of Use:	Disposal		
EXTRACTION			
Parameter	Data		
Description of release source:	Hazardous Waste Incinerator, Municipal Waste Incinerator		
Release or emission factors:	Release or emission factors		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Cincinnati Ohio EPA prepared this report and the release data methodology is unknown but expected to be accurate. However, it may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	Data are for in-scope disposal scenario.
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Other than range being given, variability and uncertainty are not addressed.
Overall Quality Determination		Low	

Study Citation:	Oppelt, E. T. (1987). Incineration of hazardous waste. Journal of Air Pollution Control Association 37(5):558-586.
HERO ID:	1924583
Conditions of Use:	Disposal - incineration

EXTRACTION

Parameter	Data
Description of release source:	Release source is from various incineration processes through vent gases and various releases after incineration as well as ash and residue handling with releases by land disposal and water via sewers.
Release quantity:	Emission rate from hazardous waste combustion (ng/kJ): mean - 4.6, range: 0-21. ng of emission per kJ of combustor heat input (1 ng/kJ = 2.34×10^{-6} lb/MMBtu)
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.
	Metric 3: Applicability	High	Data is directly applicable to disposal of DEHP.
	Metric 4: Temporal Representativeness	Low	Report is over 20 years old.
	Metric 5: Sample Size	Medium	Mostly qualitative but some release information is of a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Documents data source, methods, results, and provides extensive information regarding individual incineration methods and their pollution controls.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability through various different incineration methods. Does not address uncertainty.

Overall Quality Determination**High**

Study Citation:	Parkerton, T. F., Staples, C. A. (2003). An assessment of the potential environmental risks posed by phthalates in soil and sediment. Handbook of Environmental Chemistry Series, vol. 3 pt. Q 3:317-349.			
HERO ID:	7978775			
Conditions of Use:	As a reactant - Plasticizer in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing, Incorporation into article - Plastic material and resin manufacturing,			
EXTRACTION				
Parameter	Data			
Description of release source:	Sludge from municipal wastewater treatment plants is typically disposed of via incineration, placement in landfills, or via land application to agricultural fields, forested land or other sites e.g. parks, golf courses, and reclamation projects. (pdf pg 18)			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology utilized by U.S. EPA national sediment quality survey.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the U.S. and Europe and are representative.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Data are more than 10 years old, but no more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release.
Overall Quality Determination			High	

Study Citation: programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.
HERO ID: 6580284
Conditions of Use: Formulation of paint and varnish

EXTRACTION

Parameter	Data
Description of release source:	Air pollutant emissions are primarily the fugitive type and consist of evaporation losses of the volatile portion of the vehicle from the milling operation and from various product holding tanks and packing stations. There are also some fugitive particulate emissions that result from handling and emptying of pigment or extender bags into the grinding and dispersion mills. In some plants these loading areas are hooded and bags and pigment dusts are passed to a central collection station. At this station bags are removed for refuse disposal and the pigment dust is collected in a fabric filter and recycled into primer or other dark paint mixes. // Waste materials constitute a major source of potential liquid pollutants. These include spoiled batches, residues and solvent and aqueous solutions for washing equipment. // Most solid waste, with the exception of that which can be considered part of an air pollution emission, is incorporated into the liquid wastes described in the previous section. These include pigment particulate and latex emulsion as well as the non-volatile portion of the film former which would be left if the paint or resin were allowed to dry.
Release quantity:	Source contains information on hydrocarbon, organics, and particulate emissions, and waste solvent, resin, and paint, but nothing specific to this chemical.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

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Study Citation:		programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.		
HERO ID:		6580284		
Conditions of Use:		Formulation of paint and varnish		
Domain	Metric	EVALUATION		Comments
		Rating		
Overall Quality Determination		High		

Study Citation:	Radian Corp, (1989). Environmental analysis for the Shell Martinez RM-17 incinerator, with cover letter dated 3/15/1991 (sanitized).
HERO ID:	1335691
Conditions of Use:	Disposal - incineration

EXTRACTION

Parameter	Data
Description of release source:	Release source is a vent stack from the waste incineration process.
Release quantity:	Emission rate of DEHP is 1.5×10^{-5} g/sec
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report is by Radion Corp contracted by Shell Oil company for a TSCA submission. Likely to cover all releases since it is a TSCA submission.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.
	Metric 3: Applicability	Medium	Data is for the on-site waste incineration of liquid waste and process offgas generated in the manufacture of a chemical known as RM-17. Unclear what that chemical is for or about.
	Metric 4: Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5: Sample Size	Low	Not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Includes release media, process, unit operations, release frequency and activity of release.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses uncertainty in its environmental exposure assessment, does not address variability.

Overall Quality Determination**Medium**

Study Citation:	Roy F. Weston Inc, (1980). Characterization and fate of the discharge of priority pollutants from the Rohm and Haas Philadelphia plant into the Delaware low level collector of the Philadelphia sewer.
HERO ID:	1333014
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Process sewer
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	it is not clear which COU this reference may relate to .

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Low	It is not clear which COU this would correspond to.
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

Overall Quality Determination**High**

Study Citation:	Rule, K. L., Comber, W., S.D., Ross, D., Thornton, A., Makropoulos, C. K., Rautiu, R. (2006). Survey of priority substances entering thirty English wastewater treatment works. Water and Environment Journal 20(3):177-184.		
HERO ID:	1598403		
Conditions of Use:	Disposal - wastewater treatment		
EXTRACTION			
Parameter	Data		
Description of release source:	Phthalates, such as DEHP, are another ubiquitous group of chemicals with a widespread use throughout the industrial and household environments, particularly as additives in plastics, including pipes used for plumbing purposes. As a result, concentrations up to ca. 20 mg/L were measured, with no particular trend with increasing industrial or runoff inputs.		
Release or emission factors:	Release or emission factors		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory emission limits, industry/ process technologies) may impact releases relative to the U.S.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release. The release data study provides only limited discussion of the uncertainty in the release results.
Overall Quality Determination		Medium	

Study Citation:	Samsonova, A. S., Aleshchenkova, Z. M., Syomochkina, N. F., Baikova, S. V. (1996). Microbial decontamination of effluents from phthalate esters. Dechema Monographs 133:607-610.
HERO ID:	5433106
Conditions of Use:	Disposal - microbial degradation

EXTRACTION

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

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Source appears to use high quality data but not from frequently used source, does not indicate if it is peer reviewed or not.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is from a Russian pilot plant
	Metric 3: Applicability	Medium	Data is for disposal of DEHP through microbial degradation, unclear what type of waste treatment this could be applied to in the US.
	Metric 4: Temporal Representativeness	Low	Over 20 years old.
	Metric 5: Sample Size	Low	Not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Only includes waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by looking at different microbials and their degradation rates as well as different dilution rates

Overall Quality Determination**Low**

Study Citation:	Schripp, T., Wensing, M. (2009). Emission of VOCs and SVOCs from electronic devices and office equipment. :405-430.			
HERO ID:	9493521			
Conditions of Use:	Electrical and electronic products			
EXTRACTION				
Parameter	Data			
Description of release source:	Television sets and VCRs (page 12/26)			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Germany, an OECD country.	
	Metric 3: Applicability	High	Data are for commercial use of electronic products, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and emissions factors provided but missing release quantity, frequency, and waste treatment.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed for the individual study that samples DEHP.	
Overall Quality Determination		Medium		

Study Citation:	Shivani, Gadi, R., Sharma, S. K., Mandal, T. K. (2019). Seasonal variation, source apportionment and source attributed health risk of fine carbonaceous aerosols over National Capital Region, India. Chemosphere 237:124500.			
HERO ID:	6816297			
Conditions of Use:	Emission			
EXTRACTION				
Parameter	Data			
Description of release source:	emissions from plastic and waste burning			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	data is no more than 10 years old
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The release data study provides only limited discussion of the variability but none on uncertainty
Overall Quality Determination			High	

Study Citation:	Summers, J. W. (2006). Vinyl chloride polymers. :1-41.			
HERO ID:	7322451			
Conditions of Use:	Disposal/recycling of polyvinyl chloride (PVC) plastic			
EXTRACTION				
Parameter	Data			
Description of release source:	Although vinyl is the world’s second most widely used plastic, less than one-half percent by weight is found in the municipal solid waste stream. Most of that consists of vinyl packaging, bottles, blister packaging, and flexible film. This is because most vinyl applications are long-term uses, such as pipe and house siding, and are not disposed of quickly. Vinyl wastes are handled by all conventional disposal methods, ie, recycling, landfilling, and incineration (including waste-to-energy). (p. 14-15).			
Release quantity:	According to a 1999 study by Principia Partners (163), more than 1E9 pounds of vinyl were recovered and recycled into useful products in North America in 1997. About 18E6 pounds of that was post-consumer vinyl diverted from landfills and recycled into second-generation products. Overall, more than 99% of all manufactured vinyl compound ends up in a finished product, due to widespread post-industrial recycling (p. 15).			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	Low	The release data are for disposal of PVC plastics, which includes all types of se (industrial, commercial, consumer).
	Metric 4:	Temporal Representativeness	Medium	The data are more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Trenholm, A. R., Lee, C. C. (1987). Analysis of PIC and total mass emissions from an incinerator. Nuclear and Chemical Waste Management 7(1):33-36.
HERO ID:	1315839
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Hazardous Waste Incinerator, Municipal Waste Incinerator
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	Data are for disposal scenario, in-scope
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Other than range being given, variability and uncertainty are not addressed.

Overall Quality Determination**Low**

Study Citation:	U.S. EPA, (2022). Discharge Monitoring Report (DMR) data: Di (2-ethylhexyl)phthalate (CASRN 117-81-7), 2017-2022.			
HERO ID:	12064266			
Conditions of Use:	Multiple			
EXTRACTION				
Parameter	Data			
Release quantity:	Provides release to surface water data			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is known but not fully transparent and also only covers releases to surface water from sites.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	DMR is U.S. based data.
	Metric 3:	Applicability	High	DMR includes industries included in the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	High	DMR data are from 2016.
	Metric 5:	Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	DMR only includes release media but lacks additional metadata like release frequency, process, and unit operations that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	DMR does not address variability or uncertainty in submitter provided data.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (2022). Toxics Release Inventory (TRI) data: Di (2-ethylhexyl)phthalate (CASRN 117-81-7), 2017-2022.
HERO ID:	12064267
Conditions of Use:	Multiple

EXTRACTION

Parameter	Data
Description of release source:	TRI provides requires some use codes to be submitted with form R submissions.
Release quantity:	Provides release quantities on a per-site basis for specific release media, including fugitive air, stack air, water, land, energy recovery, recycling, treatment, etc.
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known (basis of estimate are indicated but not fully provided) and is expected to be accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	TRI is U.S. based data.
	Metric 3: Applicability	High	TRI includes industries included in the scopes of multiple chemicals.
	Metric 4: Temporal Representativeness	High	TRI data are from 2017-2022.
	Metric 5: Sample Size	Medium	Due to reporting requirements, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	TRI only includes release media and some use information but no other metadata such as unit operation.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	TRI does not address variability or uncertainty in submitter provided data.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1982). Development document for effluent limitations, guidelines and standards for the pulp, paper, and paperboard, and the builders paper and board mills (final report) (EPA 440/1-82/025).			
HERO ID:	1316234			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	Paper product manufacturing			
Release or emission factors:	nan			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	Low	The report is from paper product manufacturing, an occupational scenario that does not apply to any occupational scenario within the scope of the risk evaluation. However the information contained can be used for similar occupational scenarios like fabric products.	
	Metric 4: Temporal Representativeness	Low	Data from the 1980s.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Different mills are sampled for variability but uncertainty is not addressed.	
Overall Quality Determination		Low		

Study Citation:	U.S. EPA, (2012). Phthalates action plan.			
HERO ID:	4565597			
Conditions of Use:	General industrial manufacturing, processing, or use			
EXTRACTION				
Parameter	Data			
Description of release source:	Phthalates are released to the environment from multiple sources including industrial releases, the disposal of manufacturing, processing and industrial wastes, municipal solid waste, land application of sewage sludge, and release from products containing phthalates. Only two (DBP and DEHP) of the 8 phthalates are listed on EPA’s Toxics Release Inventory (TRI).list of toxic chemicals. The available release data for these two phthalates indicate that releases of phthalates can be expected to all primary environmental media.			
Release quantity:	2007 TRI data (EPA, 2009) for DBP and DEHP show total on-site and off-site releases of more than 336,000 pounds from 134 sites and 1,229,000 pounds from 251 sites, respectively; however, under TRI, some volume of releases are not reported by some facilities. These data also indicate that the volume of releases to particular media generally ranks in the following order (from highest to lowest release volume): land, air, water.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination		Medium		

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

EXTRACTION

Parameter	Data
Description of release source:	Emission factors for DEHP from waste oil combustors (Emission rating – D): Space Heaters - Vaporizing Burner – 2.6 E-4 kg/m ³ (2.2 E-3 lbs/1000 gal); Space Heaters - Atomizing Burner – ND.Cement kiln - Average emission factor is 4.8 x 10 ⁻⁵ kg/Mg (9.5 x 10 ⁻⁵ lbs/ton) for emission rating D
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Release data methodology is known
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the United States
	Metric 3: Applicability	High	Release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	More than 20 years old
	Metric 5: Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release, but no discussion of the uncertainty in the release results.

Overall Quality Determination**Medium**

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

EXTRACTION

Parameter	Data
Description of release source:	Provides unit/process of release.
Release quantity:	Provides annual air release data
Release or emission factors:	Release or emission factors
Release frequency:	For some releases at the process unit level, it provides the release frequency
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Submitters provide general method used to calculate emissions, but details not provided. Only covers air releases of facilities.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	NEI is U.S. based data.
	Metric 3: Applicability	High	NEI includes industries included in the scopes of multiple chemicals.
	Metric 4: Temporal Representativeness	High	NEI data are for a reporting year less than 10 years old (downloaded in 2019).
	Metric 5: Sample Size	Medium	Universe is limited to units subject to NESHAP with threshold potential to emit, although states may have different requirements; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	NEI includes release media and generally also includes daily and annual operating time, specific unit/process that is the source of release, and presence of engineering controls.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The variability in release data can be viewed from the different sites reporting but uncertainty in submitter provided data is not discussed.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Paint and varnish manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	See page 29. The primary factors affecting emissions from paint manufacture are care in handling dry pigments, types of solvents used, and mixing temperature. About 1 or 2 percent of the solvent is lost even under well-controlled conditions. Particulate emissions amount to 0.5 to 1.0 percent of the pigment handled. Varnish cooking emissions7 largely in the form of volatile organic compounds, depend on the cooking temperatures and times, the solvent used, the degree of tank enclosure and the type of air pollution controls used. Emissions from varnish cooking range from 1 to 6 percent of the raw material.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
Overall Quality Determination		Low		

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Plastics manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	See page 41-74. The major sources of air contamination in plastics manufacturing are the raw materials or monomers, solvents, or other volatile liquids emitted during the reaction; sublimed solids such as phthalic anhydride emitted in alkyd production; and solvents lost during storage and handling of thinned resins. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	printing ink manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	See page 74. Varnish or vehicle preparation by heating is by far the largest source of ink manufacturing emissions. Cooling the varnish components - resins, drying oils, petroleum oils, and solvents produces odorous emissions. At about 350°F (175°C) the products begin to decompose, resulting in the emission of decomposition products from the cooking vessel. Emissions continue throughout the cooking process with the maximum rate of emissions occurring just after the maximum temperature has been reached. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	soap and detergent manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	See page 79-82. The main atmospheric pollution problem in soap manufacturing is odor. The storage and handling of liquid ingredients (including sulfonic acids and salts) and sulfates are some of the sources of this odor. Vent lines, vacuum exhausts, raw material and product storage, and waste streams are all potential odor sources. The exhaust air from detergent spray drying towers contains 2 types of air contaminants: (1) fine detergent particles and (2) organics vaporized in the higher temperature zones of the tower. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	synthetic fiber manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	See page 89-101.Air pollution emission points in the wet spinning organic solvent process are similar to those of dry spinning. Wet spinning processes that use solutions of acids or salts to dissolve the polymer chips emit no solvent VOC, only unreacted monomer, and are, therefore, relatively clean from an air pollution standpoint. For those that require solvent, emissions occur as solvent evaporates from the spinning bath and from the fiber in post-spinning operations. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	synthetic rubber manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	See page 107. Because recovery of the unreacted monomers and their subsequent purification are essential to economical operation, unreacted butadiene and styrene from the emulsion crumb polymerization process normally are recovered. The latex emulsion is introduced to flash tanks where, using vacuum flashing, the unreacted butadiene is removed. The butadiene is then compressed, condensed, and pumped back to the tank farm storage area for subsequent reuse. The condenser tail gases and noncondensables pass through a butadiene adsorber/desorber unit, where more butadiene is recovered. Some noncondensables and VOC vapors pass to the atmosphere or, at some plants, to a flare system. The latex stream from the butadiene recovery area is then sent to the styrene recovery process, usually taking place in perforated plate steam stripping columns. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	U.S. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	7315820
Conditions of Use:	Use (Paints and coatings)

EXTRACTION

Parameter	Data
Description of release source:	The only pollutants emitted in significant quantities from solvent base coating using plasticizers are volatile organic compounds from solvent evaporation. In an uncontrolled facility, essentially all of the solvent used in the coating formulation is emitted to the atmosphere. Of these uncontrolled emissions, 80 to 95 percent are emitted with the drying oven exhaust. Some solvent (from zero to 5 percent) can remain in the final coated product, although this solvent will eventually evaporate into the atmosphere. The remainder of applied solvent is lost from a number of small sources as fugitive emissions. There are also VOC losses from solvent storage and handling, equipment cleaning, miscellaneous spills, and coating formulation mixing tanks. Fugitive solvent emissions during the coating process come from the evaporative loss of solvent around the coating head and from the exposed wet web prior to its entering the drying oven.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Release data methodology is known or expected to be accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation but not specific to DEHP.
	Metric 4: Temporal Representativeness	Low	Data is more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release, but no discussion of the uncertainty in the release results.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.
HERO ID:	7315841
Conditions of Use:	Emission

EXTRACTION

Parameter	Data
Description of release source:	The mechanically created or externally added heat present during the six principal processes (mixing, milling, extrusion, calendaring, curing, and grinding) cause VOC and HAP to be emitted. Particulate matter is primarily emitted from the dry chemicals utilized in mixing and as a result of grinding.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the United States
	Metric 3: Applicability	High	Release data are for an occupational scenario within the scope of the risk evaluation
	Metric 4: Temporal Representativeness	Low	More than 20 years old
	Metric 5: Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Provides only limited discussion of the variability but no discussion of the uncertainty in the estimates.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (2021). National analysis TRI dataset (TRI): Data used for TSCA risk evaluations, reporting year 2019.			
HERO ID:	8347325			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Release quantity:	Provides release quantities on a per-site basis for specific release media, including fugitive air, stack air, water, land, energy recovery, recycling, treatment, etc.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Methodology used by submitters to estimate release data is not known.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	TRI is U.S. based data.	
	Metric 3: Applicability	High	TRI includes industries included in the scopes of multiple chemicals.	
	Metric 4: Temporal Representativeness	High	TRI data are from 2019.	
	Metric 5: Sample Size	Medium	Due to reporting requirements, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	TRI only includes release media but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	TRI does not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		Medium		

Study Citation:	Wang, Q., Wang, L., Chen, X., Rao, K. M., Lu, S. Y., Ma, S. T., Jiang, P., Zheng, D., Xu, S. Q., Zheng, H. Y., Wang, J. S., Yu, Z. Q., Zhang, R., Tao, Y., Yuan, J. (2011). Increased urinary 8-hydroxy-2'-deoxyguanosine levels in workers exposed to di-(2-ethylhexyl) phthalate in a waste plastic recycling site in China. Environmental Science and Pollution Research 18(6):987-996.			
HERO ID:	788308			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country.	
	Metric 3: Applicability	Medium	The release data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.	
	Metric 4: Temporal Representativeness	Medium	Between 10 and 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media/concentration but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Weschler, C. J., Nazaroff, W. W. (2008). Semivolatile organic compounds in indoor environments. Atmospheric Environment 42(40):9018-9040.			
HERO ID:	787837			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	application of a pesticide or the emission of a plasticizer or flame retardant from its host material			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Data are more than 10 years but no more than 20 years old
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release, but no discussion of theuncertainty in the release results.
Overall Quality Determination			Medium	

Study Citation:	Zhu, Q., Jia, J., Zhang, K., Zhang, H., Liao, C. (2019). Spatial distribution and mass loading of phthalate esters in wastewater treatment plants in China: An assessment of human exposure. Science of the Total Environment 656:862-869.
HERO ID:	5043529
Conditions of Use:	Disposal - WWTPs

EXTRACTION**Parameter****Data**

Description of release source:	Release is from sludge in wastewater treatment plants.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION**Domain****Metric****Rating****Comments**

Domain 1: Reliability

Metric 1:

Methodology

High

Source is peer reviewed so likely contains high quality data.

Domain 2: Representativeness

Metric 2:

Geographic Scope

Low

Data is from China, a non OECD country.

Metric 3:

Applicability

Low

The release data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation

Metric 4:

Temporal Representativeness

High

Data is less than 10 years old.

Metric 5:

Sample Size

Medium

Characterized by a range with uncertain statistics.

Domain 3: Accessibility/ Clarity

Metric 6:

Metadata Completeness

Medium

Includes release media, description of release source and emission factors.

Domain 4: Variability and Uncertainty

Metric 7:

Metadata Completeness

Medium

Addresses variability by sampling multiple WWTPs, does not address uncertainty.

Overall Quality Determination**Medium**

Study Citation:	Björklund, K. (2010). Substance flow analyses of phthalates and nonylphenols in stormwater. Water Science and Technology 62(5):1154-1160.		
HERO ID:	6813724		
Conditions of Use:	Consumer use of plastics		
EXTRACTION			
Parameter	Data		
Description of release source:	Emission of phthalates and NP/EOs from vehicles is assumed to be a result of wear and tear during driving and deposition on parking areas through migration from car components and washed-out car care products. Other human activities in urban areas include diffuse sources such as shoe and textile wear, toys, paper and packaging, strollers and bicycles which may lead to emissions of phthalates and NP/EOs. Roofing material, coil coating, car undercoating and paints have been estimated by the ECB to cause almost 80% of the DEHP emissions to surface water (ECB 2004a). In the current study, the remaining phthalate sources, including atmospheric deposition, sealants and human activities, are all minor sources contributing with only a few percent to total phthalate emissions to stormwater. Similar conclusions are drawn by the ECB, who reports that the remaining uses of phthalates, for example sealants, shoe wear and some applications of soft PVC, each give rise to approximately 2–7% of the total emissions.		
Release quantity:	The flow calculations showed that approximately 4.1 kg of the four phthalates are emitted annually to stormwater in the studied area (Figure 2a–d). The highest loads were found for DINP (2,200 g), followed by DIDP (1,100 g), DEHP (800 g) and DBP (12 g).		
Release or emission factors:	Release or emission factors		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The model is free of mathematical errors and is based on scientifically sound approaches or methods. However, equations and choice of parameter values are not fully described and some equations and/or parameter values may not be appropriate for the model’s application.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The model can be appropriately applied to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The model is based on data that are generally more than 10 years but no more than 20 years old. However, the model is based on operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	Low	The model documentation describes the approach and parameters, but the equations and/or selection of parameter values are not provided. Rationale for modeling approach and parameter value selection is not provided.
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	Medium	The model has limited characterization of the variability of parameter values. The model has limited characterization of the uncertainty in the results.
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Study Citation:	Björklund, K. (2010). Substance flow analyses of phthalates and nonylphenols in stormwater. Water Science and Technology 62(5):1154-1160.		
HERO ID:	6813724		
Conditions of Use:	Consumer use of plastics		
Domain		Metric	EVALUATION
		Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	Xu, Y., Hubal, Cohen, E. A., Little, J. C. (2010). Predicting residential exposure to phthalate plasticizer emitted from vinyl flooring: Sensitivity, uncertainty, and implications for biomonitoring. Environmental Health Perspectives 118(2):253-258.			
HERO ID:	387965			
Conditions of Use:	commercial use - vinyl flooring			
EXTRACTION				
Parameter	Data			
Description of release source:	emissions of di(2-ethylhexyl) phthalate (DEHP) from vinyl flooring (VF)			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are appropriate for the model’s application.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	Medium	Model is for household, but can be applied to a commercial setting.	
	Metric 4: Temporal Representativeness	Medium	Between 10 and 20 years old.	
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided.	
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	The model characterizes variability and uncertainty in the results.	
Overall Quality Determination		High		

Study Citation:	ATSDR, (2019). Toxicological profile for di(2-ethylhexyl)phthalate (DEHP): draft for public comment.			
HERO ID:	5926020			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	Industrial releases are only a fraction of the total environmental releases of DEHP. Release of DEHP into the environment is thought to originate from diffuse sources, mainly from end-uses of DEHP (e.g., as an additive to plastics) by leaching or evaporating. Disposal of plastic products containing DEHP is also a possible source of environmental release.			
Release quantity:	Estimated releases of 46,873 pounds (~21 metric tons) of DEHP to the atmosphere from 144 domestic manufacturing and processing facilities in 2015, accounted for about 8% of the estimated total environmental releases from facilities required to report to the TRI. Estimated releases of 1,901 pounds (~0.86 metric tons) of DEHP to surface water from 144 domestic manufacturing and processing facilities in 2015, accounted for about 0.3% of the estimated total environmental releases from facilities required to report to the TRI. Estimated releases of 470,783 pounds (~214 metric tons) of DEHP to soils from 144 domestic manufacturing and processing facilities in 2015, accounted for about 86% of the estimated total environmental releases from facilities required to report to the TRI.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the United States
	Metric 3:	Applicability	High	Assessment is for an occupational scenario within scope
	Metric 4:	Temporal Representativeness	High	Risk assessment is generally no more than 10 years old
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Assessment does not address variability or uncertainty
Overall Quality Determination		High		

Study Citation:	Canada,, G.o. (2017). Risk Management Scope for 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester [DEHP] Chemical Abstracts Service Registry Number (CAS RN): 117-81-7.			
HERO ID:	6311652			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Description of release source:	Releases may occur during the manufacture and processing of phthalates, including transportation and storage, as well as during production, use and disposal of products that contain phthalates. Phthalates are not chemically bound into polymer matrices during processing activities and can migrate to the surface of polymer products over time. The rate of this migration is expected to be slow and will be counteracted by chemical and physical attractive forces which work to hold the phthalates within polymers. Releases of phthalates to the environment are expected to occur primarily to air and water (Canada 2017). Based on known applications in consumer and industrial products, environmental releases of phthalates, including DEHP are expected to occur primarily to water, through off-site wastewater treatment systems (WWTS) and through disperse releases from consumer products. (p. 9-10).			
Release or emission factors:	nan			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canadian risk management activities.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Report is from 2017.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.			
HERO ID:	675060			
Conditions of Use:	Use (general use, not differentiated)			
EXTRACTION				
Parameter	Data			
Release quantity:	Estimated DEHP emissions in Sweden were 143-432 tonnes to air per year in 2001/2002 and about 178 tonnes per year to water			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
HERO ID:	5353181			
Conditions of Use:	Waste handling, treatment and disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Releases may occur during the manufacture and processing of phthalates, including transportation and storage, as well as during production, use and disposal of products that contain phthalates (e.g., release of phthalates into wastewater systems from use of cosmetics).(29/228)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.	
	Metric 3: Applicability	Medium	Information is for phthalate waste handling, treatment, and disposal, an in-scope occupational scenario but is not specific to DEHP.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Just a description of release.	
Overall Quality Determination		High		

Study Citation:		ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
HERO ID:		679967			
Conditions of Use:		Manufacturing			
EXTRACTION					
Parameter		Data			
Release or emission factors:		Release or emission factors			
EVALUATION					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
		Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
		Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
		Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty.
Overall Quality Determination			Medium		

Study Citation:	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
HERO ID:	679967			
Conditions of Use:	Distribution			
EXTRACTION				
Parameter	Data			
Description of release source:		During distribution, losses may occur during the cleaning of drums and tanks or, exceptionally, by accidental spillage.		
Release or emission factors:		Release or emission factors		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
HERO ID:	679967			
Conditions of Use:	Manufacture of plasticized products			
EXTRACTION				
Parameter	Data			
Description of release source:		Loss to atmosphere during melt forming processes is likely.		
Release or emission factors:		Release or emission factors		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
HERO ID:	679967			
Conditions of Use:	Use of plasticized products			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.	
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The assessment does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
HERO ID:	679967			
Conditions of Use:	Disposal of plasticized products			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The assessment does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Manufacture, industrial use, disposal		
EXTRACTION			
Parameter	Data		
Description of release source:	An estimation of the contribution to the total emissions of DEHP from different life-cycle stages is given in the RAR for DEHP: 2.5% from manufacturing, 2.5% from industrial uses, 32% from end product uses, and 63% from waste handling		
Release quantity:	See table 11: From manufacturing, 1 t/y to air, 4 t/y to soil, and 220 t/y to wasteater		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.			
HERO ID:	3661424			
Conditions of Use:	Plastic Products			
EXTRACTION				
Parameter	Data			
Release quantity:	See table 11: From formulation, 30 t/y to air, 1 t/y to soil, 97 t/y to wastewater; from processing, 174 t/y to air, 41 t/y to soil, 125 t/y to wastewater; from use of articles, 415 t/y to air, 7,480 t/y to soil, 2,940 t/y to wastewater			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.			
HERO ID:	3661424			
Conditions of Use:	Disposal and recycling			
EXTRACTION				
Parameter		Data		
Release quantity:		See table 11: 9 t/y to air, 48 t/y to soil, and 10 t/y to wastewater		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	Transportation			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHES, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	Processing into plastics, application of paints/adhesives/etc. to produce articles			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	Disposal			
		EXTRACTION		
Parameter	Data			
Release or emission factors:		Release or emission factors		
Waste treatment methods and pollution control:		nan		
		EVALUATION		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	Formulation			
EXTRACTION				
Parameter	Data			
Release or emission factors:		Release or emission factors		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	End-product uses (of articles such as plastics, flooring, coated materials)			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).	
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 2-6 and table 2-7 provides estimated releases of DEHP from formulation and processing (pdf page 30)			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3:	Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by reporting emission factors for different processes but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 1-6 provides tonnage of DEHP released from manufacturing in the EU in 2007.			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3:	Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by reporting on multiple facilities but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Distribution			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).	
	Metric 3: Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Commercial Use			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3:	Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by reporting on multiple facilities but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Release quantity:	provides Releases of DEHP from main waste operations (pdf page 45)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3:	Applicability	High	The assessment is for multiple occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by reporting different waste operations but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di-"isodecyl"phthalate (DIDP).		
HERO ID:	1588746		
Conditions of Use:	Incineration		
EXTRACTION			
Parameter	Data		
Release quantity:	An estimation of the releases of DEHP from incinerators has been performed in the corresponding risk assessment (EC, 2001), based on measurements in smoke, ash and wastewater at one incineration station in Denmark (Miljøstyrelsen, 1996). It was found that 9% of the emissions are directed to the atmosphere, while 91% remain in the slags and the fly ash, which are landfilled. The total releases to the atmosphere for DEHP are estimated to be 5.7 t/a.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECJRC, (2008). European Union risk assessment report: Bis(2-ethylhexyl)phthalate (DEHP).
HERO ID:	1614673
Conditions of Use:	Production, processing, industrial uses

EXTRACTION

Parameter	Data
Description of release source:	Releases come from production, calendaring, extrusion of compound and products, spread coating, other plastisols & car undercoating, injection molding/extrusion, various plastisol applications, formulation/processing of non-polymers for sealants-formulation, sealants-processing, lacquers and paint - formulation and processing, printing ink - formulation and processing, ceramic - formulation and processing, waste through paper recycling, car shredding incineration of waste, disposal of waste on dump sites.
Release quantity:	Total emissions to air from production of DEHP are 2.0, 682 and 7.4 tons/yr. Total from transportation is 50 tons/yr. Total from all polymer formulations/processing sites: 188 to air, 188 to waste water for total of 375 tons/yr. Table 3.5 provides specific releases. Total release from adhesives is 140, for paints and lacquers is 18, for printing ink it is 20.7, and for ceramics it is 0.66 tons/yr. Total emissions from end-products uses and small-scale industrial uses: to air - 299, to waste water - 1686, to surface water - 799, to soil - 801, total - 3585 tons/yr. Total amount of DEHP waste as emission from end-product use - to air: 9.1; to surface water - 2413; to soil: 7,240 tons/yr. Table 3.37 provides summary of the distribution in tons of DEHP emissions to different environmental compartment during the total life cycle. Table 3.38 provides the same information but in percentages.
Release or emission factors:	Release or emission factors
Release frequency:	Most production sites produce 365 days/yr, one produces 170, another 300, and another 351 with an average of 340 days/yr for 2006.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Data is for EU risk assessment of DEHP.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	Medium	Data is for EU, all OECD countries.
	Metric 3: Applicability	High	Data is directly applicable to manufacturing, processing, industrial and commercial use of chemical.
	Metric 4: Temporal Representativeness	Medium	Release data is from 2006, greater than 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	Documents sources, assessment methods, results and assumptions.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	High	Addresses variability by stating releases from multiple different life cycle stages. Addresses uncertainty in its ability to accurately report all release data since not every organization is required to report depending on PV use and lack of ability to track end-product releases.

Overall Quality Determination**High**

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
HERO ID:	679933			
Conditions of Use:	Production of PVC products			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
HERO ID:	679933			
Conditions of Use:	Disposal of end products			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).
HERO ID:	679933
Conditions of Use:	Wastewater treatment

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control: Comments:	Waste treatment methods and pollution control In monitoring studies on different municipal STPs in Sweden, Denmark, Norway, and Germany, measured concentrations in untreated wastewater (influent) varied between 4-250 $\mu\text{g/l}$. The variation may depend on different contributions from household and industrial wastewater, different methods of analysis and possibly many other factors. In the treated wastewater (effluent) the DEHP concentrations varies between 0.07 and 28 $\mu\text{g/l}$. There are very few data on concentrations of DEHP in purely industrial wastewater. There is one example of very high DEHP concentrations (1,800 $\mu\text{g/l}$) in a tube that connects wastewater from an industrial area to the main inlet tube to a Swedish municipal STP. In effluent wastewater from industries and industrial areas, measured concentrations varied between 0.08 and 65 $\mu\text{g/l}$.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High
			The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium
	Metric 3:	Applicability	High
	Metric 4:	Temporal Representativeness	Medium
	Metric 5:	Sample Size	Medium
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High
			Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High
			The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

Overall Quality Determination**High**

Study Citation:	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:	7265437		
Conditions of Use:	Manufacture, industrial use, disposal		
EXTRACTION			
Parameter	Data		
Description of release source: An estimation of the contribution to the total emissions of DEHP from different life-cycle stages is given in the RAR for DEHP: 2.5% from manufacturing, 2.5% from industrial uses, 32% from end product uses, and 63% from waste handling			
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	NTP, (2000). NTP-CERHR expert panel report on di(2-ethylhexyl) phthalate. GRA and I(GRA and I):120.			
HERO ID:	679847			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity: TRI releases to air, water, underground injection, land, and total for 1987, 1992, and 1997 are presented in Table 2				
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.
HERO ID:	3808976
Conditions of Use:	Use-Automotive Coating Application

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, equipment cleaning, coating application (overspray). Releases to air and land.
Release or emission factors:	nan
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High
			Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High
	Metric 3:	Applicability	Medium
	Metric 4:	Temporal Representativeness	Low
	Metric 5:	Sample Size	Medium
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High
			All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium
			Uncertainty not addressed. Variability addressed by considering multiple coating types.

Overall Quality Determination**Medium**

Study Citation: OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).
HERO ID: 3827298
Conditions of Use: Processing and Use-Formulation of Coatings and Use of Coatings

EXTRACTION

Parameter	Data
Description of release source:	PROC: material loading, heat-up, surface evaporation, filling, micellaneous operations, material storage, leaks, spills USE: Application losses, equipment residues, drum residues. Releases to water, air, land.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	ased elsewhere.

EVALUATION

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

Overall Quality Determination**Medium**

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

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, dusts and volatiles from unloading containers, vented losses during mixing, sampling, equipment cleaning, volatiles from loading containers, off-spec products. Releases to water, air, and land.
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release or emission factors
Release frequency:	days/yr equal to number of bt/yr
Waste treatment methods and pollution control:	nan

EVALUATION

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

Overall Quality Determination**High**

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

EXTRACTION

Parameter	Data
Description of release source:	container cleaning, unloading, equipment cleaning, application losses, curing/drying, trimming. Releases to water, air, and land.
Release or emission factors:	nan
Release frequency:	50-365 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation: OECD, (2017). Emission scenario document (ESD) on the use of textile dyes.
HERO ID: 3828838
Conditions of Use: Textile Dyes

EXTRACTION

Parameter	Data
Description of release source:	unloading, container cleaning, disposal of spent dye bath, equipment cleaning.
Release or emission factors:	nan
Release frequency:	31-295 days/yr
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment from 2015 but is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical functions.

Overall Quality Determination**Medium**

Study Citation: OECD, (2015). Emission scenario document on use of adhesives.
HERO ID: 3833136
Conditions of Use: Adhesive Application

EXTRACTION

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

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.
HERO ID:	3840003
Conditions of Use:	Processing-Formulation of Coatings, inks, and adhesives

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, dusts and volatiles from unloading containers, vented losses during mixing, sampling, equipment cleaning, volatiles from loading containers, filter wastes. Releases to water, air, and land.
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release or emission factors
Release frequency:	250
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**Medium**

Study Citation:	OECD, (2004). Emission scenario document on additives in rubber industry.			
HERO ID:	4445826			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	Formulation and processing wastes to wastewater; formulation and processing wastes to air and soil, use of rubber products			
Release quantity:	Total WW flow rates (m3/day): 10-1,154, mean = 184, 90th percentile = 438			
Release or emission factors:	nan			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment from 2004 and is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios/additive types but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario document on plastic additives.			
HERO ID:	5079084			
Conditions of Use:	Processing - Plastic additives			
EXTRACTION				
Parameter	Data			
Description of release source:	Raw material handling, compounding, converting, service life, disposal. Releases to air and water.			
Release or emission factors:	nan			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios/additive types but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2011). Emission scenario document on the chemical industry.			
HERO ID:	6306753			
Conditions of Use:	Manufacture, processing, use			
EXTRACTION				
Parameter	Data			
Description of release source:	Stack Air: Reactor vents, distillation column vents, absorber units, strippers, sumps/decanter, dryers, cooling vents Fugitive Air: Valves, pump seals, compressor seals, pressure-relief valves, flanges/connections, open-ended lines, sampling connections Water: Drum cleaning, equipment cleaning, aqueous distillation streams, extraction, reaction water, absorption, solids-liquids separation, adsorption, condensation. Releases to air and water.			
Release or emission factors:	nan			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation: OECD, (2012). Emission scenario document on chemicals used in oil well production.
HERO ID: 6387322
Conditions of Use: Hydraulic Fracturing

EXTRACTION

Parameter	Data
Description of release source:	container cleaning, equipment and storage vessel cleaning, additive in oil/water from separation processes.
Release or emission factors:	nan
Release frequency:	350 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**Medium**

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

EXTRACTION

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

EVALUATION

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

Overall Quality Determination**Medium**

Study Citation:	OECD, (2004). Emission scenario document on textile finishing industry.			
HERO ID:	6558533			
Conditions of Use:	Manufacture of Textiles, Apparel, and Leather			
EXTRACTION				
Parameter	Data			
Description of release source:	pre-treatment, residual padding liquors, residual printing pasts, and residual coating pasts, cleaning of the machines, singeing, heat setting, drying, printing, chemical finishing, mechanical finishing, coating, laminating.			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple finishing agent types.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2011). Emission Scenario Document on the application of radiation curable coatings, inks, and adhesives via spray, vacuum, roll, and curtain coating.
HERO ID:	6568745
Conditions of Use:	Coating, Ink, and Adhesive Application

EXTRACTION

Parameter	Data
Description of release source:	unloading, sampling, container residue, application losses, equipment cleaning.
Release or emission factors:	nan
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	nan

EVALUATION

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

Overall Quality Determination**Medium**

Study Citation:	OECD, (2011). Resource compendium of PRTR release estimation techniques, part 4: Summary of techniques for releases from products, version 1.0.			
HERO ID:	7348917			
Conditions of Use:	End Uses			
EXTRACTION				
Parameter	Data			
Description of release source:	Building and construction products, Electrical and electronic products, Furniture, Nanoproducts, Packages and plastic bags, personal care and cleaning products, Textile and leather products, Toys and 3-cost jewelry (page 17/109). Releases typically occur during the first use of a product, when carrying out maintenance of the product, and due to wearing, exposure to heat or light or other ageing of the product (page 63/109).			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	OECD paper provides general methods and equations used to calculate emissions, but details aren't provided.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are provided by the OECD.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Paper was published in 2011, but most emission factor data is from 2003-2004, which is greater than 10 years old.
	Metric 5:	Sample Size	Low	Emission factor data is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include release source and emission factors. Formulas for release quantity are provided. Data lacks release frequency and waste treatment methods.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2021). Use of additives in plastic compounding – Generic scenario for estimating occupational exposures and environmental releases (Revised draft).
HERO ID:	10366192
Conditions of Use:	Plastics Compounding

EXTRACTION

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	Release or emission factors
Release frequency:	148-264
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2022). Emission scenario document on chemicals used in hydraulic fracturing (draft).
HERO ID:	10366193
Conditions of Use:	Hydraulic Fracturing Fluids

EXTRACTION

Parameter	Data
Description of release source:	container unloading, equipment cleaning, container cleaning, deep well injection, flowback and produced wastewater
Release or emission factors:	Release or emission factors
Release frequency:	14 days/yr for injection;350 days/yr for release for flowback and produced water
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2022). Commercial use of automotive detailing products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).			
HERO ID:	10480464			
Conditions of Use:	Automotive detailing products			
EXTRACTION				
Parameter	Data			
Description of release source:	container unloading, container cleaning, application and use of automotive detailing products.			
Release or emission factors:	nan			
Release frequency:	260 day/yr			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
HERO ID:	10480466			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Description of release source:	Container unloading, container cleaning, labware equipment cleaning, during laboratory analyses, waste disposal.			
Release or emission factors:	Release or emission factors			
Release frequency:	260 day/yr.			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11182966			
Conditions of Use:	Repackaging			
EXTRACTION				
Parameter	Data			
Description of release source:	Transfer losses, container cleaning, equipment cleaning, transfer losses during loading.			
Release quantity:	Provides methodology to estimate releases based on various parameters including: opening area of cleaning equipment, physical-chemical properties, air velocity, etc.			
Release or emission factors:	Release or emission factors			
Release frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr.			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering emissions from multiple activities.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	11373493
Conditions of Use:	Plastics Converting

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, spillage, dusts and fugitive emissions from converting, equipment cleaning, trimming wastes
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release or emission factors
Release frequency:	137-254 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.
HERO ID:	3827195
Conditions of Use:	Processing: Plastic material and resin manufacturing (compounding)

EXTRACTION

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning, loading
Release quantity:	Provides models for estimating various releases.
Release or emission factors:	Release or emission factors
Release frequency:	148-264 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2014). Formulation of waterborne coatings - Generic scenario for estimating occupational exposures and environmental releases -Draft.
HERO ID:	3827197
Conditions of Use:	Formulation of Coatings

EXTRACTION

Parameter	Data
Description of release source:	Unloading containers, container cleaning, dispersion and blending operations, sampling, equipment cleaning, filter wastes, loading, off-spec coating.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	nan
Release frequency:	235-350
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.
HERO ID:	6311218
Conditions of Use:	Incorporation into article Plastic material and resin manufacturing; Incorporation into formulation, mixture, or reaction product Plasticizer in plastics material and resin manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning (Page 10 of 18, and page 12-14 for more in-depth descriptions).
Release quantity:	Provides models for estimating various fugitive air releases (page 12-14 of 18)
Release or emission factors:	Release or emission factors
Release frequency:	250 (page 11 of 18)
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	6311221
Conditions of Use:	Formulation and Use of Dyes and pigments (printing Inks)

EXTRACTION

Parameter	Data
Description of release source:	PROC: Packaging disposal, material transfer, ink processing, equipment cleaning (page 33 to 36 of 54)USE: disposal/cleaning of ink container, cleaning printing equipment, ink drying (page 40-45 of 54)
Release or emission factors:	Release or emission factors
Release frequency:	PROC: 250 days/yrUSE: 250 days/yr(page 5 of 54)
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385709
Conditions of Use:	Flexographic Printing

EXTRACTION

Parameter	Data
Description of release source:	Equipment cleaning, fugitive air, stack air.
Release or emission factors:	Release or emission factors
Release frequency:	300 days/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385710
Conditions of Use:	Formulation and use of dyes and pigments (printing inks)

EXTRACTION

Parameter	Data
Description of release source:	PROC: Packaging disposal, material transfer, ink processing, equipment cleaning. VOC and particulate emissions are expected from the unloading of raw materials into the dispersion tank. Additional VOC emissions are expected as a result of heat-up losses and surface evaporation during the dispersion and milling operations as well as during the loading of the final ink product into receiving containers. Additional environmental releases are expected from waste streams associated with container and equipment cleaning. (page 8-9 of 23)USE: disposal/cleaning of ink container, cleaning printing equipment, ink drying. A large portion of the releases from the printing industry are associated with VOC emissions. These come from the volatile components in the printing inks as well as from various solvents that are used for equipment cleaning. Air emissions are likely to result from unloading inks into the ink reservoirs on the printing press, the generation of ink mist during high speed printing operations, and fugitive emissions from various source points in the printing process(e.g. ink reservoirs, drying ovens). Additional environmental releases of chemicals contained in printing inks can result from residual ink wastes from container cleaning, and disposal of rags and solvents used to wipe down and clean printing equipment. (page 13 and 15 of 23)
Release quantity:	PROC: See Table 2-4 on page 9 for 2007 TRI data. Air releases = 190,832 lb/yr, Surface water releases = 29 lb/yr, POTW/Wastewater releases = 823 lb/yr, Land releases = 5,561 lb/yr, Other disposal = 51,303 lb/yr.USE: See Table 2-5 on page 14 for 2007 TRI data based on the type of printing. Depending on the type of printing, Air releases = 14,150 to 5,865,923 lb/yr, Surface water releases = 0 to 275 lb/yr, Wastewater releases = 0 to 3,200 lb/yr, Land releases = 11 to 18,619 lb/yr, Other disposal = 1,767 to 210,010 lb/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.
HERO ID:	6385711
Conditions of Use:	Plastics Converting

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, spillage, dusts and fugitive emissions from converting, equipment cleaning, trimming wastes (page 25 and 41 of 96). See page 25-27 for more detailed descriptions of possible releases within the context of the process.
Release quantity:	Provides models for estimating various fugitive air releases. See Table 4-1 on page 42 for a list of these models.
Release or emission factors:	Release or emission factors
Release frequency:	137-254 days/yr (page 61 of 96)
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385719
Conditions of Use:	Furniture Coating Application

EXTRACTION

Parameter	Data
Description of release source:	container cleaning, equipment cleaning, coating application (overspray), volatile air emissions
Release or emission factors:	nan
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and wood vs metal furniture uses

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385748
Conditions of Use:	Processing-Plastics Compounding

EXTRACTION

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning. Releases to water, air, and land.
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	nan
Release frequency:	148-264
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

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

Overall Quality Determination**High**

Study Citation:	APR, (2020). U.S. post-consumer plastic recycling data.			
HERO ID:	11360400			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Release quantity:	4,803.8 million pounds of post-consumer plastic material sourced in the U.S. is recycled, which accounts for 57.1% of all bottles, 20.5% of all films, 22% non-bottle rigids, and 0.3% of all other plastics used.			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for recycling, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A- extracted data is totals.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by describing the different plastic products that are recycled, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	APR, (2023). Model Bale Specifications: 1-7 ALL Rigid Plastics.			
HERO ID:	11374516			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:		Waste treatment methods and pollution control		
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from the U.S.
	Metric 3:	Applicability	High	Data is for recycling, which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are less than 10 years old (2023).
	Metric 5:	Sample Size	N/A	N/A - Waste treatment methods.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Waste treatment methods.
Overall Quality Determination			High	

Study Citation:	Arthur D. Little Inc, (1989). Migration of di(2-ethylhexyl) phthalate from polyvinyl chloride to non-penetrating external phases.			
HERO ID:	11328009			
Conditions of Use:	Plastics products			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for plastic products, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by testing migration at different initial concentrations and temperatures but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Canada,, G.o. (2020). Phthalate substance grouping – Information sheet.			
HERO ID:	7349060			
Conditions of Use:	Can apply to multiple COUs			
EXTRACTION				
Parameter	Data			
Description of release source:		In Canada, these substances have the potential to be released to the environment, primarily to air and water. Releases may occur during their manufacturing and processing, including transportation and storage, and during the production, use and disposal of products containing them (for example, "down the drain" releases into wastewater systems from use in cosmetics). (p. 4).		
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Report is from Canada.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	Data is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Canada,, G.o. (2019). Page 5 - Fifth report on human biomonitoring of environmental chemicals in Canada.			
HERO ID:	9641570			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Description of release source:	PDF Pg. 5”Releases to the environment are associated with anthropogenic activities (Environment and Climate Change Canada and Health Canada, 2017). Releases may occur during the manufacture and processing of phthalates, including transportation and storage, as well as during the production, use, and disposal of products that contain phthalates (Environment and Climate Change Canada and Health Canada, 2017). Although release into air may occur, water is expected to be the primary receiving medium for phthalates, and occurs through wastewater effluents from industrial sources and disperse releases from consumer products (Environment and Climate Change Canada and Health Canada, 2017; Environment Canada and Health Canada 2015d).”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.	
	Metric 3: Applicability	High	Data are for many in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - Description of release source.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - Description of release source.	
Overall Quality Determination		High		

Study Citation:	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.			
HERO ID:	10442901			
Conditions of Use:	Industrial application of coatings by spraying			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
Release frequency:	Continuous release: 225 d/y. Typical industry situation (5 working days a week, shut down for vacation, no need for continuous shift).			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Emission factors and release frequency come from emission scenario documents (ESDs) and expert information.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, DEHP is not mentioned.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples used to determine emission factors and release frequency are not provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.			
HERO ID:	10442902			
Conditions of Use:	Application of coatings and inks by spraying			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
Release frequency:	Indoor - CEPE SPERC 8a.3a.v2, CEPE SPERC 8c.3a.v2, 365 d/yOutdoor - CEPE SPERC 8d.3a.v2, CEPE SPERC 8f.3a.v2, 225 d/y			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Emission factors and release frequency come from emission scenario documents (ESDs) and expert information.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, DEHP is not mentioned.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples used to determine emission factors and release frequency are not provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	DOE,, WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.		
HERO ID:	10454465		
Conditions of Use:	Vinyl flooring		
EXTRACTION			
Parameter	Data		
Description of release source:	Phthalates found in vinyl flooring can be released from the product into air and dust. They can also be released into our wastewater when we launder dusty items. Phthalates (BBP and DEHP) have been found in both WWTP influent and effluent. Phthalates are also an emerging and major source of leachate contaminant from landfills. There is widespread evidence from worldwide landfill studies that phthalates are leaching, and can become ubiquitous contaminants in the surrounding environment. Disposal of household materials such as flooring is a primary source of phthalates that can contaminate various environmental media.		
Release quantity:	In 2011, Ecology’s Puget Sound Toxics Loading Study estimated the environmental release of phthalates to the Puget Sound area from various sources, including vinyl flooring. Twenty percent of phthalates, seven tons per year, are attributable to PVC products. Of the PVC products, vinyl flooring is estimated to contribute 1.4% of phthalates or 0.1 metric tons of phthalates released into Puget Sound each year. Expanding this 0.1 metric tons estimate from the Puget Sound region only to the entire population in Washington, we expect that 0.17 metric tons (374 pounds) of phthalates are released to the environment from vinyl flooring.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Release data are estimated from Ecology’s Puget Sound Toxics Loading Study which does not indicate flaws or quality issues, but underlying methodology is not fully transparent.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, release estimates are not for DEHP specifically.
	Metric 4: Temporal Representativeness	Medium	Release estimates are based on data that is more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	No sample statistics provided for release estimation.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty of releases.
Overall Quality Determination		Medium	

Study Citation:	Dold, P. L. (1989). Current practice for treatment of petroleum refinery wastewater and toxics removal. Water Pollution Research Journal of Canada 24(3):363-390.			
HERO ID:	1924634			
Conditions of Use:	Disposal - wastewater treatment			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
Comments:	DEHP is mentioned once in the article of having a detection frequency above 50% in refinery treatment systems.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report is not from frequently used sources, but uses high quality data that does not indicate flaws or issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Canada, an OECD country.
	Metric 3:	Applicability	Medium	Data is for disposal of wastewater effluent associated with Petroleum Refinery. Does not specifically mention efficiency of removal of DEHP but does mention its presence in the wastewater.
	Metric 4:	Temporal Representativeness	Low	Greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Documents results and methods. Does not provide all potential releases from waste treatment but provides general process descriptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by evaluating various waste treatment methods. Addresses uncertainty in studies about other treatment methods due to their lack of real world testing.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.
HERO ID:	7325405
Conditions of Use:	Manufacturing/Uses

EXTRACTION	
Parameter	Data
Description of release source:	Environmental release of phthalates occurs from phthalate manufacturing plants (DEHP and DBP only), from downstream use of phthalates (DEHP and DBP only) and from the article service life (including the waste stage).

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	N/A	Description of a release source
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Description of a release source

Overall Quality Determination	High
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Study Citation:	ESIG, (2020). SPERC Factsheet – Use in rubber production and processing.
HERO ID:	11360390
Conditions of Use:	Rubber Manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Cleaning operations and maintenance operations.
Release or emission factors:	Release or emission factors
Release frequency:	300 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Europe.
	Metric 3: Applicability	High	Data are for rubber manufacturing, an in-scope, occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by emission factors for compounds of different solubilities but uncertainty is not addressed.

Overall Quality Determination**High**

Study Citation:	Fujii, M., Shinohara, N., Lim, A., Otake, T., Kumagai, K., Yanagisawa, Y. (2003). A study on emission of phthalate esters from plastic materials using a passive flux sampler. Atmospheric Environment 37(39-40):5495-5504.			
HERO ID:	1322091			
Conditions of Use:	Consumer Use-Plasticizer - various uses			
EXTRACTION				
Parameter	Data			
Description of release source:	Plastic products produced with phthalates			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 yearsbut no more than 20 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media provided but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation: Gardiner, N. (2008). Disposable decisions. Cleanroom Technology 15(2):27-28.	
HERO ID: 7978842	
Conditions of Use: Disposal	
EXTRACTION	
Parameter	Data
Waste treatment methods and pollution control: nan	
EVALUATION	
Domain	Metric
Domain 1: Reliability	
Metric 1:	Methodology
	Medium
	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	
Metric 2:	Geographic Scope
Metric 3:	Applicability
Metric 4:	Temporal Representativeness
Metric 5:	Sample Size
	Medium
	High
	Medium
	N/A
	The data are from a non-OECD country.
	The report is for an occupational scenario within the scope of the risk evaluation.
	The report is generally more than 10 years but no more than 20 years old.
	No sample data.
Domain 3: Accessibility/ Clarity	
Metric 6:	Metadata Completeness
	High
	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	
Metric 7:	Metadata Completeness
	N/A
	No scope to address variability and uncertainty.
Overall Quality Determination	
High	

Study Citation:	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
HERO ID:	8338316			
Conditions of Use:	Processing and Use			
EXTRACTION				
Parameter	Data			
Description of release source:		Indeed, they have no chemical linkage with the polymer system and can be lost over time and released into the surrounding environment during production, transport, storage, manufacture, and use and disposal of plastic polymers.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Primary authors are from Italy - OECD country.
	Metric 3:	Applicability	Medium	Information applies to multiple in-scope conditions of use but is not specific to DEHP.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	Giulivo, M., Alda, L.d., M., Capri, E., Barceló, D. (2016). Human exposure to endocrine disrupting compounds: Their role in reproductive systems, metabolic syndrome and breast cancer. A review. Environmental Research 151:251-264.			
HERO ID:	3469349			
Conditions of Use:	Disposal - Wastewater			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	nan			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	Hahladakis, J. N., Velis, C. A., Weber, R., Iacovidou, E., Purnell, P. (2018). An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling. Journal of Hazardous Materials 344:179-199.			
HERO ID:	4168432			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Description of release source:	A group studied a number of selected phthalates in samples of virgin, waste and recycled plastics, and concluded that DBP, DiBP and DEHP had the highest frequency of detection in the samples analysed, and the maximum concentration measured for DEHP was 2700 ug/g.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Kumar, H., Kumagai, S., Kameda, T., Saito, Y., Yoshioka, T. (2021). One-pot wet ball-milling for waste wire-harness recycling. Journal of Material Cycles and Waste Management 23(2):461-469.
HERO ID:	7978491
Conditions of Use:	Recycling

EXTRACTION**Parameter****Data**

Description of release source:	PVC is present in solid waste electrical and electronic equipment (WEEE) from wire cables. (1/9)
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3: Applicability	High	Data are for recycling of DEHP, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by testing different solvents and rotation speeds for the recycling method. Uncertainty isn't addressed.

Overall Quality Determination**High**

Study Citation:	Liang, Y., Caillot, O., Zhang, J., Zhu, J., Xu, Y. (2015). Large-scale chamber investigation and simulation of phthalate emissions from vinyl flooring. Building and Environment 89:141-149.			
HERO ID:	3072211			
Conditions of Use:	Use of building material containing DEHP			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The data in this report is from a chamber study and may be similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	Liang, Y., Xu, Y. (2014). Emission of phthalates and phthalate alternatives from vinyl flooring and crib mattress covers: The influence of temperature. Environmental Science & Technology 48(24):14228-14237.			
HERO ID:	3015875			
Conditions of Use:	Vinyl flooring			
EXTRACTION				
Parameter	Data			
Description of release source:	Emissions directly from vinyl flooring to air.			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and techniques that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by sampling phthalate concentrations in gas phase at various temperatures, but measurement uncertainty is not characterized.
Overall Quality Determination			High	

Study Citation:	Manoukian, A., Buiron, D., Temime-Roussel, B., Wortham, H., Quivet, E. (2016). Measurements of VOC/SVOC emission factors from burning incenses in an environmental test chamber: influence of temperature, relative humidity, and air exchange rate. Environmental Science and Pollution Research 23(7):6300-6311.			
HERO ID:	3161045			
Conditions of Use:	Incense burning (likely consumer use)			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from France or Germany, both OECD countries.
	Metric 3:	Applicability	Uninformative	Model is for emission factor of burning incense, which is not an industrial or commercial use.
	Metric 4:	Temporal Representativeness	High	Data less than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		Uninformative		

Study Citation:	Markiewicz, A., Strömvall, A. M., Björklund, K., Eriksson, E. (2019). Generation of nano- and micro-sized organic pollutant emulsions in simulated road runoff. Environment International 133 Pt. A:105140.			
HERO ID:	6966484			
Conditions of Use:	Stormwater runoff from consumer use of articles (tires, building materials, etc.)			
EXTRACTION				
Parameter	Data			
Description of release source:	Particles arising from processes such as erosion, wear and tear of tires, road surfaces and building materials are of major concern as these particles may contain substances subject to leaching, for example phthalates from PVC. // In simulated stormwater runoff from roads: The lowest concentrations of micro-sized particles were found in the samples not identified as potential emulsion, particularly sample 8 with phthalates. In the high phthalate concentration samples, the particle size occurred in a narrower monomodal distribution after mixing than in the stabilized sample, and a larger number of particles appeared in the 120–140 nm size range (Fig. 1b). For the low phthalate concentration samples, only data from the mixed sample are available, but it can be seen that the PSD is similar to the high concentration and stabilized sample. The PSD of the samples with APs and APEOs, and the sample with high concentration phthalates showed a tendency to contain more nano-sized particles after mixing (Fig. 1).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Uninformative	The report is from an occupational or non-occupational scenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Uninformative		

Study Citation:	Noguchi, M., Yamasaki, A. (2016). Passive flux sampler measurements of emission rates of phthalates from poly(vinyl chloride) sheets. Building and Environment 100:197-202.				
HERO ID:	3983119				
Conditions of Use:	Industrial and Commercial Use of PVC				
EXTRACTION					
Parameter	Data				
Release or emission factors:	Release or emission factors				
EVALUATION					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment uses high quality data and sound methods that are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3:	Applicability	High	Inhalation exposure during work with PVC is in-scope of the risk evaluation. Also, DEHP concentrations in PVC materials will inform dermal exposure assessment.	
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by analysis of various PVC sheet materials, but measurement uncertainty is not characterized.	
Overall Quality Determination			High		

Study Citation:	NYSDEC, (2011). Revised draft. Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program: Well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs.			
HERO ID:	1777818			
Conditions of Use:	Use in hydraulic fracturing			
EXTRACTION				
Parameter	Data			
Description of release source:	PDF Pg. 523”Spills or releases can occur as a result of tank ruptures, piping failures, equipment or surface impoundment failures, overfills, vandalism, accidents (including vehicle collisions), ground fires,drilling and production equipment defects, or improper operations.”			
Comments:	No area sampling for DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for use in hydraulic fracturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	N/A - description of release source.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - description of release source.	
Overall Quality Determination		High		

Study Citation:	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.
HERO ID:	10472417
Conditions of Use:	Disposal of vinyl flooring

EXTRACTION

Parameter	Data
Description of release source:	Releases from disposal of vinyl flooring (landfills). Lifespan of vinyl flooring is 30 - 50 years.
Release or emission factors:	nan
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The data reported references an RFCI product declaration report which is not a frequently used source, but does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, DEHP is not mentioned specifically.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is described through the various types of materials used for vinyl flooring. However, uncertainty related to the quantity released to landfills annually is not characterized.

Overall Quality Determination**Medium**

Study Citation:	Saeed, T., Al-Jandal, N., Abusam, A., Taqi, H., Al-Khabbaz, A., Zafar, J. (2017). Sources and levels of endocrine disrupting compounds (EDCs) in Kuwait's coastal areas. Marine Pollution Bulletin 118(1-2):407-412.
HERO ID:	3859095
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Three sewage treatment plants in Kuwait
Release quantity:	Phthalate levels in the inflow of the treatment plants ranged from 8.9 to 78.3 ug/L. The seawater from the sewage impacted area also contained detectable levels of phthalates in sediment ranging from 2145 to 15,722 ug/kg. Concentrations of DEHP (in ng/l) in the seawater from Kuwait coastal areas: Fintas – 2916.8, Fahaheel – 1561.2, Shuwaikh port – 680.1, Ghazali – 1634.8, and Sulaibekhat – 2571.6. Concentrations of DEHP (in ug/kg dry wt) in the sediment samples from Kuwait coastal areas: Fintas – 808.2, Fahaheel – 840.5, Shuwaikh port – 1121.5, Ghazali – 11,236.4, and Sulaibekhat – 1109.1.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation: Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.
HERO ID: 6311222
Conditions of Use: Industrial/Commercial Use: Paints and coatings

EXTRACTION

Parameter	Data
Description of release source:	Auto OEM: blowdown, sludge processing, generated sludge, stack air releasesAuto refinish: air filter waste from overspray, stack air
Release or emission factors:	Release or emission factors
Release frequency:	Auto OEM: sludge pit cleaning: 1 day/yr All other releases: 250 days/yrAuto refinish: 170 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering OEM and refinish applications.

Overall Quality Determination**Medium**

Study Citation:	Whittaker, K. F., Moore, A. T. (1984). Pilot scale investigations in the removal of volatile organics and phthalates from electronics manufacturing wastewater. :579-589.			
HERO ID:	5740947			
Conditions of Use:	Waste treatment of electronic materials manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	A 500-gallon stainless steel tank with suitable piping and valving used to allow easy solids drainage was used for influent storage. Air stripping unit, constructed from a ten-gallon stainless steel liquid storage can, was equipped with Teflon influent and effluent lines and an air stone diffuser. Air flow measured by an in-line rotameter, was supplied from an oil free compressor at a 20:1 air-to-water flow ratio. Carbon adsorption module consisted of four, 4-inch inside diameter, 60 inch long columns of beaded kimax glass. End caps were attached via specialized stainless steel bolt type couplings with Teflon pressures seals and Viton ”o-rings”. Each column was outfitted with Teflon screens and glass beads for media support and flow distribution. Schematic drawings of the pilot plant used during the continuous flow studies is given in figure 1. Photographs of the components are in figure 2. 1st column filled with approximately 4 feet of the sand designated for use in the proposed full-scale sand filter. The remaining columns were filled with four feet (9.9 lbs) of Nuchar WV-G activated carbon. All columns were operated in a series down-flow mode at 670 mL/min (2 gal/min/sq ft). Sand filter and carbon columns were backwashed on an as-needed basis when head losses through the unit approached 15 psi. Series of wastewater batches, spiked and flocculated, was used to provide semi-continuous flow to the pilot plant for a six week period. The volume of treated material from each batch varies depending on operating schedules and availability of untreated facility wastewater. Volumetric data in Table III.			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Source not clear if it is peer reviewed but appears to have high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Data is for waste treatment methods from electronic manufacturing industry which can be contained at the manufacturing site.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range of data points.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides process of waste treatment, the methods, and % reductions in waste.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling different days resulting in different measures of effluent reduction. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Ügdüler, S., Geem, Van, K. M., Roosen, M., Delbeke, P., E.I., Meester, De, S. (2020). Challenges and opportunities of solvent-based additive extraction methods for plastic recycling. Waste Management 104:148-182.			
HERO ID:	7976469			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Belgium, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal methods of DEHP, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination		High		

Study Citation:	Wormuth, M., Scheringer, M., Vollenweider, M., Hungerbühler, K. (2006). What are the sources of exposure to eight frequently used phthalic acid esters in Europeans?. Risk Analysis 26(3):803-824.
HERO ID:	680214
Conditions of Use:	Consumer use

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Several million tons of phthalates are used per year worldwide in the production of soft polyvinyl chloride (PVC) and other plastics that are contained in many consumer products. // Table 7 has use rates of personal care products (amount applied per use): 500-3,000 mg/use for deodorant; 650-750 mg/use for perfume; 1,200 mg/use for aftershave; 3,700-10,000 mg/use for hair styling; 8,000-16,400 mg/use for shampoo; 3,000-7,000 mg/use for skin care; 280-3,060 mg/use for nail care; 490 mg/use for makeup; 500-1,400 mg/use for baby products.
Chemical concentration:	Table 5 has min/mean/max concentrations in consumer products: 338,333 mg/kg in gloves; 10,000 mg/kg (mean) in paints; 44,000 mg/kg (mean) in adhesives; 8.6 mg/kg (mean) in deodorant; 15 mg/kg (mean) in perfumes; 0 mg/kg (mean) in aftershaves; 17 mg/kg (mean) in hair styling products; 0 mg/kg (mean) in shampoo; 0 mg/kg (mean) in skin care products; 0 mg/kg (mean) in nail care; 0 mg/mk (mean) in makeup; 0 mg/kg (mean) in baby product

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are appropriate for the model's application (note: peer review may address appropriate application).
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The model can be appropriately applied to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The model is based on data that are generally more than 10 years but no more than 20 years old. However, the model is based on operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided.
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	The model characterizes variability and uncertainty in the results.

Overall Quality Determination

High

Study Citation:	ATSDR, (2019). Toxicological profile for di(2-ethylhexyl)phthalate (DEHP): draft for public comment.
HERO ID:	5926020
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	The production volume of DEHP in the United States was 120,000 metric tons (265 million pounds) in 2002. Production and/or use in the United States in 2006 was reported as 45,000–230,000 tons (90–460 million pounds). Worldwide production was estimated to be 2 million metric tons (4.4 billion pounds) in 2004. Worldwide production of DEHP is decreasing, mainly related to the regulations being enforced against certain uses of DEHP. Estimated annual imports and exports from the United States in 2006 were reported to be approximately 69 and 13 million pounds, respectively.
Life cycle description:	DEHP is principally used as a plasticizer in the production of flexible PVC products, with about 97% of DEHP produced being used for this purpose. PVC is made flexible by addition of plasticizers and is used in many common items such as wall coverings, tablecloths, floor tiles, furniture upholstery, shower curtains, garden hoses, swimming pool liners, rainwear, baby pants, dolls, toys, shoes, automobile upholstery and tops, packaging film and sheet, sheathing for wire and cable, medical tubing, and blood storage bags. PVC is also used to produce disposable medical examination and surgical gloves, flexible tubing used to administer parenteral solutions, tubing used in hemodialysis treatment, syringes, and blood, dialysis, and storage bags. DEHP is also used as a plasticizer in products such as polyvinyl acetate, polyvinyl butyral, natural and synthetic rubber, chlorinated rubber, ethyl cellulose, nitrocellulose, and polyurethane resins. DEHP plasticizer use in medical devices and industrial/commercial products accounts for 25 and 45% of the overall consumption of DEHP, respectively.
Process description:	DEHP is produced by the esterification of phthalic anhydride with 2-ethylhexyl alcohol in the presence of an acid catalyst. Phthalate plasticizers can be produced using this reaction in batch methods or in highly automated continuous operations. DEHP can also be manufactured by the dimerization of butyraldehyde.
Number of sites:	There are 23 companies producing DEHP in the United States; however, five companies appear to be the primary U.S. producers.
Chemical concentration:	Minimal Risk Levels (MRLs) for DEHP: Inhalation exposure – 0.0002 ppm (intermediate exposure duration), Oral exposure – 0.003 mg/kg/day (acute), 0.0001 mg/kg/day (intermediate).

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the United States
	Metric 3:	Applicability	High	Assessment is for an occupational scenario within scope
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The data is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Assessment does not address variability or uncertainty

Overall Quality Determination

Medium

Continued on next page ...

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Study Citation: ATSDR, (2019). Toxicological profile for di(2-ethylhexyl)phthalate (DEHP): draft for public comment.	
HERO ID: 5926020	
Conditions of Use: Manufacturing	
EVALUATION	
Domain	Metric
Rating	
Comments	

Study Citation:	ATSDR, (2002). Toxicological profile for di(2-ethylhexyl) phthalate.			
HERO ID:	679117			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	DOP PVs: 1998 - 285 MMlbs; 309, 258, 280, 280, and 287 MMlbs for 1990, 94, 95, 96, and 97 respectively. Based on demand for 830 MMlbs of 2-ethyl-hexanol, and its use in the manufacture of plasticizers (48% of 2-ethylhexanol is used in plasticizers, 60% of which are dioctyl phthalates), projected that 241 MMlbs of DOP produced in 1999. Table 5-1 provides facilities that produce, process or use DEHP however it is TRI 1999 data. Import quantities were about 4 MMlbs in 1998.			
Life cycle description:	Section 5 provides broad life cycle description from production, import/export, to use, to disposal. DEHP is principally used as a plasticizer in PVC products with 95% of DEHP produced used as a plasticizer for PVC. It is used in many common items such as wall coverings, tablecloths, floor tiles, furniture upholstery, shower curtains, garden hoses, swimming pool liners, rainwear, baby pants, dolls, toys, shoes, automobile upholstery and tops, packaging film and sheet, sheathing for wire and cable, medical tubing, and blood storage bags.			
Process description:	DEHP is produced by the esterification of phthalic anhydride with 2-ethylhexyl alcohol in the presence of an acid catalyst			
Number of sites:	4 companies operating 5 facilities are primary US producers of DEHP in 1999.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed and uses frequently common sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	High	Data obtained from TRI and highly reputable sources.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, andassumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by showing data from different years and distributed by certain states. Addresses uncertainty by stating how some companies are not required to report TRI data.
Overall Quality Determination		High		

Study Citation:	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.			
HERO ID:	1267867			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Process description:	In the industrial setting, paints can be applied to parts by brush, roller, dip, flow, curtain, tumbling, spray, and powder coating. Spray painting by air atomization is the most common application method encountered in industry and presents the principal hazards. Here, paint is conveyed from a paint reservoir by either siphon pickup created by airflow or a pressurized system. Compressed air atomizes the paint at the nozzle to form droplets or mist, releases the droplet cloud from the gun and conveys it to the workpiece. During powder coating, the fluidized powder is conveyed through a corona discharge where the powder particles pick up a negative charge. They are then directed by the electrostatic field to the grounded workpiece and deposit a uniform coating.			
Throughput:	A 6-in wide brush may use 7 gallons of paint per day. A 9-in roller may use 14 gal/day, and air spray use varies from 10-70 gal/day.			
Chemical concentration:	Powder paints contain 50-60% resin and hardener, 50-40% pigments and fillers, and 1-2% additives.			
Comments:	This reference discusses worker activities during abrasive blasting, degreasing, electroplating, painting, metal machining, welding, chemical processing, and rubber products,			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for the use of paints and coatings, but are a general model, and not for one specific chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, standard deviations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including different paint application techniques. Uncertainty isn't addressed.
Overall Quality Determination		High		

Study Citation:	Canada,, G.o. (2017). Risk Management Scope for 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester [DEHP] Chemical Abstracts Service Registry Number (CAS RN): 117-81-7.		
HERO ID:	6311652		
Conditions of Use:	Manufacturing, Import, Export		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The total quantity of DEHP manufactured in Canada in 2012 was in the range of 1,000 – 10,000 tonnes. The total quantity of DEHP imported into Canada in 2012 was in the range of 100 – 1,000 tonnes, while the total quantity exported from Canada was in the range of 10 – 100 tonnes (Canada 2017). (p. 9).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canadian risk management activities.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Report is from 2017.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Canada,, G.o. (2017). Risk Management Scope for 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester [DEHP] Chemical Abstracts Service Registry Number (CAS RN): 117-81-7.		
HERO ID:	6311652		
Conditions of Use:	Use in plastics		
EXTRACTION			
Parameter	Data		
Chemical concentration:	DEHP is found in a wide variety of flexible plastic products, and can be found in amounts ranging from less than 20% to more than 50% by weight (p. 9). // Health Canada developed the Phthalates Regulations under the Canada Consumer Product Safety Act, to limit the concentration of six phthalates, including DEHP, in the vinyl used in children’s toys or child-care articles to <0.1% by weight. The Food and Drugs Act, require that manufacturers indicate when a medical device imported or sold in Canada contains DEHP at a concentration ≥0.1% by weight. Under the Consumer Product Safety Improvement Act of 2008 (CPSIA), the United States banned DEHP at a concentration of >0.1% by weight in children’s toys and child care articles. (p. 14). The EU Phthalates Directive on phthalates (2005/84/EC) limits the concentration of six phthalates, including DEHP, in childcare articles to ≤0.1% by weight. In June 2015, DEHP was added to the RoHS Directive list and will be restricted from 22 July 2019 for all electrical and electronic equipment with a maximum concentration of 0.1% by weight (p. 15). In 2011, Australia introduced a ban on certain children’s plastic products (e.g., toys, childcare articles, eating vessels and utensils) containing >1% DEHP (p. 16).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canadian risk management activities.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Report is from 2017.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Canada,, G.o. (2017). Risk Management Scope for 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester [DEHP] Chemical Abstracts Service Registry Number (CAS RN): 117-81-7.		
HERO ID:	6311652		
Conditions of Use:	All		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The total quantity of DEHP that was reported to be used in Canada in 2012 was in the range of 1,000 – 10,000 tonnes. (p. 9).		
Life cycle description:	DEHP was reported to be used by a variety of sectors in Canada, including chemical manufacturing, pharmaceutical formulation, medical equipment and supplies manufacturing, paint, coating and adhesive manufacturing, plastic and rubber product manufacturing, computer and equipment manufacturing, and major appliance manufacturing companies, as well as merchant wholesalers, such as professional machinery, equipment and supplies merchant wholesalers and home entertainment equipment merchant wholesalers. A variety of products, mixtures or manufactured items containing DEHP were reported, including: polyvinyl chloride plastic, plastic compounding, surgical drains, tubes, syringes, flooring tile, wire and cable, computer and electronic equipment, major home appliances, paints and coating, and food packaging. (p. 9).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canadian risk management activities.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Report is from 2017.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Chung, B. Y., Choi, S. M., Roh, T. H., Lim, D. S., Ahn, M. Y., Kim, Y. J., Kim, H. S., Lee, B. M. (2019). Risk assessment of phthalates in pharmaceuticals. Journal of Toxicology and Environmental Health, Part A: Current Issues 82(5):351-360.			
HERO ID:	5432993			
Conditions of Use:	Pharmaceutical drugs			
EXTRACTION				
Parameter		Data		
Life cycle description:		Life cycle description of drug creation given in figure 2 with indication of possible phthalate contamination at the encapsulation step.		
Chemical concentration:		DEHP concentration in drugs (ug/kg or ug/L): film coated tablet - (3.55-5.48); extended release coated tablet - 6.0; Hard capsule - (4.92-5.23); Tablet - (3.75-5.23); Suspension - 7.07. Max detected in solid was 6.0 and for liquid it was 7.07.		
Exposure route:		ingestion		
Physical form:		solid, liquid		
Comments:		About concentration in pharmaceuticals and relates to consumer exposure.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	Data is peer reviewed so likely contains high quality data.
Domain 2: Representativeness		Metric 2: Geographic Scope	Medium	Data is for South Korea, an OECD country.
		Metric 3: Applicability	Low	Data is risk assessment of phthalates present in ingestible pharmaceutical drugs, which is not in scope but identifies potential contamination route in overall drug process
		Metric 4: Temporal Representativeness	High	Source is less than 10 years old.
		Metric 5: Sample Size	Medium	Characterized by range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Medium	Documents results and methods, identifies potential contamination route and identifies exposure routes and physical forms and types of medication.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Medium	Addresses variability by looking at different drug delivery methods. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.		
HERO ID:	675060		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Process description:	DEHP is generally produced by dimerization of butyraldehyde, which is synthesized from propylene.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	N/A	Data is qualitative
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.			
HERO ID:	675060			
Conditions of Use:	Use (general use, not differentiated)			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Swedish use volume was ~2,000 tonnes in 2005			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.			
HERO ID:	675060			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Life cycle description:	Sewage treatment facilities			
Number of sites:	16			
Chemical concentration:	36,000-80,000 ug/kg DW in sludge			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	CPSC, (2010). Toxicity review of Di(2-ethylhexyl) Phthalate (DEHP).
HERO ID:	2525689
Conditions of Use:	Manufacturing / Import

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Annual production estimates for DEHP in 2002 were approximately 240 million pounds (TURI, 2008). The 2006 IUR estimated that the aggregated U.S. national production volume of DEHP was between 100 and < 500 million pounds. These production estimates far exceeded the 2006 estimated annual imports (~ 69 million pounds) and exports (~ 13 million pounds) from the United States, suggesting that local incorporation into products was very important in the overall distribution of DEHP (p. 16 and Table 3.1).
Life cycle description:	As a polymer, DEHP has been primarily used as a general purpose plasticizer in plastics production (97% of all DEHP). It has had additional uses in the creation of PVC, polyvinyl acetate, rubbers, cellulose plastics and polyurethane. As a polymer, DEHP imparts flexibility and other mechanical properties to various types of plastics found in consumer products, medical devices, and industrial/commercial products. Its use in medical devices (i.e., medical tubing and IV bags) and industrial/commercial products accounted for 25% and 45% of the overall consumption, respectively. As a non-polymer, DEHP has been used in the formulation and industrial use of sealants, adhesives, paints, lacquers, printing inks, dielectric fluids, and ceramics. These uses constituted less than 3 to 5% of the national use of DEHP. (p. 18-19). See table 3.2 for a list of consumer products reported to contain DEHP.
Process description:	DEHP is manufactured commercially in a closed system by catalytically esterifying phthalic anhydride with 2-ethylhexanol. Unreacted alcohols are recovered and reused, and the DEHP mixture is purified by vacuum distillation or activated charcoal. The purity of DEHP using this method has been reported historically at over 99% (CPSC, 1985). The remaining fraction of the DEHP commercial mixture is comprised of the impurities isophthalic acid (CAS No. 121-91-5), terephthalic acid (CAS No. 100-21-0), and maleic acid (CAS No. 110-16-7; Thomas et al., 1978 cited in CPSC, 1985). DEHP can also contain bisphenol A (CAS No. 80-05-7) at concentrations ranging from 0.025 to 0.5% (ECB, 2008). (p. 16). Available in 200 kg drums (p. 16/329).
Number of sites:	The 2006 EPA non-confidential Inventory Update Reporting (IUR) database listed three producers (Eastman Chemical Company; Sterling Chemicals, Inc; and Sunoco, Inc) and eight importers (BASF Corporation; Chemcentral Corporation; GNC Corporation, Incorporated; Kyowa Hakko USA, Inc; LG Chem America, Inc; Polyone Corporation; Teknor Apex; and Tremco Incorporated) of DEHP into the United States. Market analysis reporting suggested that 2 additional producers (BASF Corporation and Exxon Mobil) currently compete with Eastman Chemical Company as the major U.S. producers of DEHP (Tecnon Orbichem, 2007). (p. 16).
Chemical concentration:	99.6% (p. 15).

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity				

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Study Citation:		CPSC, (2010). Toxicity review of Di(2-ethylhexyl) Phthalate (DEHP).		
HERO ID:		2525689		
Conditions of Use:		Manufacturing / Import		
		EVALUATION		
Domain	Metric	Rating	Comments	
	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty				
	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.			
HERO ID:	5155508			
Conditions of Use:	Manufacturing/production			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1994: Globally 2.2 to 8.8 billion pounds (1-4 million tons per year). 2006: estimated global was 2.205 to 8.18 billion pounds per year. US production peaked in 1976 at 397 million lbs, was at its lowest in 1993 at 240 million lbs and remained fairly steady between those years. 1950-54: 230 million lbs. 1982: 251,067,000 lbs. 2002: 0.265 - 4,000 billion lbs. 2012: 152,694,720 lbs and shows at least 15 companies for import/manufacturing. 1991 in Canada: 11 million lbs down from 31 million in 1984. 2007 EU: 750 million lbs showing a decrease from 1.3 billion lbs in 1997. ECHA 2010 estimated 460 million lbs per year in the previous 2 to 3 years. 1994-1995 Germany: 550 million lbs. 2004 EU: 490 million lbs. Danish EPA reported EU: 460 million lbs in 2009-2010 compared to 770 million lbs in 2007. Nordic countries: 1.7 million lbs of DEHP in 2012. Nordic countries 2000: 43 million lbs. 1993 Japan: 770 million lbs. 1995 Japan: 660 million lbs. 1995 Taiwan and China: 460 million lbs. Majority (95%) of DEHP is reported to be used in PVC and remaining in non-plasticizer use (HSDB 2015; ATSDR 2002). In 2005, 30% of the use of DEHP as plasticizer in consumer products.			
Process description:	DEHP is produced by esterification of 2-ethylhexanol and phthalic anhydride either with an acid or metal catalyst (such as sulfuric acid or para-toluenesulfonic acid) or at high temperature. Raw materials used in the production of DEHP: 2-ethylhexanol, phthalic anhydride, acid or metal catalyst: sulfuric acid, para-toluenesulfonic acid, or other.			
Number of sites:	5 sites are primary producers of DEHP in US (2002 - ATSDR), 23 companies reported in US (IARC - 2012). 2 Canadian companies identified (1994). In 2010, 19 producers in Mexico, 9 in China, 4 in the UK, 3 in Germany, 2 producers each in China, India, and Japan, and one each in Belgium, Bulgaria, Canada, the Czech Republic, France, South Africa, Switzerland and the former state union of Serbia and Montenegro. Same source also reported production by 5 German companies, 3 in Austria and France, 2 in Belgium and 1 in Finland, Spain and Sweden. Chem Sources Online search identified 23 US, 10 Chinese, 9 Mexican, 4 UK, 3 German, 2 Belgian, Indian, Japanese and Swiss, and 1 Canada, Czech Republic, France, South African and Yugoslavia.			
Chemical concentration:	Plastics commonly contain concentrations of up to 40% DEHP by weight and in some cases may contain more. Home maintenance: paint roller - 5.5%; wall covering and flooring materials - 3.0%; adhesives, glues, and sealing compounds - 1.8%; wall covering and flooring materials - semi-flexible PVC - 1.54%; Wall coverings and flooring materials - cushioned PVC - 1.36%; Wall coverings and flooring materials - homogeneous PVC - 0.57%; PVC flooring - <=33.0%; Building material: PVC cable insulation - unexposed jacketing - 4.6 +/- 0.1.			
Comments:	Table 3-2 gives chemical concentrations of DEHP of multiple toys and children care products. Table 3-3 gives chemical concentrations of DEHP in other consumer products that are not childcare - home maintenance products are included under chemical concentration.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source uses high quality data that are from common sources such as ATSDR, EPA and EU sources as well.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Report contains US and other OECD data
	Metric 3:	Applicability	High	Data is directly applicable to PV of DEHP.
	Metric 4:	Temporal Representativeness	Medium	majority of data is from 2000s
	Metric 5:	Sample Size	Medium	Characterized by a range over different years
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
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Study Citation:	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.		
HERO ID:	5155508		
Conditions of Use:	Manufacturing/production		
Domain	Metric	EVALUATION Rating	Comments
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Addresses variability by reporting different years of production.
Overall Quality Determination		High	

Study Citation:	CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).		
HERO ID:	679920		
Conditions of Use:	Production of plastic products, including consumer products		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Di(2- ethylhexyl) phthalate (DEHP), also known as dioctyl phthalate (DOP), and the functionally equivalent plasticizer diisooctyl phthalate (DIOP) comprise roughly half of all DAP manufactured.		
Process description:	U.S. toy manufacturers began voluntary removal of DEHP from pacifiers and nipples in 1986 (TMA, 1986). DEHP was the predominant plasticizer used in soft PVC children’s products, but since the early 1980’s, has been replaced in most countries by other plasticizers, in particular DINP (Steiner et al., 1998; Wilkinson and Lamb, 1999).		
Chemical concentration:	An analysis of 15 samples of PVC materials used to manufacture toys in Spain revealed a mixture of plasticizers including DINP, DEHP, and DIDP, and reported DEHP contents ranging from <0.1 to 34% dry weight, with 6 of 15 samples containing >10% DEHP dry weight (Marin et al., 1998). Rastogi (1998) reported DEHP in 3 of 4 teethers (0.01 to 0.07% dry weight) and in 2 of 3 dolls (0.12 and 22.4% dry weight, respectively), as well as trace amounts of DBP, DEP, or BBP in some the items studied. More than a decade ago DEHP concentrations of approximately 30 to 42% dry weight were detected by Lay and Miller (1987) in U.S.-manufactured pacifiers. More recent data like those just summarized suggest that the Lay findings do not reflect DEHP concentrations in products intended to be mouthed that are currently manufactured in the U.S. and covered by the voluntary ban (TMA, 1986). At the request of the CHAP, the CPSC chemistry laboratory tested two samples of PVC “jelly” sandals (Chen, 2000). Neither sample was found to contain DINP. One sample of yellow PVC jelly sandals purchased in California was determined to contain 13.5% DEHP and 15.7% diisobutyl/dibutyl phthalates (total phthalate content 29.2%). The second sample was purchased in Maryland and had a pink sole with clear straps; the sole was determined to contain 31.8% DEHP, and the straps were found to contain 31.6% DEHP and 2.5% dibutyl phthalate (total phthalate content 34.1%).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
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Study Citation:	CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).		
HERO ID:	679920		
Conditions of Use:	Production of plastic products, including consumer products		
Domain	Metric	EVALUATION	
		Rating	Comments
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
HERO ID:	5353181			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	"DINP, DIDP, and DEHP were manufactured in and/or imported into Canada in quantities greater than 10 million kg/year. (4/228)"			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.	
	Metric 3: Applicability	Medium	Data is for manufacturing, which is in-scope but not specific to U.S.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (means, medians, maximums, ranges) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed below the reporting table and variability is not addressed.	
Overall Quality Determination		High		

Study Citation:	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
HERO ID:	679967			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	About 2.7 x 10^6 tonnes/year of total phthalates are produced. DEHP accounts for over 50% of the tonnage.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Lacquers, paints, inks		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The total consumption of DEHP for paints and lacquers has been estimated at 900 tonnes per year in 2007, based on similar considerations (ECHA, 2009a).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Plastics		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The total consumption of DEHP for flooring vinyl products has been estimated at 30,200 tonnes per year in 2007.		
Life cycle description:	The main use (94%) of the four phthalates contained in articles proposed for restriction is in PVC. Minor uses are in non-PVC polymers and non-polymers. Uses include: Flooring (and heavy wall covering), Insulation on wires and cables, Electronic devices, Plast coated fabric and film/sheets used for bags and brief/suitcases and similar items, Plast coated fabrics and film/sheets used for tablecloth, curtains, shower curtains and similar items (not industrial uses), Carpet tiles/squares produced with (typically) PVC-foam as back cover, Water- and air mattresses, Plast coated wallpaper/tapestry, Footwear, Bathing equipment (swim-coats/wings/belts and pools - inflatable and others), Balls for training and physical exercises, Others: Erasing rubber		
Chemical concentration:	Concentrations of the phthalates in articles are between 25 and 50%. DEHP is 0.57 - 3% in flooring per table 4, <= 13.6% per narrative. 30-70% in wires and cables. 12-21% in bags. The analyses show that all three shower curtains contain DEHP in concentrations between 6.7 and 22%. The analyses showed that 4 oilcloths had a content of DEHP above 1% (up to 25%). A Danish survey of selected non-toy products which could cause exposure to children included a PVC shower curtain containing 26% DEHP, a dish mat with 11% DEHP, and a transparent table cloth (PVC film) with 14% DEHP. The Danish EPA has analysed 8 carpet tiles for the content of DEHP, DBP, DIBP and BBP. None of the analysed tiles contained these four phthalates in concentrations above 0.1%. Plasticiser concentrations in PVC in water beds are assumed to similar to the film used in air mattresses, namely 20-30%. The Danish EPA has analysed 13 air mattresses for the content of DEHP, DBP, DIBP and BBP (Danish EPA, 2010a). Four of the analysed mattresses had a concentration of DEHP above 1% varying from 8.2 to 30.4%. DIBP was detected in one of the mattresses in concentrations below 0.1% and DBP and BBP were not detected in any of the analysed mattresses. PVC wallpaper had a content of DEHP between 6.9 and 9%. PVC in the tested footwear contained up to 23.2% DEHP. Intertek who performs tests on bathing equipment informs that DEHP is the preferred plasticiser with concentrations in the interval 20-40%. Other study showed 1%, 26%, or 33% in swimming equipment. Another large producer informs that DEHP and DBP are used in very low concentrations (<1%) in balls. Another Danish investigation analysed four erasers and found DEHP in concentrations between 17 and 44% (Danish EPA, 2007). Also see Tables 14 and 19.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHes, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity			
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Study Citation:		ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:		3661424		
Conditions of Use:		Plastics		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 6:		Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty				
Metric 7:		Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Manufacture, import, export		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Tonnage by end use market in Table 2: a total of 39,900 t/y is imported, 282,200 t/y is manufactured for use in articles, 36,600 t/y is exported		
Life cycle description:	Breakdown of DEHP by use in Table 2: 10.6% for flooring, 3.5% for wall covering, 34.1% for film/sheet/coated/molded products, 18.4% for wires and cables, 10.4% for hoses and profiles, 7% for other polymer applications, 1.4% for adhesives/sealants, 0.2% for lacquers and paints, 0.4% for printing ink		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECHA, (2010). Evaluation of new scientific evidence concerning the restrictions contained in Annex XVII to Regulation (EC) No 1907/2006 (REACH): Review of new available information for di-'isononyl' phthalate (DINP).
HERO ID:	3687875
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	DINP, DIDP and DPHP represent nowadays ca. 65% of the overall consumption of plasticisers in Western Europe, for only ca. 16% for DEHP (in 2008, ECPI workshop, 2009; ECPI, 2010; CEFIC, 2010); in comparison, at global level DINP and DIDP represent only ca. 30% of the total consumption of plasticisers, for 50% for DEHP (ECPI workshop, 2009). in 1999, DINP and DIDP were representing only 35% of the consumption of phthalates in Western Europe, for 42% for DEHP (ECPI workshop, 2009). The manufacture of DEHP has indeed decreased from 595,000 tonnes/year in EU-15 in 1997 to 340,000 tonnes/year in EU-25 in 2007 (ECHA, 2009a), for a total use of DEHP of only 221,000 tonnes/year in 2004 (EU, 2008) and ca. 210,000 tonnes/year in the last few years (ECPI workshop, 2009); on the contrary, the use of DINP has constantly increased since 19949 (ECPI workshop, 2009).

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

Overall Quality Determination	High
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Study Citation:	ECHA, (2010). Evaluation of new scientific evidence concerning the restrictions contained in Annex XVII to Regulation (EC) No 1907/2006 (REACH): Review of new available information for di-'isononyl' phthalate (DINP).		
HERO ID:	3687875		
Conditions of Use:	Use in plastics		
EXTRACTION			
Parameter	Data		
Life cycle description:	HMW phthalates can be used in (electrical) wire and cables, flexible PVC sheets, coated fabrics, automotive applications (synthetic leather for car interiors, car underbody coatings, cables), building and construction (e.g. waterproofing) and (vinyl) flooring (www.dinp-facts.com). Other reported uses are in shoe soles, sealings, paints and lacquers, same as for DEHP (EU, 2003; ECHA, 2009a), as well as in footwear in general and in swimming pools and ponds liners (www.dinp-facts.com). According to Industry, DINP can be blended into a paste (socalled “plastisol”), which makes it particularly fitted for coating (such as tarpaulins, synthetic leather, flooring, wall covering, etc.) and rotomoulding (such as some toys and sporting articles) applications; although it can also be used in “plastisols”, DIDP is preferably used in extruded and calendered articles, such as cables, profiles, roofing sheets or ponds liners (ECPI, 2010; ECPI, 2010a). Phthalates, including DINP, have also been mentioned to be used in children’s clothing (ECPI newsletter, summer 2009, issue 16; see also “Use in other articles for/in contact with children” section below).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHes, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	Formulation			
EXTRACTION				
Parameter	Data			
Process description:	Table 2-1: Formulation of adhesives/sealant: Use in closed batch process (synthesis or formulation) Industrial setting; Use in batch and other process (synthesis) where opportunity for exposure arises. Industrial setting. Formulation of lacquers and paint: Use in closed batch process (synthesis or formulation) Industrial setting; Use in batch and other process (synthesis) where opportunity for exposure arises. Industrial setting. // Section 2.2.1: For polymer products, "formulation" means production of semi-final products, such as PVC compound, which is pre-mixed, extruded PVC granulate ready for production of PVC end-product (e.g. hoses or toys), or plastisol, a pasty mixture (or "paste") of constituents prepared for spread coating of textiles or other materials.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
HERO ID:	6316858			
Conditions of Use:	Processing into plastics, application of paints/adhesives/etc. to produce articles			
EXTRACTION				
Parameter	Data			
Process description:	Table 2-1: Compounding of polymer: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Industrial setting. Calendering of polymer: Calendering operations. Industrial setting. Spread coating (with plastisol):Roller application or brushing of adhesive and other coating. Industrial or non-industrial setting. Application of adhesives/ sealant: Spraying in industrial settings and applications. Industrial setting; Roller application or brushing of adhesive and other coating. Industrial or non-industrial setting; Hand-mixing with intimate contact and only PPE available. Nonindustrial setting. Painting (application of lacquers and paint): Spraying in industrial settings and applications. Industrial setting; Spraying outside industrial settings and/or applications.// Section 2.2.1: Here, "processing" is the production of the polymer products themselves (hoses, toys, etc.). // See additional explanation on p. 22.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides volume of DEHP (tonnes/yr) in 2007 for manufacture, formulation, processing, and use of end products in the EU (pdf page 4)			
Process description:	manufacture: DEHP is produced by the esterification of phthalic anhydride with 2- ethyl-hexanol. This reaction occurs in two successive steps. Elevated temperatures and a catalyst accelerate the reaction rate. Depending on the catalyst used, the temperature in the second step varies from 140°C to 165°C with acid catalysts and from 200°C to 250°C with amphoteric catalysts. Excess alcohol is recovered and recycled and DEHP is purified by vacuum distillation and/or activated charcoal. The reaction sequence is performed in a closed system. This process can be run continuously or batchwise. Production of a particular phthalic ester may in some cases be conducted on a campaign basis, which has also been indicated by manufacturers for this study.			
Number of sites:	seven manufacturers of DEHP in the EU			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by reporting on multiple facilities but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.		
HERO ID:	7325004		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Provides volume of DEHP (tonnes/yr) in 2007 for manufacture, formulation, processing, and use of end products in the EU (pdf page 4)		
Process description:	processing: Formulation of adhesives, sealants, paints, lacquers and printing inks – Formulation of these chemical products basically consists of mixing of ingredients in batch or continuous processes.Calendering - In the calendering of flexible PVC, the polymer mass runs through the gaps between the hot rolls of the calender. The average DEHP concentration is reported to be about 25% (RAR, 2008).Extrusion - During extrusion, the melted PVC compound is pressed through a die with subsequent cooling. The major different product types of plasticised PVC extrusion are “profiles” such as wire, cable and hose, and blow moulded film.Plastisol applications -”Plastisol” is a pasty liquid obtained by blending (formulating) PVC resin with plasticiser and other ingredients at room temperature. The plastisol is applied by spreading it on a substrate (e.g. paper, fabric, or car metal plate), or dipping items into it, and thereafter heating it (to be “gelled” or “fused”) to typically above 160°C.Injection moulding - In injection moulding, melted compound is pressed into a “negative”, cooled mould (boots or shoe soles). As the hot material is not exposed to air, because the process is closed, very little plasticiser is expected to be released.Processing (application) of adhesives, sealants, paints, lacquers and printing inks - According to the Swedish product register non-polymer products contain between 0.2 and 50% DEHP. Paints contain a maximum of 40% DEHP. In printing inks, DEHP is used as solvent especially for inks used in the textile industry and inks used on plastics and paper (RAR, 2008).Production of ceramics - Plasticisers can be used as additives for ceramics to improve their processability. They work in combination with binders to give formed, unfired parts the flexibility or deformability required for subsequent handling and processing. They may also be added to spray dried or granulated powders so that the granules crush easily during pressing. Common constituents in such form liquid are polyethylene glycol, polypropylene glycol, propylene glycol and several phthalates (SRI, 1993).		
Throughput:	processing: source provides data on sales distribution for varying process types in EU (PDF page 24) also provides table with percentage of total DEHP used in different types of processing (pdf page 25)		
Number of sites:	DEHP was formulated in about 560 sites in EU		
Chemical concentration:	The average DEHP concentration is reported to be about 25% (RAR, 2008). According to the Swedish product register non-polymer products contain between 0.2 and 50% DEHP. Paints contain a maximum of 40% DEHP.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
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Study Citation:		ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.		
HERO ID:		7325004		
Conditions of Use:		Processing		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	Medium	Variability addressed by reporting of multiple facilities but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of bis(2-ethylhexyl)phthalate (DEHP) as well as information on potential alternatives to its use.			
HERO ID:	7325004			
Conditions of Use:	Commercial Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides volume of DEHP (tonnes/yr) in 2007 for manufacture, formulation, processing, and use of end products in the EU (pdf page 4)			
Chemical concentration:	Use: The content of DEHP in flexible polymer materials varies but is often around 30% (w/w).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from OECD countries throughout the EU (Denmark and UK).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions. (2007)
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di-"isodecyl"phthalate (DIDP).			
HERO ID:	1588746			
Conditions of Use:	Use in PVC products - roofing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Table 2.5 - 1,000 t/a is used in roofing material and 5,000 is used in roofing coil coating			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di-”isodecyl”phthalate (DIDP).		
HERO ID:	1588746		
Conditions of Use:	Use in PVC products - Use in coated fabric		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Table 2.5 - 21,000 t/a is used in coated fabric		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di- "isodecyl"phthalate (DIDP).			
HERO ID:	1588746			
Conditions of Use:	Use in PVC products - Use in hoses and profiles			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Table 2.5 - 6,000 t/a is used in hoses and profiles			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	ECJRC, (2008). European Union risk assessment report: Bis(2-ethylhexyl)phthalate (DEHP).
HERO ID:	1614673
Conditions of Use:	Manufacturing, processing and industrial uses.
EXTRACTION	
Parameter	Data
Production, import, or use volume:	The production volume of DEHP in Western Europe for 1997 is 595,000 tons/yr, 67,000 tons were imported. One company imports between 1,000 to 5,000 as well as another company importing 10,000 - 50,000 tons. Global production of DEHP between 1 and 4 million tons/yr in 1994. No info on import or export of DEHP containing articles/products which adds to uncertainty. Polymers consist of 97% of PV of DEHP at 462,000, with 1,000 in roofing materials, 5,000 in roofing (coil coating), 20,000 on cables, 21,000 on coated fabrics, 6,000 on hoses and profiles, 7,000 on car under-coatings, and 40,000 on shoe soles. 3% of use is in non-polymers at 14,280. About 15 - 25% of total DEHP used in Europe is formulated and processed to a semi-manufactured product. Table 2.3: Total calendaring DEHP: 106,148 tons/yr; Total extrusion: 223,720 tons/yr; Total injection moulding and extrusion: 83,680; Total spread coating: 115,192 tons/yr. Total other plastisols: 16,660 tons/yr and total non polymer applications: 14,280 tons/yr.
Life cycle description:	Figure 2.1 is an overview of the relevant life cycle stages of DEHP. There is import, production or export of DEHP. Formulation of PVC, a non-PVC polymer compound. Next there could be import of semi-manufactured products containing DEHP, processing non-polymers containing DEHP and export of semi-manufactured products containing DEHP, and polymer processing (calendering, spread coating, other plastisol, extrusion, an injection moulding). There is import of end-products containing DEHP, private and professional use of DEHP containing products, as well as non-polymers and export of end-products with DEHP. Lastly there is disposal.
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Study Citation:	ECJRC, (2008). European Union risk assessment report: Bis(2-ethylhexyl)phthalate (DEHP).
HERO ID:	1614673
Conditions of Use:	Manufacturing, processing and industrial uses.

		EVALUATION	
Domain	Metric	Rating	Comments
Process description:	Apparently all manufacturers of phthalate esters use similar processes. DEHP is produced by the esterification of phthalic anhydride with 2-ethyl-hexanol. This reaction occurs in two successive steps. The first reaction step results in the formation of monoester by alcoholysis of phthalic acid. This step is rapid and proceeds to completion. The second step involves the conversion of the monoester to the di-ester. This is a reversible reaction and proceeds more slowly than the first. To shift the equilibrium towards the di-ester, the reaction water is removed by distillation. Elevated temperatures and a catalyst accelerate the reaction rate. Depending on the catalyst used, the temperature in the second step varies from 140°C to 165°C with acid catalysts and from 200°C to 250°C with amphoteric catalysts. Variations in purity may occur depending on catalyst, reactant alcohol and process type. Excess alcohol is recovered and recycled and DEHP is purified by vacuum distillation and/or activated charcoal. The reaction sequence is performed in a closed system. This process can be run continuously or batchwise. Production of a particular phthalic ester may in some cases be conducted on a campaign basis. Production plants often produce DEHP only due to the large volumes. A typical number of production days during a year is >330 days. Two routes of PVC formulation include: "Dry-blending": The PVC resin is blended with plasticiser and other additives at a temperature of typically around 100 -120°C. Temperatures over 100°C occur occasionally. During dry blending the exposure of hot material to open air is small. A total charge of typically 150 kg, including 50 kg of plasticiser and a volume of air in the blender of 100 litres. At 100°C the saturation concentration of DEHP is 20 mg/m ³ , i.e. 0.1 m ³ . 20 mg/m ³ =2 mg. Assuming one air exchange per run, the amount of emitted DEHP vapour is very small. A dry powder is obtained (the so-called "dry blend"), which can be stored and shipped in bulk or bags. The hot blended powder material can be conveyed to a compounding extruder producing a semi-manufactured product. Further processing may occur via extrusion, injection moulding and sometimes calendering at the same or at another site downstream. "Plastisol blending": The PVC resin is blended with plasticiser and other ingredients at room temperature. Approximately 30-35% of all plasticiser in PVC is used in plastisol applications. A pasty liquid (a so-called "plastisol" or "paste") results. Further processing may occur via spread-coating, dipping, spraying and various other moulding processes. A third method, rather obsolete, is the so-called Banbury blending or mixing. It is a batch process starting with the raw material at ambient temperature and subsequently increasing the temperature up to maximum of 120 -140°C. The further processing of the "dry-blend" is performed by heating the blend in one or several stages e.g. by friction or by heating the surfaces and transferring it into the molten state. The moulding occurs above 160°C. Calendering: running it through the gaps between the hot rolls of a calender (film, flooring, roofing). The average DEHP content in calendered products is about 25%. Calendered flooring, roofing and wall covering is at least twice as thick as film and sheet and is produced at lower temperatures. As a consequence of the greater thickness, the surface to volume ratio and therefore the plasticiser loss is approximately half of that in film and sheet Extrusion: pressing it through a die with subsequent cooling (hose, tubing, cable) Injection moulding: pressing it into a "negative", cooled mould (boots, shoe soles) The major different product types of plasticised PVC extrusion are "profiles" such as wire, cable and hose, and blow moulded film. The "plastisol" is applied by spreading on a substrate (e.g. paper or fabric) and thereafter heated (= "gelled" or "fused") to typically above 160°C. Major application modes are: • spreading (spread coating). Paste is homogenised onto the tissue to be coated (flooring, coated fabric textile, woven glass) by a knife or a perforated roller. Spread coated products are "fused" (gelled) in tunnel ovens heated with hot air at about 180°C. The energy is supplied by infrared heating source (IR) and/or hot air. • dipping of moulds into plastisol. This is applied to the production of gloves. • spraying or injection of pseudoplastic onto car body as anti-corrosive coating, or into crowns or capsules for beverage bottles • slush and rotational moulding (fenders, car door arm rests, balls, dolls, boots, hollow articles). A spherical mould of required geometry is filled with the proper amount of paste, upon rotation due to centrifugal force the paste will be homogeneously spread over the inner walls of the mould. Gelation is accomplished by hot air and for large shapes by direct flameheating.		
Number of sites:	Pgs 246-247: Due to data from industry (BASF AG, 1999) DEHP is formulated in about 560 sites in EU. The number of sites processing materials containing DEHP is assumed to be more than 1,000. In the USA approximately 340,790 employees at 19,400 facilities may be exposed to DEHP (US EPA, 1996).		
Chemical concentration:	The content of DEHP in flexible polymer materials varies but is often around 30% w/w.		

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data for the EU
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for the EU, OECD countries.
	Metric 3: Applicability	High	Data is applicable to production, processing and industrial use of DEHP.

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Study Citation:		ECJRC, (2008). European Union risk assessment report: Bis(2-ethylhexyl)phthalate (DEHP).		
HERO ID:		1614673		
Conditions of Use:		Manufacturing, processing and industrial uses.		
		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 4:	Temporal Representativeness	Low	Most production data is over 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	Report clearly documents results, methods and assumptions.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	High	Data addresses variability by showing various uses of DEHP and their respective PVs. Addresses uncertainty in a lack of ability to track import and export of DEHP containing products.
Overall Quality Determination			High	

Study Citation:	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
HERO ID:	679933		
Conditions of Use:	Production of PVC products		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Table 2.4: 1,000 t/a for roofing materials; 5,000 t/a for roofing coil coating; 21,000 t/a for coated fabric; 6,000 t/a for hoses and profiles		
Life cycle description:	For PVC in cars the lifetime was estimated to be 12-16 years, for different building materials 10-20 years, and for roof coating 20 years. For roofing material BASF (1999a) gives a lifetime of 20 years. For coil coating 10 years is used (ECPI, 1998b). In this assessment 25 years is used for both roof and wall coating. For cables and wires the lifetime was estimated to be 10-50 years. In this assessment the average, 30 years, is selected. The technical lifetime for a building is assumed to be 100 years (no reference). No lifetime is available for fabric coating. However, it is assumed to be 10 years. According to ECPI (1998b), the lifetime for flooring is 10 years. However, according to a producer (Tarkett-Sommer, 1999) is 20 years a more realistic lifetime.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	EPA., Danish (2010). Survey and health assessment of products for interior car care.			
HERO ID:	6302451			
Conditions of Use:	Automotive Care Products			
EXTRACTION				
Parameter	Data			
Process description:	Sprayed on the surface to be treated. Wiped off with a cloth. Sprayed directly on the cloth and spread on the surface. Cream applied with a cloth. Tissue is used. (p. 31, more examples in Table 4.1 on p. 32)			
Throughput:	20 g/car (Table 6.2, p. 54)			
Chemical concentration:	0.25 mg/g (Table 0.2, p. 9, Table 5.3, p 39, Table 6.4 p55); 0.032 mg/g (Table 6.4, p55), 0.0026 mg/g (Table 6.5, p56), 0.17 mg/g (Table 6.6, p56)			
Physical form:	Spray w. propellant (Table 2.1, p. 20)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	This is a Danish Assessment (EU) and uses high quality data and techniques.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from an OECD country.
	Metric 3:	Applicability	Medium	The objective of the assessment was for consumers but work included outreach to car centres and other related workplaces, so it is also applicable for commercial use of automotive care products.
	Metric 4:	Temporal Representativeness	Medium	The report is from 2010 which is over 10 years old but less than 20 years old.
	Metric 5:	Sample Size	High	Discrete concentration data is provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report documents all approaches and data sources.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Report addresses both uncertainty and variability.
Overall Quality Determination			High	

Study Citation:	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).			
HERO ID:	7265437			
Conditions of Use:	Manufacture, import, export			
EXTRACTION				
Parameter	Data			
Production, import, or use volume: Life cycle description:	In the EU in 2007: Tonnage by end use market in Table 7: a total of 39,900 t/y is imported, 282,200 t/y is manufactured for use in articles, 36,600 t/y is exported Breakdown of DEHP by use in Table 7: 10.6% for flooring, 3.5% for wall covering, 34.2% for film/sheet/coated/molded products, 18.5% for wires and cables, 10.4% for hoses and profiles, 7.1% for other polymer applications, 1.4% for adhesives/sealants, 0.2% for lacquers and paints, 0.4% for printing ink			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	EPA., Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ethylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:	7265437		
Conditions of Use:	Plastic Products		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The total consumption of DEHP for flooring vinyl products has been estimated at 30,200 tonnes per year in 2007.		
Life cycle description:	The main use (94%) of the four phthalates contained in articles proposed for restriction is in PVC. Minor uses are in non-PVC polymers and non-polymers. Uses include: Flooring (and heavy wall covering), Insulation on wires and cables, Electronic devices, Plast coated fabric and film/sheets used for bags and brief/suitcases and similar items, Plast coated fabrics and film/sheets used for tablecloth, curtains, shower curtains and similar items (not industrial uses), Carpet tiles/squares produced with (typically) PVC-foam as back cover, Water- and air mattresses, Plast coated wallpaper/tapestry, Footwear, Bathing equipment (swim-coats/wings/belts and pools - inflatable and others), Balls for training and physical exercises, Others: Erasing rubber		
Chemical concentration:	Concentrations of the phthalates in articles are between 25 and 50%. DEHP is 0.57 - 3% in flooring per table 9, <= 13.6% per narrative. 30-70% in wires and cables. 12-21% in bags. The analyses show that all three shower curtains contain DEHP in concentrations between 6.7 and 22%. The analyses showed that 4 oilcloths had a content of DEHP above 1% (up to 25%). A Danish survey of selected non-toy products which could cause exposure to children included a PVC shower curtain containing 26% DEHP, a dish mat with 11% DEHP, and a transparent table cloth (PVC film) with 14% DEHP. The Danish EPA has analysed 8 carpet tiles for the content of DEHP, DBP, DIBP and BBP. None of the analysed tiles contained these four phthalates in concentrations above 0.1%. Plasticiser concentrations in PVC in water beds are assumed to similar to the film used in air mattresses, namely 20-30%. The Danish EPA has analysed 13 air mattresses for the content of DEHP, DBP, DIBP and BBP (Danish EPA, 2010a). Four of the analysed mattresses had a concentration of DEHP above 1% varying from 8.2 to 30.4%. DIBP was detected in one of the mattresses in concentrations below 0.1% and DBP and BBP were not detected in any of the analysed mattresses. PVC wallpaper had a content of DEHP between 6.9 and 9%. PVC in the tested footwear contained up to 23.2% DEHP. Intertek who performs tests on bathing equipment informs that DEHP is the preferred plasticiser with concentrations in the interval 20-40%. Other study showed 1%, 26%, or 33% in swimming equipment. Another large producer informs that DEHP and DBP are used in very low concentrations (<1%) in balls. Another Danish investigation analysed four erasers and found DEHP in concentrations between 17 and 44% (Danish EPA, 2007).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHes, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity			
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Study Citation:		EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ethylhexyl)phthalate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:		7265437		
Conditions of Use:		Plastic Products		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 6:		Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty				
Metric 7:		Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	EPA., Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:	7265437		
Conditions of Use:	Lacquers, paints, inks		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The total consumption of DEHP for paints and lacquers has been estimated at 900 tonnes per year in 2007, based on similar considerations (ECHA, 2009a).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Gkrillas, A., Dirven, H., Papadopoulou, E., Andreassen, M., Hjertholm, H., Husøy, T. (2021). Exposure estimates of phthalates and DINCH from foods and personal care products in comparison with biomonitoring data in 24-hour urine from the Norwegian EuroMix biomonitoring study. Environment International 155(Elsevier):106598.		
HERO ID:	7978731		
Conditions of Use:	As a reactant-Plasticizer in plastic material and resin manufacturing; Incorporation into article-Plasticizer in all other basic organic chemical manufacturing, plastics product manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The Organisation for Economic Co-operation and Development (OECD) reported in 2018 that global production volumes of phthalate plasticisers could reach approximately 5.5 million metric tonnes per year. (pdf pg 2)		
Chemical concentration:	Due to their toxicological potential in humans, uses of DBP (di-n-butyl phthalate), DEHP and DiBP (diisobutyl phthalate) were regulated so as not to exceed concentrations equal or greater than 0.1% by weight of plasticised material, individually or in combination in the EU market after July 2020 (EU 2018/2005). (pdf pg 2)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Medium	Data reference all phthalates, with limited chemical-specific findings.
	Metric 4: Temporal Representativeness	High	Source is from 2021.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination		High	

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.			
HERO ID:	27010			
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing, plastics product manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	138 million kg DEHP used as plasticizer in US in 1979. This accounts for 26% of total phthalate plasticizer use in US.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.			
HERO ID:	27010			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	123.9 million kg in 1980, 136 million kg in 1979, 197.5 million kg in 1974			
Process description:	Di(2-ethylhexyl) phthalate is produced commercially by the reaction of excess 2- ethylhexanol with phthalic anhydride in the presence of an acid catalyst such as sulphuric acid or para-toluene sulphonic acid.			
Number of sites:	9			
Chemical concentration:	99.0-99.6%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Sampling or analytical method is approved by WHO and equivalent to approved OSHA or NIOSH methods.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Source is from an international organization, but the data are from the U.S. and representative of the industry.	
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent PEL establishment and are > 20 years old.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Monitoring data include all associated metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Lee, M., Kim, J. H., Lee, D., Kim, J., Lim, H., Seo, J., Park, Y. K. (2018). Health risk assessment on hazardous ingredients in household deodorizing products. International Journal of Environmental Research and Public Health 15(4):744.		
HERO ID:	4730751		
Conditions of Use:	Use of deodorizing products (Auto care products)		
EXTRACTION			
Parameter	Data		
Throughput:	Table 4, 0.55-1.02 g/s on median for spray deodorizer and liquid diffuser		
Chemical concentration:	Table 7, 215.950 mg DEHP/kg product		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation. (There is commercial and consumer auto care products COU)
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Liss, G. M., Hartel, R. W. (1983). Health Hazard Evaluation Report No. HETA-82-032-1384, Badische Corporation, Kearny, New Jersey. NIOSH(HETA-82-032-1384):82-032.			
HERO ID:	1334319			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Site capacity is 180 million lbs/yr			
Process description:	The production of DEHP is an outdoor continuous-flow operation. The production process involves the esterification of 2-ethylhexanol with PA in the presence of a catalyst.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from NIOSH, a frequently used source and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The assessment does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NICNAS, (2008). Existing chemical hazard assessment report: Diethylhexyl phthalate.			
HERO ID:	5178600			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Life cycle description:	DEHP is the one of the most extensively used phthalates worldwide. In the USA upto 2002, approximately 97% of DEHP was used as a plasticizer in PVC. In the European Union (EU) up to 2006, DEHP use represented around half of the total volume of phthalates used as plasticizers. DEHP-containing PVC is used in a variety of consumer products e.g. toys, automotive components, furniture, shoes and boots, outdoor and rainwear, building material such as flooring, cables, profiles and roofs. DEHP is also used as ingredient in cosmetics and medical products like blood bags, dialysis equipment. Current EU legislation restricts the use of DEHP in toys and childcare articles, and prohibits its use in cosmetics. In Australia, DEHP is used in flooring, waterproofing materials, cable sheathing/insulation, PVC labels, surface repair resin molds, epoxy and polyurethane products, rubber components in automotive brake assemblies and hot melt adhesives for automotive assembly and repair. The chemical is also used in fragrance bases for perfumery and cosmetic products. Some businesses note phasing out of the chemical in these latter applications following the ban on cosmetics use in the EU.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Australia, an OECD country.	
	Metric 3: Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination		High		

Study Citation:	NTP, (2000). NTP-CERHR expert panel report on di(2-ethylhexyl) phthalate. GRA and I(GRA and I):120.			
HERO ID:	679847			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		According to Aristech Chemical Company, the production volume of DEHP is approaching 2 million tons		
Life cycle description:		DEHP is used as a plasticizer of polyvinyl chloride (PVC) in the manufacture of a wide variety of consumer products. Important examples of DEHP use include: building products (flooring and pavements, roof coverings, wallpaper, polymeric coatings, tubes and containers, wire and cable insulation), car products (vinyl upholstery, car seats, underbody coating, trim), clothing (footwear, raincoats), food packaging, children’s products (toys, crib bumpers), and medical devices. It is currently the only phthalate plasticizer used in PVC medical devices.		
Process description:		Di(2-ethylhexyl) phthalate (DEHP) (CAS RN 117-81-7) is produced by reacting 2-ethylhexanol (2-EH) with phthalic anhydride. reaction is either conducted in the presence of an acid or metal catalyst or at a high temperature.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHES, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
		Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
		Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
		Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	NTP, (2000). NTP-CERHR expert panel report on di(2-ethylhexyl) phthalate. GRA and I(GRA and I):120.			
HERO ID:	679847			
Conditions of Use:	PVC products - children’s toys and medical devices			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP was detected in children’s products at concentrations of 0.002–41.6% dry weight DEHP. PVC-based medical devices generally contain 20-40% DEHP by weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (e.g., European Union or OECD reports, NIOSH HHES, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination		High		

Study Citation:	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-n-octyl phthalate (DnOP). (6):i-III90.			
HERO ID:	679112			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Phthalates are manufactured within closed systems, but exposure to workers can occur during filtering or loading/ unloading of tank cars. Higher exposures to phthalates can occur during the production of flexible PVC because the processes are open and run at higher temperatures.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Though data is 18 years old, the process description described is still relevant today.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - information not dependent on metadata	
Overall Quality Determination		High		

Study Citation:	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-isononyl phthalate (DINP). Center for the Evaluation of Risks to Human ReproductionVol(2):i-III90.			
HERO ID:	680097			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Phthalates, including DEHP, are a group of similar chemicals widely used to soften and increase the flexibility of plastic consumer products such as shower curtains, medical devices, upholstery, raincoats, and soft squeeze toys.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Low	Data are for phthalates generally, not DEHP specifically
	Metric 4:	Temporal Representativeness	Medium	The data are more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - information not dependent on metadata
Overall Quality Determination		Medium		

Study Citation:	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.			
HERO ID:	3808976			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	54,633,000 total gallons automotive refinish coatings/yr 99,747 - 1,097,457 gallons coating/yr (depending on coating type)			
Life cycle description:	Automotive Coating Application			
Process description:	Repair/replace automotive surface, initial wash (water/detergent and/or solvent), sanding (dry or wet), mixing of primer coatings, spray paint (multiple layers of primer), curing/drying each layer, sanding (dry or wet), solvent wipe-down, mixing of each coating (basecoat and clearcoat), spray paint (multiple layers of basecoat and clearcoat), curing/drying each layer			
Throughput:	Op Days: 250 days/yr. 0.25-12 gal coating/site-day, depending on number of jobs Also provides method for adjsutng the use rate based on the type of coating product used			
Number of sites:	32,296			
Chemical concentration:	15-25%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	Data is for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (min, max, mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating types.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).			
HERO ID:	3827298			
Conditions of Use:	Processing and Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	3.2 million tonnes coating/yr in 2001			
Life cycle description:	Formulation of Coatings and Use of Coatings			
Process description:	PROC: Dispersion, milling, finishing, filling USE: Application via roller/brush, air spray systems, airless and air-assisted airless spray systems, electrostatic spray, electrodeposition/electrocoating and autodeposition, dip coating, flow and curtain coating, roll coating, and supercritical carbon dioxide coating systems			
Throughput:	0.62-9.0 l/vehicle (auto refinishing); 1.1-5.1 g coating/can (metal can coating sites)			
Number of sites:	60,330 automotive application sites; 33 metal coating application sites			
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.			
Physical form:	liquid or solid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical functions and coating types	
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario document on adhesive formulation.		
HERO ID:	3827299		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	15.8-4,990 million kg adhesive/yr of different type of adhesives (Table 3-2 on page 43)		
Life cycle description:	Formulation of Adhesives		
Process description:	Unloading raw materials from containers into mixing vessel, mixing, packaging/on-site storage		
Throughput:	Batch Size: 4000 kg or 1,000 gallons of adhesive/bt. Op days and batches/day: Equal to the number of batches. Provides methodology for estimating throughput based on the amount of adhesive produced, and the concentration of the chemical in the adhesive.		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the adhesive use rate, and the concentration of the chemical in the adhesive formulation		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of adhesives.
Overall Quality Determination		High	

Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.			
HERO ID:	3827300			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1,500 - 9,100,000 kg adhesive/site-yr			
Life cycle description:	Adhesive Application			
Process description:	unloading, dilute and mix (optional), application (roll, spray, curtain, bead/syringe), drying/curing, product finishing			
Throughput:	Op days: 50-365 days/yr. Provides methodology for estimating throughput based on the amount of adhesived used, and the concentration of the chemical in the formulation			
Number of sites:	541-22,294			
Chemical concentration:	Provides conc. estimates based on chemical function and adhesive type, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.	
Overall Quality Determination		High		

Study Citation:	OECD, (2017). Emission scenario document (ESD) on the use of textile dyes.			
HERO ID:	3828838			
Conditions of Use:	Textile Dyes			
EXTRACTION				
Parameter	Data			
Process description:	Dye formulation received, unloaded, dyeing of fiber, yarn, or fabric.			
Throughput:	Provides methodology for estimating throughput based on the amount of textile dyed and concentration of chemical in the dye.			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, use rate, and operating days.			
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment from 2015 but is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical functions.	
Overall Quality Determination		Medium		

Study Citation:	OECD, (2015). Emission scenario document on use of adhesives.			
HERO ID:	3833136			
Conditions of Use:	Adhesive Application			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1,500 - 9,100,000 kg adhesive/site-yr			
Process description:	unloading, dilute and mix (optional), application (roll, spray, curtain, bead/syringe), drying/curing, product finishing			
Throughput:	Provides methodology for estimating throughput based on the amount of adhesive used, and the concentration of the chemical in the formulation.			
Number of sites:	541-22,294			
Chemical concentration:	Provides conc. estimates based on chemical function and adhesive type, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.	
Overall Quality Determination		High		

Study Citation:	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.		
HERO ID:	3840003		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	0.7-69.84 million kg coating/ink/adhesive/yr		
Life cycle description:	Formulation of Coatings, inks, and adhesives		
Process description:	Preheating (optional), Unloading raw materials from containers into mixing kettle, mixing, filtering, packaging		
Throughput:	Op days: 250 days/yr. Provides methodology for estimating throughput based on the amount of product produced, and the concentration of the chemical in the formulation.		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the use rate, and the concentration of the chemical in the formulation		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2004). Emission scenario document on additives in rubber industry.			
HERO ID:	4445826			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides total synthetic rubber production and synthetic and natural rubber consumption in various EU (including UK) countries indicating EU accounts for 25% of world synthetic rubber production, and percentage used for various end-use products, and market share of various rubbers.			
Process description:	Mastication and creation of mixtures, shaping, vulcanisation/curing			
Throughput:	Provides throughputs of various rubber products at a generic point source.			
Chemical concentration:	Provides conc. estimates based on additive function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment from 2004 and is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various additive functions, end-use products, and types of rubber.	
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario document on plastic additives.		
HERO ID:	5079084		
Conditions of Use:	Processing - Plastic Additives		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Provides % of polymers used for various end-use applications		
Life cycle description:	Plastics Compounding and Converting		
Process description:	Provides descriptions for a variety of closed, partially open, and open compounding and converting processing. Including the following compounding processes: tumbling, ball blending, gravity mixers, paddle mixers, intensive vortex mixers, banbury mixers, two roll mills, and extruder mixing. And the following converting processes: extrusion, injection molding, compression molding, extrusion blow molding, injection blow molding, film extrusion, extrusion coating, thermoforming, calendering, hand lay up, spray techniques, and filament winding. ESD also provides a break down of the % and volume of polymers used in each process in the UK.		
Throughput:	Provides methodology for estimating throughput of polymers and additives		
Number of sites:	4000 sites in UK		
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment from 2009 but is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering prevalence of various processing methods, additive functions, and plastics.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2011). Emission scenario document on the chemical industry.			
HERO ID:	6306753			
Conditions of Use:	Manufacture, processing, use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Manufacture, Formulation of processing aids, processing as a reactant, use of processing aids			
Process description:	General synthesis process consists of reaction, handling/transportation, isolation, handling/transportation, purification, handling/transportation, then either reaction to make another chemical or on to the next life cycle stage			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.	
	Metric 3: Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted (process description only)	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted (process description only)	
Overall Quality Determination		Medium		

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Hydraulic Fracturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	703-112,875 bbl/well-yr.			
Process description:	container unloading, storage, pumped into oil well, extracted, temporary storage tank or separation process, natural gas processing/refinery/disposal.			
Throughput:	1.29-3.86 million bbl oil/day.			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, oil production rate, and operating days.			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering on- and off-shore wells and chemical functions.	
Overall Quality Determination		High		

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.		
HERO ID:	6393282		
Conditions of Use:	Transportation and Storage		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	11 million tonnes shipped via rail tankers 30 million tonnes shipped via pipelines		
Process description:	On-site storage of chemicals, filling of containers, transport to distributors/downstream users/consumers, containers with residual chemical transported to recycling/cleaning or disposal site, empty/cleaned containers returned to distributor or production site		
Number of sites:	Container cleaning sites in UK: 40 for road tankers; 8 for steel drums; 8 for plastics drums; 6 for fibre drums; 13 for IBCs; 7 for hazardous waste containers		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical forms, containers and storage system types.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2004). Emission scenario document on textile finishing industry.			
HERO ID:	6558533			
Conditions of Use:	Manufacture of Textiles, Apparel, and Leather			
EXTRACTION				
Parameter	Data			
Process description:	Finishing agents applied from aqueous solutions/dispersions by means of foulards (padding machines), drying, curingAND/ORCoating and laminating applied via blade, spraying, and printing techniques.			
Throughput:	6-13 tonnes textile/day20-1,000 kg finishing agent/tonne textile			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple finishing agent types.
Overall Quality Determination			Medium	

Study Citation:	OECD, (2011). Emission Scenario Document on the application of radiation curable coatings, inks, and adhesives via spray, vacuum, roll, and curtain coating.			
HERO ID:	6568745			
Conditions of Use:	Coating, Ink, and Adhesive Application			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	0.7-69.84 million kg coating/ink/adhesive/yr.			
Process description:	Unloading from containers, dilute and mix (optional), application (roll, spray, curtain), UV/EB curing.			
Throughput:	Provides methodology for estimating throughput based on the amount of product produced, and the concentration of the chemical in the formulation.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the use rate, and the concentration of the chemical in the formulation.			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2021). Use of additives in plastic compounding – Generic scenario for estimating occupational exposures and environmental releases (Revised draft).			
HERO ID:	10366192			
Conditions of Use:	Plastics Compounding			
EXTRACTION				
Parameter	Data			
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2022). Emission scenario document on chemicals used in hydraulic fracturing (draft).		
HERO ID:	10366193		
Conditions of Use:	Hydraulic Fracturing Fluids		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	11,000,000 gallon/well-yr (50th percentile) Table 3-2 (pg. 27) give full statistics on the known use rates.		
Process description:	Receiving chemicals, transfer to storage tank, formulation of fracturing fluids, well injection, wastewater management		
Number of sites:	982,000 total wells in the U.S.		
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD is based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering different chemical functions and data provided by multiple facilities.
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2022). Commercial use of automotive detailing products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).			
HERO ID:	10480464			
Conditions of Use:	Automotive detailing products			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides methodology to estimate annual use rate based on number of cars, product used per car, and density of product.			
Process description:	Receive detailing products, dilute with water, application to vehicle through washing, polishing, and/or wiping.			
Throughput:	1 to 16 ounces of automotive detailing product per car.			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, annual throughput - 147,152 total establishments.			
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering different chemical functions.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
HERO ID:	10480466			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides methodology to estimate annual use rate.			
Process description:	Receive chemicals, weigh or measure chemical, add chemical to labware, dilute/add other laboratory chemicals, add sample, run analytical testing, dispose of sample and laboratory chemical waste.			
Throughput:	255 grams reagent/site-day (average); 2,000 mL reagent/site-day (average); Table 3-2 gives daily throughput for laboratory stock solutions.			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, annual throughput - 40,639 total establishments.			
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering different chemical functions.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11182966			
Conditions of Use:	Repackaging			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Table B-1 presents PMN data on repackaging rate in kg chemical/site-yr.			
Process description:	<p>Pre-manufacture notices (PMN) submitted from 2010 to 2020 under EPA’s New Chemicals Program indicated imported and repackaged chemicals can be solids or liquids and may be neat or in solutions/mixtures and contained in various packaging types. After they arrive at the repackaging site, repackaging operations occur where the chemical is transferred from the transport container it was imported in to a new one of a different size in order to meet the customer’s needs (JACO, 2021). Chemicals may also be transferred from original containers to intermediate storage containers before packaging into smaller containers (Cooke, 2013; NIOSH, 2009). Chemicals are expected to be received at repackaging sites in drums or larger bulk containers (supersacks, totes, tank trucks, etc.) (Cooke, 2013; NIOSH, 2009). The chemical of interest may be received in its final formulation and transferred directly from these large containers into smaller containers, charged to a temporary storage tank, or it may be charged to a mixing tank and diluted or mixed with other chemicals before it is repackaged. Once the chemical has been formulated to desired specifications, it can be repackaged. Workers may be potentially exposed during the unloading of chemicals from the original transport containers into temporary storage or new transport containers. Releases of chemicals may also occur during this stage, from open container surfaces (e.g., if the chemical is volatile), transfer operations (e.g., if the chemical is volatile or a powder), and original transport container disposal. Repackaging operations for liquid chemicals typically involve pouring or pumping the product from the original containers or mixing /storage tanks into the new containers. A study conducted by the Health and Safety Laboratory in the U.K. investigated two chemical repackaging sites (Cooke, 2013). At both of these sites the chemical was delivered to the site by road tanker and pumped into dedicated storage tanks. One of the sites, a hydrazine supplier, pumped the hydrazine into a mixing vessel where it was diluted with water and packaged into smaller containers for sale to customers. At the other site, trichloroethylene was pumped from storage tanks into a closed loop system where workers using a hydraulic lance connected to a semi-automated filling system transferred the chemical into new containers (Cooke, 2013). The usual process for repackaging solid chemicals differs from the processes for liquids. A NIOSH Health Hazard Evaluation Report (HHE) from 2009 investigated a repackaging facility that was transferring bulk shipments of silane-coated glass beads ranging between 0.2 – 1.2mm in diameter. At this facility, 2,200 lb supersacks of the product are lifted with a forklift over a metal bin, then cutting the bottom of the container with a knife to empty the beads into the bin. The metal bin is then lifted by a forklift, and the glass beads are poured into hoppers. From the hoppers the beads are gravity fed into smaller cardboard boxes or paper sacks that are shipped to customers (NIOSH, 2009). Workers may be potentially exposed during the transfer of chemicals from temporary storage into new transport containers. Releases of chemicals may also occur during this stage from open container surfaces (e.g., if the chemical is volatile), transfer operations (e.g., if the chemical is volatile or a powder), and cleaning any equipment that was used in during the process.</p>			
Number of sites:	Table 1-2 presents the number of repackaging sites based on 2019 U.S. Census data.			
Chemical concentration:	A fraction of completed IRERs from 2010-2020 were reviewed, 21 submissions contained information on chemical repackaging. In these submissions, chemicals were repackaged at concentrations ranging from 1% to 100%, with a 50th percentile of 93%, a 95th percentile of 100%, and a mode of 100%.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
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Study Citation:		U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).		
HERO ID:		11182966		
Conditions of Use:		Repackaging		
		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete use amounts provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple repackaging facilities.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11373493			
Conditions of Use:	Plastics Converting			
EXTRACTION				
Parameter	Data			
Process description:	Compounded resins received, unloaded, forming/molding/shaping, trimming, finishing (including coating operations)			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.			
HERO ID:	3827195			
Conditions of Use:	Processing: Plastic material and resin manufacturing (compounding)			
EXTRACTION				
Parameter	Data			
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging.			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic. 148-264 days/yr.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2014). Formulation of waterborne coatings - Generic scenario for estimating occupational exposures and environmental releases -Draft.		
HERO ID:	3827197		
Conditions of Use:	Formulation of Coatings		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	1.6-16 million kg coatings/site-yr		
Process description:	Unloading solid/liquid components from tank cars, totes, drums, or sacks and from filter replacement → pre-mixer (pigment dispersion), grinder (pigment dispersion), blending tank, filter, packaging.		
Throughput:	Provides methodology for estimating throughput based on the amount of coatings produced, and the concentration of the chemical in the coating.		
Chemical concentration:	Provides conc. estimates based on chemical function and coating type, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating applications, and multiple chemical functions
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.		
HERO ID:	6311218		
Conditions of Use:	Incorporation into article Plastic material and resin manufacturing; Incorporation into formulation, mixture, or reaction product Plasticizer in plastics material and resin manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	provides the North American Production (lb/yr) of the types of Thermoplastics from 2003 (page 3 of 18)		
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch (see page 8 for more detail on this step), extrusion/shaping, packaging (See page 4 and 10 of 18 for description)		
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic (page 11 of 18)		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic (page 11-12 of 18)		
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific. (see Table 3 on page 7 of 18)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).		
HERO ID:	6311221		
Conditions of Use:	Formulation and Use of Dyes and pigments (printing Inks)		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	11.9-373.8 million kg ink/yr (depending on printing application, page 28 and 37 of 54). Default is 2.0 million kg/site-yr (page 29 of 54)		
Process description:	PROC: Vehicle consisting of resin, solvent, drying agents, and resin plasticizing oils is prepared, pigment blended into vehicle, fed to dispersing mill, raw ink let down with additional solvent and other additives, packaged for sale. (page 22 of 54)USE: Provides descriptions for lithography, gravure, flexography, letterpress, digital priting, and screen printing. (page 22-27 of 54)		
Throughput:	Provides methodology for estimating throughput based on the amount of ink produced, and the concentration of the chemical in the ink for both PROC and USE		
Number of sites:	PROC: 13-239 (depending on printing application, Table 4 on page 28 of 54)USE: 454-18,622 (depending on printing application, Table 7 on page 37 and Table 8 on page 38)See page 29 of 54 for calculations to find this.		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific. (See the various formulas for defaults)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple printing applications, and multiple chemical functions
Overall Quality Determination		Medium	

Study Citation:	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385709			
Conditions of Use:	Flexographic Printing			
EXTRACTION				
Parameter	Data			
Process description:	ink received in drums, charged to ink chamber, flexographic press, ink in substrate product.			
Throughput:	1,800 kg ink/site-day (20 kg/hr x 4 presses x 7.5 hours x 3 shifts)			
Number of sites:	Provides methodology to estimate number of sites based on ink use rate and concentration of chemical in ink.			
Chemical concentration:	1-10%, general additive concentration not chemical or function specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385710			
Conditions of Use:	Formulation and use of dyes and pigments (printing inks)			
EXTRACTION				
Parameter	Data			
Life cycle description:	It was estimated that approximately 97% of all industrial end use printing activities can be categorized within five different printing processes: lithography, flexography, gravure, letterpress and screen printing (page 6 of 23).			
Process description:	PROC: Vehicle consisting of resin, solvent, drying agents, and resn plasticizing oils is prepared, pigment blended into vehicle, fed to dispersing mill, raw ink let down with additional solvent and other additives, packaged for sale. (page 6-8)USE: Provides descriptions for lithography, gravure, flexography, letterpress, digital priting, and screen printing. (page 10 - 13)			
Number of sites:	See Table 2-2 on page 7: A total of 4,221 sites from 2007 data			
Chemical concentration:	Of the reviewed 15 chemicals, 8 chemicals were manufactured or imported in 100% concentration; 7 chemicals were manufactured or imported in concentrations < 100%. (page 15-16 of 23)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	The GS is more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Uncertainty not addressed. Variability not addressed.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.			
HERO ID:	6385711			
Conditions of Use:	Plastics Converting			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Market data (Freedonia, 2013a) indicate that the demand for thermoplastic additives in the U.S. totaled approximately 1.5 billion kilograms in 2012 (page 23 of 96. Also see table 1-5 on page 23 for historical and forecasted US demand)			
Process description:	Compounded resins received, unloaded, forming/molding/shaping, trimming, finishing (including coating operations) (page 24 of 96 for diagram and description). More detailed process description on page 25-27.			
Throughput:	Provides methodology for estimating throughput (annual use rate, daily use rate, and number of batches) based on the amount of plastic produced, and the concentration of the chemical additive in the plastic among other factors (page 37-38 of 96)			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic (page 38-39)			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific (Table 1.1 and 1.2 on pages 15-17 of 96)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385719			
Conditions of Use:	Furniture Coating Application			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Metal: 5,000-446,600 L coating/yrWood: 4,326-4,372 L coating/yr			
Process description:	Metal furniture: Metal cleaning, coating unloaded, coating mixing, coating application (spray booth, manual or automatic), flash-off, drying oven Wood furniture: coating unloaded, coating mixing, coating application (spray booth, manual or automatic), flash-off, drying oven, sanding and other finishing operations			
Throughput:	Metal: 20-1,786 L coating/dayWood: 17.3-17.4 L coating/day			
Number of sites:	152-8,176			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and wood vs metal furniture uses
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385748			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plastics Compounding			
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging			
Throughput:	Op days: 148-264 days/yr. Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.	
Overall Quality Determination		High		

Study Citation:	Wypych, G. (2015). Health & safety and environmental impact. :413-439.			
HERO ID:	5633778			
Conditions of Use:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	DEHP is part of EPA’s of High Production Volume (HPV) chemicals, which means it is produced or imported at or above 1 million lbs/yr. (2/27)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Production volume is only characterized by a lower bound.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Wypych, G. (2020). Health and safety and environmental impact. :431-458.			
HERO ID:	7978600			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	DEHP is a High Production Volume chemicals which constitutes chemicals produced or imported in quantities of at least one million pounds per year in the United States. (1/28)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Production volume is only characterized by a lower bound.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	3M Company (2010). Material Safety Data Sheet: 3M™ Vinyl Tape 764, 766, 767, & 3903.			
HERO ID:	6302180			
Conditions of Use:	Plastic Compounding			
EXTRACTION				
Parameter	Data			
Chemical concentration:	10-30%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	3M Company (2018). 3M Scotchcast Poly Plus (Colors).			
HERO ID:	6302183			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
		EXTRACTION		
Parameter	Data			
Chemical concentration:	0.1-1.0%			
		EVALUATION		
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination		High		

Study Citation:	3M, (2011). Material Safety Data Sheet (MSDS): 3M™ Economy Vinyl Electrical Tape 1400, 1400C.			
HERO ID:	6302182			
Conditions of Use:	Fabrication of Final Product from Articles			
EXTRACTION				
Parameter	Data			
Chemical concentration:	7-10%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2011 which is more than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	3M, (2017). 3M One-Step Rust Converter, PN 3513.			
HERO ID:	6311435			
Conditions of Use:	Use of automotive care products			
EXTRACTION				
Parameter	Data			
Chemical concentration:	1-5%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.	
Overall Quality Determination		High		

Study Citation:	3M, (2019). 3M™ Finesse-It Polish - Finishing Material, 13084, 28792, 81235, 83058.			
HERO ID:	6311436			
Conditions of Use:	Application of paints, coatings, adhesives, and sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Product contains less than the EU regulatory maximum concentration value (0.1%) of phthalates.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Regulatory data sheet contains primary information from the manufacturer and does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	Regulatory data sheet is applicable to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Source is from 2020, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Value is only the regulatory limit.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	ACA, (2019). Comment submitted by Raleigh Davis, Assistant Director and Riaz Zaman, Counsel, Government Affairs, American Coatings Association (ACA) regarding the proposed 20 high priority candidates for chemical risk evaluation.			
HERO ID:	10369850			
Conditions of Use:	Coatings and adhesives			
EXTRACTION				
Parameter	Data			
Life cycle description:	The chemical is used in plasticizers. It’s used as an additive and found as an impurity in coatings, sealants and adhesives.			
Chemical concentration:	Specialty products may contain amounts above 10%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The data and data sources are not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	Low	No sample data is provided.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Accustandard, (2023). Safety Data Sheet (SDS): Phthalate Esters Mix in Methanol (M-606).			
HERO ID:	6302674			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.02%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Adams, R. C., Pretzer, W. R., Yokelson, H. B., Wilhelmi, M. A. (2004). Heat Aging Performance of Decorative Lighting Products. :31-35.		
HERO ID:	7978865		
Conditions of Use:	Processing: Plasticizer in plastic material and resin manufacturing		
EXTRACTION			
Parameter	Data		
Chemical concentration:	Table 1 provides overall plasticizer and relative DOP concentration in Decorative Lights (2002 – 2003 products). Relative concentration ranged from not reported (blank) to 89.7%. Table 2 provides relative DOP concentration in Decorative Lights (2003 – 2004 products). Relative concentration ranged from not reported (blank) to 100%.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by taking concentration measurements in products from different years but uncertainty is not addressed.
Overall Quality Determination		High	

Study Citation:	Afshari, A., Gunnarsen, L., Clausen, P. A., Hansen, V. (2004). Emission of phthalates from PVC and other materials. Indoor Air 14(2):120-128.			
HERO ID:	789522			
Conditions of Use:	PVC and Vinyl Flooring			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	9500 tonnes of phthalates (including DEHP) consumed in Denmark in 1992, much of it used for PVC and vinyl flooring			
Chemical concentration:	PVC flooring can contain 17 - 18.5% (Table 3)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Data sources, and/or techniques or methods used in the report are specified and information does not indicate quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations and volumes that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Airserco Manufacturing Company LLC (2009). Material Safety Sheet.			
HERO ID:	6311439			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<4.9%			
Physical form:	liquid			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	ANAMET Electrical Inc. (2012). Anaconda Type MTC Blk 1-1/4.			
HERO ID:	6302189			
Conditions of Use:	Plastic Compounding			
EXTRACTION				
Parameter	Data			
Chemical concentration:	% Weight Balance: 0-7.583%Weight grams/ft: 6.946885			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Aparicio, I., Santos, J., Alonso, E. (2009). Limitation of the concentration of organic pollutants in sewage sludge for agricultural purposes: A case study in South Spain. Waste Management 29(5):1747-1753.			
HERO ID:	697741			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Life cycle description:	Land application of sludge			
Chemical concentration:	Denmark fixed in 1996 concentration limit of 50 mg/kg for DEHP for land application of sludge. There is frequent detection of DEHP in dehydrated sludge at concentrations higher than the limit value of 100 mg/kg fixed by the EU for land application of sludge.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	APR, (2020). U.S. post-consumer plastic recycling data.			
HERO ID:	11360400			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”In 2020, a minimum of 4,803.8 million pounds of post-consumer plastic material sources in the U.S. was recovered for recycling in the categories of Bottles (by resin), Non-bottle Rigid, Film, and Other Plastics (excluding foam).”			
Life cycle description:	% of total recovered for recycling: All bottles: 57.1%PET Bottles: 36.8%HDPE Bottles: 19.6% PP & Other Bottles: 0.7%Non-bottle Rigid: 22.0%Film: 20.5%Other Plastics: 0.3%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for recycling, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A- extracted data is totals	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by describing amounts of recycled products for several categories but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:		APR, (2023). Model Bale Specifications: 1-7 ALL Rigid Plastics.			
HERO ID:		11374516			
Conditions of Use:		Recycling			
EXTRACTION					
Parameter		Data			
Process description:		Plastic recycling bale size is approximately 30"x42"x48"or30"x48"x60". Bale density is 15-20 lb/ft^3. Bales shouldbe heldtogetherwith10-12 gauge,noncorrosivegalvanized metal wire, with all bale wireswrapped in one direction (crisscrossing or double strapping should be preapproved by the buyer beforeshipping). A minimum number of balewires should be used to maintainbaleintegrity.The number will vary with bale size and density.Baleintegritymust be maintained throughout loading, shipping,unloading andstorage.Bales should be stored, withthe bottom bale on a pallet, indoorsor covered outdoors. Material must not be stored outdoors uncovered fora periodexceeding four (4)weeks toprevent UVdegradation from direct sunlight and moisture contamination.			
EVALUATION					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Data is from the U.S.
		Metric 3:	Applicability	High	Data is for recycling, which is an in-scope occupational scenario.
		Metric 4:	Temporal Representativeness	High	Data are less than 10 years old (2023).
		Metric 5:	Sample Size	N/A	N/A - Process description.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	N/A	N/A - Process description.
Overall Quality Determination				High	

Study Citation:	Arthur D. Little Inc, (1989). Migration of di(2-ethylhexyl) phthalate from polyvinyl chloride to non-penetrating external phases.			
HERO ID:	11328009			
Conditions of Use:	Plastics compounding			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Kodaflex Plasticizer dioctyl phthalate: 95.1% concentration by HPLC.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastics compounding, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Ashworth, M. J., Chappell, A., Ashmore, E., Fowles, J. (2018). Analysis and assessment of exposure to selected phthalates found in children’s toys in Christchurch, New Zealand. International Journal of Environmental Research and Public Health 15(2):200.			
HERO ID:	4198524			
Conditions of Use:	Use - Children’s Toys			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Table 3 provides % phthalate by mass of toys. For DEHP: 32 toys were 0-0.1% by mass, 1 toy was 0.1-1.0% by mass, 1 toy was 1.1-10% by mass, 6 toys were 10.1-20% by mass, 2 toys 20.1-30% by mass, 5 toys were 30.1-40% by mass, 1 toy was 40.1-50% by mass, 1 toy was 50.1-60% by mass. Max conc % by mass was 54.1, mean conc % by mass was 8.62 and median conc % by mass was 0.010.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	Axalta, (2021). Safety Data Sheet (SDS): Rapid Dry Multi-Surface Gray Primer.			
HERO ID:	6302534			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<1%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2024 which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Bang, D.,uY, Kyung, M., Kim, M., Jung, B.,uY, Cho, M. C., Choi, S., Kim, Y., Lim, S. K., Lim, D., Won, A., Kwack, S., Lee, Y., Kim, H., Lee, M.,u, B. (2012). Human Risk Assessment of Endocrine-Disrupting Chemicals Derived from Plastic Food Containers. Comprehensive Reviews in Food Science and Food Safety 11(5):453-470.			
HERO ID:	1335313			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	2003 production of phthalates in the EU was estimated to be 595,000 tons of DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so data likely to be accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for the EU which encompasses OECD countries
	Metric 3:	Applicability	High	Applicable to the manufacture of PA.
	Metric 4:	Temporal Representativeness	Medium	Data is less than 20 years old.
	Metric 5:	Sample Size	Low	Not characterized by statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Documents results and source generally described
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Bao, J., Wang, M., Ning, X., Zhou, Y., He, Y., Yang, J., Gao, X., Li, S., Ding, Z., Chen, B. (2015). Phthalate concentrations in personal care products and the cumulative exposure to female adults and infants in Shanghai. Journal of Toxicology and Environmental Health, Part A: Current Issues 78(5):325-341.			
HERO ID:	2816857			
Conditions of Use:	Use of Personal Care Products			
EXTRACTION				
Parameter	Data			
Process description:	PE are added to PCP as emollients, skin permeability enhancers, and stabilizers for color or fragrance (Parlett et al., 2013).			
Throughput:	Use rates and application frequency of personal care products in Table 1			
Chemical concentration:	Concentration in personal care products compiled in Table 3: ranges from 0 to 80 mg/kg			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	Uninformative	The report is from an occupational or non-occupationalscenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			Uninformative	

Study Citation:	Björklund, K. (2010). Substance flow analyses of phthalates and nonylphenols in stormwater. Water Science and Technology 62(5):1154-1160.		
HERO ID:	6813724		
Conditions of Use:	Production of plastics		
EXTRACTION			
Parameter	Data		
Life cycle description:	One of the most important sources of phthalates is flexible PVC, where 95% of the phthalates are used as plasticisers (ECB 2003a,b, 2004a,b). Flexible PVC is often used for coating on roofing and cladding sheets or in products such as tarpaulins, cable coating and hoses. The remaining 5% of the phthalate consumption involves non-PVC polymers and non-polymer uses, such as paints and sealants.		
Chemical concentration:	the phthalates make up 35% of the PVC material		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium	

Study Citation:	Bornehag, C. G., Lundgren, B., Weschler, C. J., Sigsgaard, T., Hagerhed-Engman, L., Sundell, J. (2005). Phthalates in indoor dust and their association with building characteristics. Environmental Health Perspectives 113(10):1399-1404.
HERO ID:	674952
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Worldwide phthalate production has been estimated to exceed 3.5 million tons/year. DEHP accounts for roughly 50% of overall phthalate production, although this percentage has been decreasing in recent years.
Life cycle description:	Most of the current DEHP production is used in PVC products, including PVC flooring, where it typically constitutes 30% of PVC by weight.
Chemical concentration:	Concentrations (mg/g dust) for different phthalates in settled dust from 346 bedrooms: DEHP - 1.310 (mean), 0.770 (median), 0.000–40.459 (range), 4.069 (95th percentile). DEHP concentrations depends on flooring: no-PVC – 0.700 and PVC – 0.868. This article has also presented association between concentration of DEHP in dust (>median) and building characteristics. This article has also presented concentration of DEHP in dust in different countries. As for example, in USA - 340 ug/g (50th percentile) and 854 ug/g (95th percentile). The main finding from this study is that the concentrations of DEHP in dust are associated with the amount of PVC/vinyl used as flooring and wall material in the home, but that there are also many other sources of these phthalates. Although PVC flooring and vinyl on walls do not fully explain the concentration of phthalates in dust, occurrences of such materials are associated with higher concentrations of DEHP in dust indoors.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Provides only limited discussion of the variability in the determinants of exposure but no discussion of the uncertainty in the exposure estimates.

Overall Quality Determination	High
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Study Citation:	Brown, S. L., Chan, F. Y., Jones, J. L., Liu, D. H., McCaleb, K. E., Mill, T., Sapios, K. N., Schendel, D. E. (1975). Research program on hazard priority ranking of manufactured chemicals: Phase II - Final report (chemicals 41-60).			
HERO ID:	17495			
Conditions of Use:	Manufacturing, Processing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		441.5 mil lbs/yr manufactured, 435.0 mil lbs/yr consumed		
Number of sites:		12		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Medium	Report does not specify the data gathering method used.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Data are from the U.S.
		Metric 3: Applicability	High	Data are for manufacturing and processing, in-scope occupational scenarios.
		Metric 4: Temporal Representativeness	Low	1975: Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
		Metric 5: Sample Size	High	Provides industry data.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Bruck, S. D. (1982). The need for better plastic materials for disposable medical applications: Public health benefits and industrial developments. International Journal of Artificial Organs 5(2):85-86.			
HERO ID:	5753581			
Conditions of Use:	Commercial Use - Plasticizer in Medical devices			
EXTRACTION				
Parameter	Data			
Chemical concentration:	PVC contains up to 45% by weight DEHP plasticizer			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Unclear if source is peer reviewed. Appears to use high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	Low	Data is for medical device exposures during treatment and surgery. Not an occupational scenario outlined but could be applied to some commercial uses.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old (1982)
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents results and data, provides exposure route and estimates of exposure during treatment/surgery.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Cadogan, D., Howick, C. (2000). Plasticizers.			
HERO ID:	6311430			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Worldwide consumption of plasticizers is estimated at 3.5 x 10^6 t and is of the order of 1 million tons in Western Europe. In Western Europe, DEHP accounts for about 50% of all plasticizer usage.			
Process description:	Manufactured by the dimerization of butyraldehyde, and the butyraldehyde itself being synthesized from propylene.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Cao, X. L. (2010). Phthalate esters in foods: Sources, occurrence, and analytical methods. Comprehensive Reviews in Food Science and Food Safety 9(1):21-43.		
HERO ID:	1322045		
Conditions of Use:	Plasticizer		
EXTRACTION			
Parameter	Data		
Chemical concentration:	Like many other PVC products, plasticizers such as phthalates are used in PVC tubing to make it more flexible, and among which DEHP is the most frequently used with as much as 40% in the tubing. (2/23) DEHP was detected in the cap gaskets used in 7 of the 21 domestic (Japan) bottled food products with levels ranging from 19.6% to 31.2%. PVC gloves used in the preparation of the foods contained up to 41.0% of DEHP. (5/23)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality techniques that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3: Applicability	Low	Data are for consumer use of plastic products, which is similar to commercial use of plastic products, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by reporting ranges of concentrations. Uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation:	Cao, X. L. (2010). Phthalate esters in foods: Sources, occurrence, and analytical methods. Comprehensive Reviews in Food Science and Food Safety 9(1):21-43.			
HERO ID:	1322045			
Conditions of Use:	Dyes, pigments, and fixing agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP is part of printing ink formulations from 2-8%. (4/23)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality techniques that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of printing inks, which is similar to commercial use of printing inks, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by reporting ranges of concentrations. Uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Castle, L., Mayo, A., Gilbert, J. (1989). Migration of plasticizers from printing inks into foods. Food Additives and Contaminants 6(4):437-443.			
HERO ID:	790189			
Conditions of Use:	Consumer Use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Food Packaging			
Chemical concentration:	In food wrapping: <0.1 -0.7% w/w			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Uninformative	The report is from an occupational or non-occupationalscenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by samples collected from multiple wrappers, but uncertainty is not addressed.
Overall Quality Determination			Uninformative	

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Life cycle description:	DEHP is primarily used to produce flexibility in plastics, mainly PVC, which is used for many consumer products, toys, packaging film, and blood product storage and intravenous delivery systems.			
Chemical concentration:	Concentrations of DEHP in plastic materials may reach 40% by weight. DEHP has been removed from or replaced in most toys and food packaging in the United States. Urinary concentrations of MEHP, a DEHP metabolite, (geometric mean, ug/L) are as follows: males – 2.56 to 4.31, females – 2.15 to 4.23. Similar data is available for different age ground and difference race/ethnicity. Data for other metabolites of DEHP are also available.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty
Overall Quality Determination		Medium		

Study Citation:	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.			
HERO ID:	10442901			
Conditions of Use:	Industrial application of coatings by spraying			
EXTRACTION				
Parameter	Data			
Throughput:	Typical maximum daily usage, for any one substance, based on sector knowledge 1000 kg product/day at any one location. Pigment/extender/filler: 100 kg/dayBinder: 100 kg/dayWater: 350 kg/dayOrganic solvent/coalescent: 450 kg/dayAdditives: 5 kg/day			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Data is from CEPE SpERC 8.3. The report uses high quality data and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, DEHP is not mentioned.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	Low	No distribution of samples provided for throughput.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.			
HERO ID:	10442902			
Conditions of Use:	Application of coatings and inks by spraying			
EXTRACTION				
Parameter	Data			
Throughput:	Typical maximum daily usage, for any one substance, based on sector knowledge 100 kg product/day at any one location.Pigment/extender/filler: 10 kg/dayBinder: 10 kg/dayWater: 35 kg/dayOrganic solvent/coalescent: 45 kg/dayAdditives: 0.5 kg/day			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Data is from CEPE SpERC 8.3. The report uses high quality data and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, DEHP is not mentioned.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	Low	No distribution of samples provided for throughput.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	CertiPrep., SPEX (2017). Safety data sheet: Phthalates in polyethylene standard w/BPA.			
HERO ID:	6301542			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.3% by weight			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The document only provides a discrete value.
Overall Quality Determination			High	

Study Citation:	CertiPrep., SPEX (2017). Phthalates in polyethylene standard: Safety data sheet.			
HERO ID:	6301560			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.3% DEHP by weight			
Comments:	Source has two SDS PDFs. This submission is for 6301560_784022_6301560.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2022, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	CertiPrep., SPEX (2017). Phthalates in polyethylene standard: Safety data sheet.			
HERO ID:	6301560			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.3% DEHP by weight			
Comments:	Source has two SDS PDFs. This submission is for 6301560_688717_6301560.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	CertiPrep., SPEX (2016). Safety Data Sheet (SDS): Haloethers & Phthalates.			
HERO ID:	6302559			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	CertiPrep., SPEX (2017). Safety data sheet: Phthalate standard.			
HERO ID:	6302569			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	CertiPrep., SPEX (2023). Safety Data Sheet (SDS): bis(2-Ethylhexyl)phthalate.			
HERO ID:	6302570			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	CertiPrep., SPEX (2017). Safety data sheet: Phthalates in Poly(vinyl chloride).			
HERO ID:	6984560			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.3%			
Physical form:	solid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	CETCO, (2019). Material Safety Data Sheet (MSDS): LDC 60V.			
HERO ID:	6311441			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<1%			
Physical form:	solid paste			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Chakraborty, P., Sampath, S., Mukhopadhyay, M., Selvaraj, S., Bharat, G. K., Nizzetto, L. (2019). Baseline investigation on plasticizers, bisphenol A, polycyclic aromatic hydrocarbons and heavy metals in the surface soil of the informal electronic waste recycling workshops and nearby open dumpsites in Indian metropolitan cities. Environmental Pollution 248(Elsevier):1036-1045.
HERO ID:	5433039
Conditions of Use:	Disposal - electronic waste

EXTRACTION	
Parameter	Data
Production, import, or use volume:	In 2014: estimated amount of global e-waste generated was approximately 41.8 million tons with only 15% generated waste recycled. Developing countries, e-waste is expected to represent about 1% of total solid waste. Asia contributed 38% of global e-waste generated in 2014. India generated 5.9 MT of domestic hazardous waste and imported 6.4 MT of which 50,000 tons was e-waste. Of e-waste generated in India, about 95% are recycled. Approximately 0.35 MT of e-waste plastic were generated and is expected to increase to 0.88 by 2018. In e-waste, up to 30% by weight comprises plastic materials and epoxy resins.
Process description:	Operational procedures in recycling e-waste by the informal sectors include dismantling, shredding, precious metals extraction by acid leaching.
Chemical concentration:	Fig 2 gives percentage of waste DEHP consisted of at different facilities: EWD - ~5%; EWS - ~5%; EWR - ~80%; DS - ~10%

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so methodology is likely to be accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is for India, a non-OECD country.
	Metric 3:	Applicability	Low	Data is for informal sector of waste dismantling and includes municipal dumpsites.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes release media and activity of source.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different sources of release in the same industry. Does not address uncertainty.

Overall Quality Determination	Medium
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Study Citation:	Chang, C. T., Chiou, C. S. (2006). Assessment of control strategies for reducing volatile organic compound emissions from the polyvinyl chloride wallpaper production industry in Taiwan. Journal of the Air and Waste Management Association 56(5):611-617.			
HERO ID:	1333868			
Conditions of Use:	Processing: Plasticizer in all other basic organic chemical manufacturing; custom compounding of purchased resins; miscellaneous manufacturing; paint and coating manufacturing; plastics material and resin manufacturing; plastics product manufacturing.			
EXTRACTION				
Parameter	Data			
Process description:	The process involved dissolving PVC in solvents, coating paper with rollers, drying in ovens, embossing base PVC wallpaper with rollers and surface treatments. The coating process involved adding some solvents as thinners and additives.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 yearsbut no more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination		Medium		

Study Citation:	Chao, K. P., Huang, C. S., Wei, C. Y. (2015). Health risk assessments of DEHP released from chemical protective gloves. Journal of Hazardous Materials 283(Elsevier):53-59.			
HERO ID:	2718083			
Conditions of Use:	Laboratory use of nitrile and PVC gloves.			
EXTRACTION				
Parameter	Data			
Chemical concentration:	PVC gloves used in food preparation were 22-41% by weight DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed, analytical methodology is likely accurate.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for Taiwan, a non-OECD country.	
	Metric 3: Applicability	Low	Data is for dermal exposure of DEHP in nitrile and PVC gloves based on a specific solvent permeating through the glove into the skin. Likely not applicable to a occupational scenario.Related COU would be DEHP used in plastics which is used for plastic gloves (this may be relevant for understanding leaching of DEHP from plastic glove.)	
	Metric 4: Temporal Representativeness	High	Data is from 2015 so less than 10 years old.	
	Metric 5: Sample Size	Medium	Range of data for the permeability and dose data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report documents results, methods and assumptions in its analytical technique and calculations. Generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by the different chemicals used to determine what the dermal dose would be. Does not address uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Chao, K., Huang, C. S., Wei, C. Y. (2013). Extraction and percolation of PAEs from chemical protective gloves. Polymer Testing 32(8):1551-1557.			
HERO ID:	2346103			
Conditions of Use:	Chemical protective gloves.			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP extracted concentration varied by extraction chemical. Chemicals were Acetone, Ethyl ether, Hexane, and Methanol. DEHP conc in gloves (mg/g glove) from solvents on extraction: Neoprene - 0.071 +/- 0.016; 0.077 +/- 0.015; 0.111 +/- 0.026; 0.027 +/- 0.015. Nitrile: 0.242 +/- 0.036, 0.259 +/- 0.033, 0.525 +/- 0.061, 0.197 +/- 0.039. PVC glove: 4.451 +/- 0.231, 4.553 +/- 0.286, 9.277 +/- 0.267, 2.395 +/- 0.156. DEHP was extracted at different temperatures using hexane at 20, 40, 60 and 80 C. Neoprene: 0.136 +/- 0.026, 0.401 +/- 0.099, 0.527 +/- 0.075, 0.541 +/- 0.035. Nitrile: 0.582 +/- 0.072, 0.851 +/- 0.092, 0.905 +/- 0.046, 0.947 +/- 0.052; PVC: 12.101 +/- 0.267, 16.685 +/- 0.323, 24.336 +/- 0.516, 24.689 +/- 0.457.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Unclear if source is peer reviewed, source is controlled lab study and appears to be high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3:	Applicability	Medium	Data is not explicitly for an occupational scenario but could be applied to one where workers are required to wear neoprene, nitrile or PVC protective gloves.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old (2013)
	Metric 5:	Sample Size	Medium	Characterized by a range of data with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides data sources, methods, results and assumptions and are generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different protective gloves and evaluating extraction of DEHP at different temperatures with different solvents. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Chem., HB (2014). Safety Data Sheet (SDS): DOP.			
HERO ID:	6302422			
Conditions of Use:	Manufacturing/Plastic Compounding			
		EXTRACTION		
Parameter	Data			
Chemical concentration:	100% by weight			
		EVALUATION		
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2014 which is more than 10 but less than 20 years old
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Chem., HB (2015). Safety Data Sheet (SDS): DOP DLD Drum.			
HERO ID:	6302435			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	72% by weight			
Physical form:	solid powder			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Chem., HB (2015). Safety Data Sheet (SDS): VINOPRENE 647.			
HERO ID:	6302450			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	38-44% by weight DEHP.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for rubber manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Concentrations are given in a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	Chem., HB (2019). Safety Data Sheet (SDS): HB C-90.			
HERO ID:	6302452			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	7-13%			
Physical form:	solid free flowing powder			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2019 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Chien, Y. C., Ton, S., Lee, M. H., Chia, T., Shu, H. Y., Wu, Y. S. (2003). Assessment of occupational health hazards in scrap-tire shredding facilities. Science of the Total Environment 309(1-3):35-46.			
HERO ID:	1488993			
Conditions of Use:	Disposal - recycling of tires			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	It is estimated that 2.4 million t (~300 millions) of scrap tires was generated in the US in 1990, a large portion (70%) of which were disposed of in landfills or dump piles, creating potential problems of environmental hygiene and fire hazard (Jang et al., 1998; EPA, 1991)			
Process description:	Tire shredding is primarily a physical process that breaks down the structure of tire and involves the production of heat, noise and particulates. Typically, water spray mist is added during the first one or two chopping stages for lubrication, reducing both temperature and particulate generation to some degree. Whole tires are fed via conveyor into a super chopper, which shreds them into large chunks. These chunks are then transferred to heavy shredders, where they are chipped into pieces of a few square inches. These chips can then be used to power energy-demanding industries, such as pulp mills and cement plants, as TDF. Alternatively, the tire chips can be ground still further using a series of granulators to produce rubber crumbs of different sizes. Meanwhile the other two major tire components, i.e. steel and textile, are retrieved during the crumbing processes using magnetic and vibration/density separators.			
Throughput:	The average process loadings for plants A and B were 26 500 and 55 000 kg per day, respectively.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.	
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Study Citation:	Chien, Y. C., Ton, S., Lee, M. H., Chia, T., Shu, H. Y., Wu, Y. S. (2003). Assessment of occupational health hazards in scrap-tire shredding facilities. Science of the Total Environment 309(1-3):35-46.		
HERO ID:	1488993		
Conditions of Use:	Disposal - recycling of tires		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	Christia, C., Poma, G., Harrad, S., Wit, De, C. A., Sjostrom, Y., Leonards, P., Lamoree, M., Covaci, A. (2019). Occurrence of legacy and alternative plasticizers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption. Environmental Research 171:204-212.			
HERO ID:	5772597			
Conditions of Use:	Household use (dust exposure)			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	More than 90% of all phthalates were used in the production of PVC in 2012 in Europe. ECHA 2018 - DEHP manufacture/import volume (ton/yr) - 10,000-100,000.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed which would indicate high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Low	Data is dust concentration in homes, offices, and classrooms. Not occupational exposures.
	Metric 4:	Temporal Representativeness	High	Data is from 2019.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different indoor environments across different countries. Does not address uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Clement Associates., Inc. (1989). Human health risk assessment for the Ciba-Geigy St Gabriel, LA incineration project with cover letter dated 042789. 890000189:#86-890000189.
HERO ID:	1335586
Conditions of Use:	Disposal - incineration

EXTRACTION	
Parameter	Data
Process description:	Incinerators are liquid incinerator and rotary kiln incinerators. Liquid incinerator is a multi-component facility designed to burn both aqueous and liquid organic wastes as well as certain other wastes. Contains waste feed storage tanks, a thermal oxidizer (incinerator), quench pot and secondary quench, a hydro-sonic off-gas scrubber system, and a vent stack. Follows from the waste feed tanks through the eventual emission of gases to the atmosphere. Control of the facility is accomplished through a sophisticated computerized system when gives the operators instantaneous feedback about conditions inside the unit. Rotary kiln incinerator includes various waste feed tanks, hoppers, and conveyers, the incinerator, a secondary combustion chamber, a quench chamber, particulate conditions, scrubber system, and vent stack. Followed from the introduction of the feed into the kiln to the final emissions into the atmosphere.
Throughput:	7,950 lb/hr fed into liquid incinerator.
Comments:	All data characterized as simply "phthalates" but in trial burns, DEHP consisted of 28% of total phthalates so it was selected as the "surrogate" phthalate for the assessment.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is a TSCA submission so likely to be accurate and cover all release sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	Medium	Data is for on-site disposal of DEHP however does not state what the waste is a result of.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination	Medium
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Study Citation:	Co., Glidden (1999). Material Safety Data Sheet (MSDS): Woodmaster polyurethane clear finish-gloss.			
HERO ID:	6311446			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter		Data		
Chemical concentration:		0.01-0.1% by weight		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Source is from 1999 which is more than 20 years old
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Comet, (2016). Safety Data Sheet (SDS): Dioctyl phthalate.			
HERO ID:	6302245			
Conditions of Use:	Plastic Compounding			
		EXTRACTION		
Parameter	Data			
Chemical concentration:	100%			
		EVALUATION		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Cordeiro, C. F., Petrocelli, F. P. (2005). Vinyl acetate polymers.			
HERO ID:	10186827			
Conditions of Use:	Processing: Plasticizer in adhesive manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizers are added to emulsion adhesives to modify several properties of both the emulsion and the finished adhesive film. By softening the polymer particles dispersed in the emulsion and increasing their mobility, plasticizers cause them to flow together more easily. This usually increases the viscosity of the emulsion and tends to destabilize it for faster breaking and setting speeds at the time it is applied. In addition, the increased softness and mobility help the emulsion to wet smooth, nonporous surfaces, eg, films, foils, and coated papers, thereby increasing its adhesion to them. Also, the softened polymer particles coalesce more rapidly and at a lower temperature than is possible with the unplasticized emulsion. This improved coalescence increases the water resistance of the adhesive film.			
Comments:	Plasticizers are usually highboiling esters, eg, phthalates. Report discusses plasticizer in general and their effect on the final product.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The information is for an occupational scenario within the scope of the risk evaluation but information is general to plasticizers and not specific to DEHP.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A for extracted information.
Overall Quality Determination			High	

Study Citation:	Corea-Téllez, K., Bustamante-Montes, P., García-Fábila, M., Hernández-Valero, M., Vázquez-Moreno, F. (2008). Estimated risks of water and saliva contamination by phthalate diffusion from plasticized polyvinyl chloride. Journal of Environmental Health 71(3):34-9, 45.			
HERO ID:	697766			
Conditions of Use:	Use as plasticizer			
EXTRACTION				
Parameter	Data			
Life cycle description:	DEHP is used in flooring, wall coverings, food container and wraps, personal care and medical products, as a solvent and plasticizer for cellulose acetate, and in the manufacturing of lacquers, varnishes, and coatings.			
Process description:	Plasticization consist of mixing rigid plastic (thermoplastic) with a low molecular weight substance (the plasticizer) to obtain a flexible material.			
Chemical concentration:	Phthalate concentrations in plasticized PVC can reach as high as 60% of the materials weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The plastics tested in the study appear to be from a non-OECD country (Mexico). The regulations governing the contents in these articles may be different than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

Study Citation:	Cornak, S., Jarosova, A. (2013). The screening of phthalic acid esters in operating fluids of vehicles. Applied Mechanics and Materials 436:153-157.		
HERO ID:	2346094		
Conditions of Use:	Industrial use of automotive care products (lubricant and oils)		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Mid-90s, nearly 600,000 tons were made in Europe yearly. More than 2 million tons of DEHP is produced worldwide [2005].		
Chemical concentration:	Final product of plastic materials may contain up to 40% of plasticizer. 10 samples taken of different automobile operational materials: plastic lubricants EP-2 - 7.36 mg/kg; Plastic lubricants G3 - 4.39 mg/kg; Vaseline - 0.34; Konkor oil - <0.20; Conservative oil for CV 2 enginer - 94.60; Oil for two-stroke enginer - <0.0; Gear oil 80W/90 - 9.40; Silicon oil - 0.0; Multigrade engine oil 15W/40 - <0.20; Engine oil Castrol 0W/40 - 2.79		
Exposure route:	inhalation, dermal, and oral.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data and sound methods not from frequently used sources but does not indicate flaws or issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for Switzerland, an OECD country.
	Metric 3: Applicability	High	Data is directly applicable to COU of automobile care products.
	Metric 4: Temporal Representativeness	High	Report is less than 10 years old, chemical concentration data is less than 10 years old. PV data is over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range of data based on the sample.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Sources, methods and results are documented and sources are generally apparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by testing various different automobile care products. Does not address uncertainty.
Overall Quality Determination		Medium	

Study Citation:	CPSC, (2015). Exposure assessment: Potential for the presence of phthalates in selected plastics.		
HERO ID:	5155510		
Conditions of Use:	Processing as catalyst.		
EXTRACTION			
Parameter	Data		
Process description:	DEHP identified in both Polypropylene and Acrylonitrile butadiene styrene. Polypropylene (PP): Phthalates are not used as additives however Ziegler-Natta catalysts are used in the production of PP and these catalysts are prepared using magnesium- and titanium (IV) chloride and an internal donor, which is very often a phthalate such as DEHP. 3 methods of production of PP: Slurry Polymerization (also called solvent polymerization)- the common manufacturing process when PP production started, involves carrying out the polymerization in an inert hydrocarbon solvent such as hexane or heptane, which eliminates catalyst activity. Bulk polymerization (or mass polymerization) - the common manufacturing process that followed the slurry polymerization process, unlike slurry polymerization, does not need the use of hexane or heptane solvents. Instead, it uses higher pressure and liquefied propylene as the diluent for the slurry. It eliminates unwanted products of the polymerization reaction. Gas phase polymerization process- the primary current process used in which the propylene and solid catalyst (such as Ziegler-Natta catalysts) are contacted together and then polymerization takes place in either the fluidized-bed reactor or the stirred bed process at the higher pressure as used in bulk polymerization. This process is a more convenient process in production of homopolymer and copolymer and is the most common process used in modern plants among the several processes in polypropylene production. DEHP is not specific to be used in the manufacturing of ABS.		
Chemical concentration:	The catalysts used in production of Polypropylene, Polyethylene, and High Impact Polystyrene may have phthalates that my survive the polymerization process and the phthalates may theoretically be present in concentrations of about 1 mg/kg in the final pellets. Based on test results the phthalate values do not exceed 0.15 mg/kg (0.15 ppm or 0.00001 weight %) and they are often below the threshold of the analytical method of 0.01 mg/kg (0.000001 weight %). Reported studies state 3-12 ppb of DEHP in coffee capsules, coffee pods and moka pots. Microwaved PP containers with water in it after 10 minutes had less than 6 ppb of several phthalates. DEHP identified at 40 mg/kg (40 ppm +/- 5 ppm) with ABS.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data but is not from frequently used sources however it does not indicate any quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Report created by US Consumer Product Safety commission however sampled data is from OECD countries.
	Metric 3: Applicability	High	Report is about the chemical process to create the plastic and that the catalyst used may contain DEHP.
	Metric 4: Temporal Representativeness	High	Process data is from 2014 and is less than 10 years old.
	Metric 5: Sample Size	Low	Mostly qualitative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents data sources, results and methods but is generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by looking at multiple plastics and identifying they all use the same catalyst that could contain DEHP. Does not address uncertainty.
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Study Citation:	CPSC, (2015). Exposure assessment: Potential for the presence of phthalates in selected plastics.		
HERO ID:	5155510		
Conditions of Use:	Processing as catalyst.		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	Deng, Y., Bonilla, M., Ren, H., Zhang, Y. (2018). Health risk assessment of reclaimed wastewater: A case study of a conventional water reclamation plant in Nanjing, China. Environment International 112:235-242.			
HERO ID:	4728647			
Conditions of Use:	Disposal - wastewater			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Concentrations of DEHP from reclaimed wastewater treatment units (ng/L) are as follows: oxidation ditch – 4.1e4 +/- 5.8e3, coagulation tank – 3.5e4 +/- 5.5e3, biological aerated filter – 4.4e4 +/- 4.7e3, ultraviolet disinfection pool – 3.7e4 +/- 2.8e3			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty in the results.	
Overall Quality Determination		High		

Study Citation:	Dirven, A.,M, H.A., Broek, v.d., H., P.H., Arends, M., A.M., Nordkamp, H. H., Lepper, de, G.,M, A.J., Henderson, P. T., Jongeneelen, F. J. (1993). Metabolites of the plasticizer di(2-ethylhexyl)phthalate in urine samples of workers in polyvinylchloride processing industries. International Archives of Occupational and Environmental Health 64(8):549-554.		
HERO ID:	68266		
Conditions of Use:	Processing		
EXTRACTION			
Parameter	Data		
Process description:	Hexaplas DOP was added to recycled PVC together with coloring materials, dibutylphthalate, and other additives. The mixture was warmed and mixed in a semiopen "papienheimer" at 160C After 30 min the liquid PVC paste was transported to an extruder (working temperature 170 °C) Granules were cooled in water and stored for further processing Production occurred in a batchwise manner. PVC paste was produced from DEHP, PVC granules, and other additives in a closed, batchwise process (temp 200 degrees.)		
Throughput:	Boot Factory: 30 tonnes/week, Cable Factory: 12500 kg/week		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data from NIOSH methods.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination	Medium		

Study Citation:	Dixit, S., Yadav, A., Dwivedi, P. D., Das, M. (2015). Toxic hazards of leather industry and technologies to combat threat: a review. Journal of Cleaner Production 87(Elsevier):39-49.
HERO ID:	2952861
Conditions of Use:	Processing or industrial use in leather. Disposal.

EXTRACTION

Parameter	Data
Production, import, or use volume:	1.68 x 10 ⁹ m ² of leather made annually around the world (2001)
Life cycle description:	Fig 1 provides all possible technological operations from raw hide to finished product: raw hide → pre tanning (trimming, soaking, liming, unhairing, reliming, fleshing, deliming, bating, scudding, pickling) → pelt → tanning (chrome/vegetable-tanning, basification, piling) → Wet Blue leather → Post tanning operations (sammying, splitting, shaving, re-chroming, neutralization, re-tanning, fat-liquoring, dyeing, setting, drying) → Crust Leather → Finishing operations (conditioning, staking spraying/roller coating, toggling, trimming buffing, measuring, plating/polishing) → finished product.
Process description:	Manufacturing process for leather preparation can be divided into 3 basic sub-processes: preparatory stage/beam house stage, tanning stage and crusting stage. Surface coating may be an addition step into the leather process. Preparatory stage or the beam house operation stage is carried out when the hide/skin is prepared for tanning. This stage includes preservation, soaking, liming, unhairing, fleshing, splitting, reliming, deliming, bating, degreasing, bleaching, pickling and depickling. At the onset, the hides are trimmed and soaked not only to restore the lost moisture during curing but to get rid of salt and other solids. Subsequently, the hides are fleshed to remove excess tissue, muscles or fat adhering to the hide so that uniform thickness may be obtained. Dehairing is performed mostly by liming process using a series of drums containing lime liquors (calcium hydroxide) and sharpening agents, however thermal, oxidative, and chemical methods may also be applied. The softness and flexibility to the leather may be obtained by bating and deliming, which is performed by keeping the hides in a solution of ammonium salt dissolved in water along with proteolytic enzymes at 27-32C. Pickling is required as the next step to adjust the acidity with the use of a brine solution and sulphuric acid. Tanning converts the rawhide or skin into a stable material that dries out to a flexible form without putrefying and becomes suitable for a wide variety of end applications. In general, depending upon the end application of the leather, two tanning methods is used; vegetable tanning or chrome tanning. The process of vegetable tanning usually requires 3 weeks so that the dye penetrates to the hide. Further, the hides are dipped in sodium bicarbonate or sulphuric acid drums for bleaching and for the removal of tannins bound to the surface. Before set out to dry, lignosulfate, corn sugar and oils may be added to the leather and then it undergoes further finishing steps. Chrome tanning is done by the reaction between the hide and trivalent chromium salt, most commonly basic chromium sulphate. At pH 3 the tanning materials are introduced and the pH is raised. The soaking, fleshing, liming/dehairing, deliming, bating, and pickling and the drying/finishing steps are essentially the same as in the case of vegetable tanning except that an additional processes of retanning, dyeing, and fat liquoring to produce usable leathers. Many a times oil is applied on the skin before leather drying to replace the natural oil lost during beam house and tanyard processes; this step is called fat liquoring. The leather is thereafter wrung, set out, dried, and finished. The pH of chrome tanned leather finish between 3.8 and 4.2. Chrome-tanned leather is more superior to vegetable tanned leather due to its softness, high thermal and water stability and less time consuming. Almost all leather made from the skin of sheep, lambs, goats, pigs is chrome tanned. Crusting takes place after the thinning, re-tanning and lubricating of the hide. Sometimes dye is also added in this process. During crusting, the chemicals added have to be fixed followed by drying and softening process. Crusting involves several steps like wetting back, sammying, splitting, shaving, re-chroming, neutralization, re-tanning, dyeing, fat liquoring, filling, stuffing, stripping, whitening, fixating, setting, drying, conditioning, milling, staking, and buffing. Finishing process consists of surface coating that include: oiling, brushing, padding, impregnation, buffing, spraying, roller coating, curtain coating, polishing, plating, embossing, ironing, combing (for hair-on), glazing and tumbling.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Journal article is peer reviewed so data is highly accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is from India, a non-OECD country.
	Metric 3: Applicability	Medium	Data is similar to what would be employed in a waste facility that produces leather products.

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Study Citation:		Dixit, S., Yadav, A., Dwivedi, P. D., Das, M. (2015). Toxic hazards of leather industry and technologies to combat threat: a review. Journal of Cleaner Production 87(Elsevier):39-49.		
HERO ID:		2952861		
Conditions of Use:		Processing or industrial use in leather. Disposal.		
Domain		Metric	EVALUATION	
			Rating	Comments
		Metric 4:	Temporal Representativeness	Medium
		Metric 5:	Sample Size	Low
Domain 3: Accessibility/ Clarity				
		Metric 6:	Metadata Completeness	Medium
Domain 4: Variability and Uncertainty				
		Metric 7:	Metadata Completeness	Medium
Overall Quality Determination			Medium	

Study Citation:	DJECO (2018). Safety data sheet: Glitter Boards.			
HERO ID:	6302640			
Conditions of Use:	Fabrication of final product from articles			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP was below the limit of detection in various glitter-containing products. It was, however, detected in the coating used for the brush handles at 0.006%(p9).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for fabrication of final products from articles. , an in-scope occupational sce- nario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Unclear on if one sample was tested or if the value represents the average of the sam- ples.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Sample size are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple products but uncertainty is not addressed.
Overall Quality Determination		High		

Study Citation:	Dobrzyńska, M. M. (2016). Phthalates - widespread occurrence and the effect on male gametes. Part 1. General characteristics, sources and human exposure. Roczniki Państwowego Zakładu Higieny 67(2):97-103.			
HERO ID:	3230347			
Conditions of Use:	Consumer use - gen pop exposure for indoor air			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	50% of total used phthalates is DEHP			
Chemical concentration:	Plastics may contain 1-40% DEHP by weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so methodology is likely highly accurate.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Source is from Poland, an OECD country.	
	Metric 3: Applicability	Low	Data is for gen pop exposure in indoor air and rest is urinary metabolite data for more gen pop.	
	Metric 4: Temporal Representativeness	High	Report is from 2015 and sampling data is from 2013, so less than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	DOE,, WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.		
HERO ID:	10454465		
Conditions of Use:	Vinyl flooring		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	It was estimated that vinyl flooring sold in Washington each year contributes 4,500 – 16,800 metric tons of phthalates to our homes, workplaces, and schools and 0.15 metric tons of phthalates to the environment. Recent national estimates of the sales of resilient flooring, a category of flooring comprised largely of types of vinyl flooring, range from \$3.68 billion in 2016 (Floor Covering Weekly, 2017) to \$4.5 billion in 2019 (Resilient Floor Covering Institute, 2019), the lower amount corresponding to 4.27 billion square feet.		
Life cycle description:	Vinyl flooring manufacturing, installation, and disposal		
Chemical concentration:	It was estimated that over half of vinyl flooring may contain phthalates at concentrations ranging from 9 to 32% by weight. The volume of phthalates used in vinyl flooring has changed over time. In 2011, Washington state estimated that among polyvinyl chloride products, including flooring, 30% are composed of DEHP (Ecology 2011). Afshari et al. (2004) found that 17 – 18.5% of the PVC flooring was comprised of DEHP. In 2014, a study of 16 types of vinyl flooring found concentrations of phthalates ranging from 9 – 23% of the flooring by weight (Liang & Xu, 2014).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The report uses high quality data that does not indicate flaws or quality issues. However, data measurement methodology is not fully transparent.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evalu-ated.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by evaluating various flooring materials, but measurement un-certainty is not addressed.
Overall Quality Determination		High	

Study Citation:	Dold, P. L. (1989). Current practice for treatment of petroleum refinery wastewater and toxics removal. Water Pollution Research Journal of Canada 24(3):363-390.
HERO ID:	1924634
Conditions of Use:	Disposal - wastewater treatment

EXTRACTION

Parameter	Data
Process description:	Process descriptions for Sour Water Stripping, API Separator, Dissolved Air Flotation, Biological Secondary Treatment are all listed. Sour Water Stripping - dependent on pH, amongst other parameters. Hydrogen sulphide can be stripped readily at 40 C while temperatures in excess of 100 C are sometimes applied for ammonia removal. For these reasons the stripping process is sometimes conducted in two stages to optimize performance. API separation is an oil-water liquid-liquid separators shown in Figure 4 and separates immiscible liquids present in a wastewater stream. Sufficient time under quiescent conditions is provided in the separator for oil droplets to coalesce and rise to the surface, forming a continuous phase of floating oil; this oil is skimmed from the surface, and thereby removed from the waste stream. The skimmed oil is recycled to the upstream refining process. Sludge accumulating at the base of the separator must be withdrawn and disposed of in an appropriate manner. Figure 5 shows oil removal vs separator retention time. Dissolved air flotation is a gravity separation process in which air bubbles are attached to oil droplets. The separation process is similar to an API separator. The DAF is more effective in removing dispersed oil droplets because the buoyancy difference is enhanced by attachment of the small air bubbles. For biological treatment a portion of the organic material is oxidized and is called catabolism. Part of the energy generated is captured and utilized to convert the remaining portion of the organic material into new cell tissue; this process is called anabolism. The process can involve a range of reactor types (plug flow, completely mixed, attached growth, etc). The system commonly employed is aerobic activated sludge system shown in figure 7. Activated sludge system has suspended microbial culture used to treat the wastewater. Influent containing organic material enters a mixed reactor to which oxygen is supplied. Oxygen is provided by bubbling air through the contents of the reactor from diffusers on the based shown in Figure 7. Oxygen transfer takes place at the gas-liquid interface. Mechanical devices such as surface aerators may be utilized; mixed liquor is sprayed into the air above the liquid surface, thereby entraining and dissolving oxygen. Rate of input is regulated to maintain a dissolved oxygen conc. of approximately 2 mg/L in the reactor.
Chemical concentration:	DEHP is mentioned once in the article of having a detection frequency above 50% in refinery treatment systems.
Comments:	DEHP is mentioned once in the article of having a detection frequency above 50% in refinery treatment systems.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report is not from frequently used sources, but uses high quality data that does not indicate flaws or issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for Canada, an OECD country.
	Metric 3: Applicability	Medium	Data is for disposal of wastewater effluent associated with Petroleum Refinery. Does not specifically mention efficiency of removal of DEHP but does mention its presence in the wastewater.
	Metric 4: Temporal Representativeness	Low	Greater than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Documents results and methods. Does not provide all potential releases from waste treatment but provides general process descriptions.

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Study Citation:	Dold, P. L. (1989). Current practice for treatment of petroleum refinery wastewater and toxics removal. Water Pollution Research Journal of Canada 24(3):363-390.		
HERO ID:	1924634		
Conditions of Use:	Disposal - wastewater treatment		
Domain	Metric	EVALUATION Rating	Comments
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Addresses variability by evaluating various waste treatment methods. Addresses uncertainty in studies about other treatment methods due to their lack of real world testing.
Overall Quality Determination		Medium	

Study Citation:	Dong, R. H., Zhang, H., Zhang, M. R., Chen, J. S., Wu, M., Li, S. G., Chen, B. (2017). Association between Phthalate Exposure and the Use of Plastic Containers in Shanghai Adults. Biomedical and Environmental Sciences 30(10):727-736.			
HERO ID:	4728955			
Conditions of Use:	Processing and/or use (as a plasticizer)			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Phthalates are mainly used as plasticizers to increase the flexibility of plastics. Phthalates account for 90% of plasticizer consumption in China (> 0.87 million per year). Researchers have reported that DEHP accounted for approximately 50% of all plasticizers used in PVC.			
Chemical concentration:	Compared to non-consumption, consumption of plastic-packaged breakfast had 14.81% higher levels of urinary DEHP metabolites. Consumption of plastic-packaged processed food had 13.95% higher levels of urinary DEHP metabolites than non-consumption.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Dupli-Color Products Company (2017). Dupli-Color® Bed Armor™, material safety data sheet.			
HERO ID:	6311443			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Eagle, (2015). Safety Data Sheet (SDS): Eagle Paver Sealer.			
HERO ID:	11803657			
Conditions of Use:	Sealant			
		EXTRACTION		
Parameter	Data			
Chemical concentration:	0.1-0.2%, p. 2			
Physical form:	Clear liquid, p.3			
		EVALUATION		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Eagle, (2015). Safety Data Sheet (SDS): Eagle Supreme Seal & Eagle Gloss Coat.			
HERO ID:	6302432			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.15% by weight			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is about 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Earthjustice, (2020). Exhibit 1 to comments of rubbertown emergency action et al., re: TSCA risk evaluations for high-priority substances and substances undergoing manufacturer-requested risk evaluations.			
HERO ID:	10385015			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		No production or use volume reported for DEHP.		
Number of sites:		Port Arthur: 1 siteHouston: 14 sitesCancer Alley: 2 sites		
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Number of sites gathered from Toxics Release Inventory reporting.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Discrete release data provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by evaluating the number of sites throughout different regions. However, uncertainty in not characterized.
Overall Quality Determination			High	

Study Citation:	ECHA, (2017). Opinion on an Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP).		
HERO ID:	10112937		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Combined tonnage of DEHP, DBP, DIBP, and BBP [2014] 62,612 tonnes used in EU28 article manufacturing, 15,722 tonnes contained in exported articles, 124,245 tonnes contained in imported articles; [2020] baseline projections 13,828 tonnes used in EU28 article manufacturing, 5,952 tonnes contained in exported articles, 112,965 tonnes contained in imported articles; [2039] baseline projections 9,663 tonnes used in EU28 article manufacturing, 3,025 tonnes contained in exported articles, 136,474 tonnes contained in imported articles; (pdf pg. 14)		
Chemical concentration:	The conditions of the restriction proposed by SEAC are: 'The following articles or any parts thereof containing DEHP, DBP, DIBP, and BBP in a concentration, individually or in any combination, greater than or equal to 0.1% by weight of each plasticised material shall not be placed on the market...' pg. 10Note: there are several stipulations and types of articles listed in the proposal set forth by this document.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Report published in 2017, no more than 10 years old.
	Metric 5: Sample Size	N/A	no sampling data extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Datasources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is not addressed. Variability is considered in the information extracted.
Overall Quality Determination		High	

Study Citation:	ECHA, (2010). Evaluation of new scientific evidence concerning the restrictions contained in annex XVII to regulation (EC) no 1907/2006 (REACH): Review of new available information for bis(2-ethylhexyl) phthalate (DEHP).			
HERO ID:	5353093			
Conditions of Use:	Furniture and furnishings not covered elsewhere			
EXTRACTION				
Parameter	Data			
Chemical concentration:	”DEHP was reported to be found in vinyl floorings and in vinyl wallpaper (in concentrations up to 16% and 10% w/w respectively). DEHP was also detected in other household equipment’s and products like carpets (in concentrations up to 9.2%) and shower curtains (in concentrations up to 9.2%) (4/24)”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of furniture, which is similar to the in-scope occupational scenario of commercial use Furniture and furnishings not covered elsewhere.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (concentrations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in each study that was included in the study are included in footnotes. Variability is addressed by comparing different studies within the report.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2010). Evaluation of new scientific evidence concerning the restrictions contained in annex XVII to regulation (EC) no 1907/2006 (REACH): Review of new available information for bis(2-ethylhexyl) phthalate (DEHP).			
HERO ID:	5353093			
Conditions of Use:	Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Chemical concentration:	”DEHP was found in several categories of toys plastic foam like books, balls, masks, jigsaws or swords; dolls and “Disney/cartoons” characters; inflatable feeding bottles; stickers for bath tubs; wooden toys; play bags; so called “mucous toys”), in some cases in concentrations over 0.1% and up to 19.1%. DEHP was only found in pacifiers’ coverage in very low concentrations, i.e. below 0.1%, and in shower mats in concentrations up to 12.9%. A survey conducted for the Danish EPA showed that 10 out of 26 (38.5%) tested erasers were containing phthalates; among the nine (9) erasers which were further analyzed, three (3) were containing DEHP (33%), in concentrations up to 44% w/w. DEHP was also found in the PVC-made component of one pencil case; the concentration of DEHP in that component was 17% w/w (5/24)”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of toys and equipment, which is similar to the in-scope occupational scenario of commercial use of Toys, playground, and sporting equipment.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (concentrations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in each study that was included in the study are included in footnotes. Variability is addressed by comparing different studies within the report.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2010). Evaluation of new scientific evidence concerning the restrictions contained in annex XVII to regulation (EC) no 1907/2006 (REACH): Review of new available information for bis(2-ethylhexyl) phthalate (DEHP).			
HERO ID:	5353093			
Conditions of Use:	Fabric, textile, and leather products not covered elsewhere			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP was found in some (children) clothes in concentrations up to 17%, in body stockings in concentrations up to 1.8%, and on printings on shirts in concentrations up to 1.1%. DEHP was found in several articles like jackets (in loose reflector pieces, in concentrations up to 21.3%), in mittens (in labels and outer material, in concentrations up to 14.7% and below 0.1% respectively), and in rubber clogs (in concentrations up to 1.6%. (7/24)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of textiles, which is similar to the in-scope occupational scenario of textile finishing.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (concentrations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in each study that was included in the study are included in footnotes. Variability is addressed by comparing different studies within the report.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2010). Evaluation of new scientific evidence concerning the restrictions contained in annex XVII to regulation (EC) no 1907/2006 (REACH): Review of new available information for bis(2-ethylhexyl) phthalate (DEHP).			
HERO ID:	5353093			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”In Western Europe, DEHP represents nowadays (2008 figures) only 18% of the overall consumption of plasticizers; at global level DEHP represents 50% of the total use of plasticizers. The manufacture of DEHP has decreased from 595,000 tonnes/year in EU-15 in 1997 to 340,000 tonnes/year in 2007, for a total use of DEHP of only 221,000 tonnes/year in 2004, and ca. 210,000 tonnes/year in the last 2 to 3 years. (5/24)”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Denmark, an OECD country.	
	Metric 3: Applicability	Medium	Data are for manufacturing, an in-scope occupational scenario. But, U.S. production data is not specified.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (total production, percentages) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in each study that was included in the study are included in footnotes. Variability is addressed by comparing different studies within the report.	
Overall Quality Determination		High		

Study Citation:	ECHA, (2009). Background document for bis(2-ethylhexyl) phthalate (DEHP): Document developed in the context of ECHA’s first Recommendation for the inclusion of substances in Annex XIV.			
HERO ID:	7325009			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	DEHP is manufactured in the European Union (EU) in a volume of approximately 340,000 tonnes/year in 2007			
Number of sites:	7 manufacturing sites in the EU			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	ECHA, (2009). Background document for bis(2-ethylhexyl) phthalate (DEHP): Document developed in the context of ECHA’s first Recommendation for the inclusion of substances in Annex XIV.			
HERO ID:	7325009			
Conditions of Use:	Processing and Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	The net use of DEHP in the EU is estimated to approximately 280,000 tonnes/year in 2007.Table 1 provides tonnes/year of DEHP used during various processingTable 2 provides DEHP tonnage in end products			
Chemical concentration:	The content of DEHP in flexible polymer materials varies, but is often around 30% (w/w).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	ECHA, (2009). Data on manufacture, import, export, uses and releases of benzyl butyl phthalate (BBP) as well as information on potential alternatives to its use.			
HERO ID:	7325021			
Conditions of Use:	Plastics compounding			
EXTRACTION				
Parameter	Data			
Process description:	"Plastisol" is a pasty liquid obtained by blending (formulating) PVC resin with plasticizer and other ingredients at room temperature. Paste is spread onto the substrate to be coated (flooring, coated fabric textile, woven glass, etc.) by a knife or a perforated roller. Spread coated products are “fused” (gelled) in tunnel ovens heated with hot air. The energy is supplied by an infrared heating source (IR) and/or hot air. (22/87)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources. (ECHA).	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the U.K., an OECD country.	
	Metric 3: Applicability	High	Data are for plastics compounding, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted	
Overall Quality Determination		High		

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.		
HERO ID:	7325405		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Historical production, export, import and consumption of DEHP, DBP and DIBP in EU28 in 2013 in tonnes: production – 89,615, exports – 3,443, imports – 8,029		
Life cycle description:	DEHP is a general purpose plasticiser.		
Chemical concentration:	The typical concentration of the DEHP in articles is between 15-30% of the soft PVC content, however, it varies substantially depending on the article type and sampling of various consumer articles has shown that DEHP is present in concentrations up to 461 000 mg/kg.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report addresses variability in terms of concentration but does not address uncertainty.
Overall Quality Determination		High	

Study Citation:	El-Hadj, Benabdallah, T., Dosta, J., Mata-Alvarez, J. (2006). Biodegradation of PAH and DEHP micro-pollutants in mesophilic and thermophilic anaerobic sewage sludge digestion. Water Science and Technology 53(8):99-107.			
HERO ID:	679120			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		4.2 million MT		
Chemical concentration:		10-100 mg/kg dw in WWTP sludge		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report appears to use high quality data and/or techniques or sound methods, but data is from Commission of European Community Directorate-General, not a frequently used source of data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			Medium	

Study Citation:	ENF, (2024). Plastic recycling plants in the United States.			
HERO ID:	11360395			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Number of sites:	59 plants in the U.S. recycle plastics into various forms, including granules/pellets and flakes. The document lists all plants along with hyperlinks to their address and other metadata.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for recycling, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - number of sites.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - number of sites.
Overall Quality Determination			High	

Study Citation:	Ennis-Flint, (2015). Safety Data Sheet (SDS): SB WHT 150 VOC HWVW1.			
HERO ID:	6302433			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1% by weight			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited information on the variability and does not address uncertainty.	
Overall Quality Determination		High		

Study Citation:	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
HERO ID:	7349020			
Conditions of Use:	Processing: Plastic Product Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Plastic products manufacturing involves molding, forming, shaping, or otherwise altering plastic resins or plastic materials to produce an intermediate or final product. This manufacturing industry is also commonly referred to as plastics processing or polymer processing. The manufacture of resins is not a part of plastic products manufacturing; however, some facilities manufacture resins at the same site as where the resins are processed. This chapter will not address the manufacture of resins because it is not an activity inherent to plastic products manufacturing. Solid and foamed plastic products are manufactured using plastic resins or solid plastic chips as the starting material. Most plastic products are manufactured by mixing plastic resins with additives, applying heat or pressure to the mixture, and shaping the mixture to form the desired product. More in Section 2.1 (pg 9-17)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment uses high quality data that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The report is for plastics manufacturing an occupational scenario within the scope of the risk evaluation, however the data is general and not specific to the chemical.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Process description.
Overall Quality Determination			High	

Study Citation:	ESIG, (2020). SPERC Factsheet – Use in rubber production and processing.			
HERO ID:	11360390			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Manufacture of tires and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanising, cooling and finishing.			
Throughput:	100,000 kg/day			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Europe.
	Metric 3:	Applicability	Medium	Data are for rubber manufacturing, an in-scope occupational scenario but is not chemical-specific
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results and data sources. Methods and assumptions are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	FCW, (2017). Statistical Report 2016.			
HERO ID:	10472414			
Conditions of Use:	Flooring			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		TABLE 2, U.S. floor covering market sales volume (in millions of square feet) for years 2012, 2013, 2014, 2015, and 2016, respectively: Carpet & area rugs 10,459; 10,865; 11,358; 11,551; 11,523Hardwood flooring 1,160; 1,357; 1,496; 1,567; 1,691Ceramic floor & wall tile 2,165; 2,366; 2,640; 2,839; 3,000Laminate flooring 964; 993; 1,002; 1,010; 1,008Luxury vinyl tile (LVT) 711; 852; 1,002; 1,177; 1,495Vinyl sheet & floor tile 2,020; 2,181; 2,216; 2,251; 2,505Other resilient flooring 191; 200; 204; 241; 273TABLE 5, U.S. floor covering imports volume (in millions of square feet) for years 2012, 2013, 2014, 2015, and 2016, respectively: Carpet & area rugs 2,074.8; 2,158.5; 2,425.0; 2,550.4; 2,755.9Hardwood flooring 420.3; 531.8; 530.0; 569.4; 543.3Ceramic floor & wall tile 1,489.9; 1,722.6; 1,709.9; 1,881.1; 1,985.9Vinyl sheet & floor tile 1,582.5; 1,825.8; 2,124.7; 2,047.9; 2,780.1Other resilient 153.4; 168.1; 173.8; 210.2; 246.4Laminates 557.5; 612.8; 657.0; 649.5; 640.6		
Life cycle description:		Various types of flooring (e.g., vinyl, laminate, etc.) are manufactured, imported, and installed within the United States.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Medium	Report uses high quality data from Catalina Research, but the methodology used to determine sales volumes and import volumes is not fully transparent.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
		Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, DEHP is not mentioned specifically.
		Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
		Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. Samples chosen for analysis is not fully transparent.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Medium	Variability is addressed by evaluating sales volumes and import volumes over several years for various types of flooring. However, uncertainty related to reported volumes is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Fong, J. P., Lee, F. J., Lu, I. S., Uang, S. N., Lee, C. C. (2014). Estimating the contribution of inhalation exposure to di-2-ethylhexyl phthalate (DEHP) for PVC production workers, using personal air sampling and urinary metabolite monitoring. International Journal of Hygiene and Environmental Health 217(1):102-109.
HERO ID:	1600110
Conditions of Use:	Processing - furniture/furnishing or PVC

EXTRACTION	
Parameter	Data
Process description:	Study population were in three factories that used only DEHP as a plasticizer to produce PVC synthetic leather sheets and pellets in Taiwan. 28 workers were recruited from one PVC film factory. 61 workers were recruited from 2 PVC pellet factories. Similar process components in each plant: material tanks, Banbury mixer, plastic rolling machine or plastic granulator, and product conveyor. The pipeline transfer of DEHP from materials tanks and Bunbury mixers were both closed processes and connected to an operating system through automatic control panels. The plastic rolling machine and PVC plastic granulator processes were both open processes and manually operated. Because of frictional heating, the temperatures rose to 150 - 170 C in Banbury mixers when PVC powder was mixed with DEHP. The gelled material was then transferred to the next processing component (plastic rolling machine or PVC plastic granulator), during which DEHP evaporated into the ambient air. End products were moved on a conveyor in an open process and cooled to room temperature for packaging. None of the plants had installed a local exhaust system for PVC processing.
Throughput:	First PVC film factory had annual usage volumes of DEHP of 4500 tons. PVC pellet factory had annual usage volumes of DEHP close to 2400 tons and 1300 tons.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Data is peer reviewed and consists of high quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for Taiwan, a non-OECD country.
	Metric 3: Applicability	High	Data is for processing and is applicable to a COU.
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Addresses variability by testing across different processing sites and addressing correlation between urinary metabolite data and airborne data. Addresses uncertainty by its handling of the LOD.

Overall Quality Determination	High
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Study Citation:	Fragrance, Wellington (2014). Chocolate.			
HERO ID:	6302311			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product/ All			
EXTRACTION				
Parameter	Data			
Chemical concentration:	>80%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a minimum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Frery, N., Santonen, T., Porras, S. P., Fucic, A., Leso, V., Bousoumah, R., Duca, R. C., Yamani, El, M., Kolossa-Gehring, M., Ndaw, S., Viegas, S., Iavicoli, I. (2020). Biomonitoring of occupational exposure to phthalates: A systematic review. International Journal of Hygiene and Environmental Health 229:13548.			
HERO ID:	7978498			
Conditions of Use:	Processing: Plasticizer in plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Phthalates (also known as phthalate esters or esters of phthalic acid) are a group of plasticizers with a worldwide production volume of around 5.5 million tons per year. (1/22)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are for multiple European countries and analysis was done in France, an OECD country.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation, but data is general to Phthalates and not specific to DEHP.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	Fromme, H., Lahrz, T., Piloty, M., Gebhart, H., Oddoy, A., Rüden, H. (2004). Occurrence of phthalates and musk fragrances in indoor air and dust from apartments and kindergartens in Berlin (Germany). Indoor Air 14(3):188-195.			
HERO ID:	5556411			
Conditions of Use:	Lab Use			
EXTRACTION				
Parameter	Data			
Process description: See "Extraction and analysis" section on page 3				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journalarticles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues. The analytical method was based on themethods EPA IP-8, (1990), ASTM D4861 (1994) and-Dionex Applikation 333 (1999).
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Germany
	Metric 3:	Applicability	High	The report is for Lab Use, which is an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old. Report was published in 2003 but data is from 2000 and 2001.
	Metric 5:	Sample Size	N/A	Process description
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Process description
Overall Quality Determination			High	

Study Citation:	Garberg, P., Högberg, J., Lundberg, I., Lundberg, P. (1989). NIOH and NIOSH basis for an occupational health standard. Di(2-ethylhexyl)phthalate (DEHP).			
HERO ID:	807356			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Life cycle description:	Used primarily as a softener in plastics, primarily for polyvinyl chloride. Smaller amounts are used as lubricants. pg. 7/54			
Process description:	DEHP is produced from phthalic anhydride and alcohols (pg. 8/54)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data was originally published in Sweden but republished in the US.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Gardiner, N. (2008). Disposable decisions. Cleanroom Technology 15(2):27-28.		
HERO ID:	7978842		
Conditions of Use:	Commercial Use: Plastic and rubber products		
EXTRACTION			
Parameter	Data		
Chemical concentration:	DEHP and DINP may represent between 22% and 44% of total PVC glove composition. (1/2)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the U.K., an OECD country.
	Metric 3: Applicability	High	Data are for commercial use of plastic and rubber products, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium	

Study Citation:	Gaspar, F. W., Castorina, R., Maddalena, R. L., Nishioka, M. G., Mckone, T. E., Bradman, A. (2014). Phthalate exposure and risk assessment in California child care facilities. Environmental Science & Technology 48(13):7593-7601.			
HERO ID:	2345959			
Conditions of Use:	DEHP exposure in childcare facilities			
EXTRACTION				
Parameter	Data			
Number of sites:	40 early childhood education facilities			
Chemical concentration:	Median Dust Concentration: 172.2 ug/g			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation	
	Metric 4: Temporal Representativeness	Medium	The data is more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling during multiple visits to many facilities.	
Overall Quality Determination		Medium		

Study Citation:	Gaudin, R., Marsan, P., Ndaw, S., Robert, A., Ducos, P. (2011). Biological monitoring of exposure to di(2-ethylhexyl) phthalate in six French factories: a field study. International Archives of Occupational and Environmental Health 84(5):523-531.			
HERO ID:	697297			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizer in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing			
Chemical concentration:	20-60% DEHP by weight when used as plasticizer of polyvinyl chloride			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Source provides industry data from field studies.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Data source and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Gaudin, R., Marsan, P., Ndaw, S., Robert, A., Ducos, P. (2011). Biological monitoring of exposure to di(2-ethylhexyl) phthalate in six French factories: a field study. International Archives of Occupational and Environmental Health 84(5):523-531.			
HERO ID:	697297			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	2,000,000 tons worldwide in 2002 200,000 tons in the European Union in 2006			
Life cycle description:	Manufacture			
Process description:	DEHP is obtained by esterification of phthalic anhydride, itself obtained after oxidation of o-xylene with 2-ethylhexanol.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Source provides industry data from field studies.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination		High		

Study Citation:	Gaudin, R., Marsan, P., Robert, A., Ducos, P., Pruvost, A., Lévi, M., Bouscaillou, P. (2008). Biological monitoring of occupational exposure to di(2-ethylhexyl) phthalate: Survey of workers exposed to plastisols. International Archives of Occupational and Environmental Health 81(8):959-966.			
HERO ID:	698237			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	20-60% DEHP by weight when used as plasticizer of polyvinyl chloride			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The report includes industry data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Gaudin, R., Marsan, P., Robert, A., Ducos, P., Pruvost, A., Lévi, M., Bouscaillou, P. (2008). Biological monitoring of occupational exposure to di(2-ethylhexyl) phthalate: Survey of workers exposed to plastisols. International Archives of Occupational and Environmental Health 81(8):959-966.			
HERO ID:	698237			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	200,000 tons in the European Union in 2006			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The report includes industry data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
HERO ID:	8338316			
Conditions of Use:	Processing: Plasticizer in plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	PVC Plastics			
Process description:	They are manufactured by a reaction of phthalic anydride with various alcohols starting frommethanol and ethanol for the smaller compounds, up to iso-decanol straight chain or with somebranching (pg. 4)			
Chemical concentration:	In PVC materials, the total amount of DEHP, DBP, and BBP used as plasticizers adds up to 30–60%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Primary authors are from Italy - OECD country.
	Metric 3:	Applicability	Medium	Information is for an occupational scenario within the scope of the risk evaluation but concentration data is not specific to DEHP.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Concentration is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The review paper provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High		

Study Citation:	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
HERO ID:	8338316			
Conditions of Use:	Other (FDA Products)			
EXTRACTION				
Parameter	Data			
Chemical concentration:	pg. 16-28 provides concentration data of phthalates in beverages and other food products.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Primary authors are from Italy - OECD country.
	Metric 3:	Applicability	Uninformative	Data is for non-occupational data that is not within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Concentration is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The review paper provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Uninformative		

Study Citation:	Giulivo, M., Alda, L.d., M., Capri, E., Barceló, D. (2016). Human exposure to endocrine disrupting compounds: Their role in reproductive systems, metabolic syndrome and breast cancer. A review. Environmental Research 151:251-264.			
HERO ID:	3469349			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In 2010, the global production of phthalates was estimated at 4.9 million tons, which accounts for 84% of the total plasticizer production. DEHP is the most commonly used plasticizer with a production volume of 3–4 millions of tons worldwide (Wams,1987).			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	Godwin, A. D., Krauskopf, L. G. (2008). Monomeric plasticizers. :173-238.			
HERO ID:	7324538			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Process description:	One primary requirement for plasticization is that a plasticizer must be thoroughly mixed and incorporated into the PVC polymer matrix. This is accomplished by heating with mixing, until the plasticizer is incorporated into the resin. The plasticized material is then molded or shaped into the useful product and cooled. Different plasticizers will exhibit different characteristics in both the ease with which they form the plasticized material and in the resulting physical properties of the flexible product. (3/66)			
Chemical concentration:	DEHP is present in PVC resin at 50 parts per hundred rubber (phr) as a plasticizer, or 50%. (8/66) Formulations based on end-product are given throughout the article.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (concentrations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by comparing concentrations of different plasticizer applications. Uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Group, Identity (2016). Blue Stamp-Ever stamp.			
HERO ID:	6302444			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<0.2%			
Physical form:	solid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:		Group,, Identity (2016). Safety Data Sheet (SDS): Red Stamp-Ever stamp.			
HERO ID:		6302424			
Conditions of Use:		Use of Dyes, Pigments, and Fixing Agents			
		EXTRACTION			
Parameter		Data			
Chemical concentration:		<0.2% by weight			
		EVALUATION			
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
		Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
		Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium			

Study Citation:		Group,, Identity (2016). Safety Data Sheet (SDS): Black Stamp-Ever stamp.		
HERO ID:		6302436		
Conditions of Use:		Use of Ink, toner, and colorants		
		EXTRACTION		
Parameter		Data		
Chemical concentration:		<0.2% by weight		
		EVALUATION		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples characterized only by a maximum
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Group,, Identity (2016). Safety Data Sheet (SDS): Green Stamp-Ever stamp.			
HERO ID:	6302440			
Conditions of Use:	Ink, toner, and colorants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<0.2%			
Physical form:	solid green flexible gel saturated with ink			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Hahladakis, J. N., Velis, C. A., Weber, R., Iacovidou, E., Purnell, P. (2018). An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling. Journal of Hazardous Materials 344:179-199.			
HERO ID:	4168432			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizers are most commonly used for improving the flexibility, durability and stretchability of polymeric films, and DEHP is one such plasticizers.			
Process description:	DEHP used in PVC formulations			
Chemical concentration:	A study investigating the phthalate migration from baby bottles under hot-fill conditions of 70 degC, for an approx. contact time of 2 h, found that migration levels of DEHP ranged between 25 and 50 ug/kg. In another study of migration of 7 plasticizers from PVC gaskets in the closures of glass jars, when in contact with oily foods, the average transfer was found to be 46%. Another group studied the migration of 5 phthalates from disposable tableware to drinking water and found that the concentrations of DEHP in the drinking water samples (5.83 ng/mL) exceeded the limit levels for drinking water (3 ng/mL). A study evaluated the migration of 8 phthalates from plastics to a) cooking oil and b) mineral water, under various storage conditions. Storage times tested were up to 2 months, under several static conditions (20 degC, 40 degC, and 60 degC) and under a“dynamic” state (20 degC). DEHP and DBP displayed the highest level of migration into cooking oil at 20 degC after 2 months. It needs to be taken into consideration that several migration limits have been set from European Commission (EC) for different plasticizers, e.g. 1.5 mg/kg for DEHP.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
HERO ID:	6558535			
Conditions of Use:	Commercial use - spray painting.			
EXTRACTION				
Parameter	Data			
Process description:	Autobody shop is located in a two-story building. Before the cars are painted, structural damage to the cars is repaired on the upper level of the shop which is illustrated in the article. This involves the repair and replacement of damaged parts. Workers may be exposed to aerosols from sanding, grinding, and welding. Shop does some restoration of automobiles. After structural damage repair, they are prepared for painting. This involves sanding, washing, and covering parts of hte vehicle that are not being painted with either paper or plastic. After the car has been painted, defects in the paint job are removed by buffing. In the upper level of the shop, vehicle preparation is done next to the spray painting booth. Lower level is illustrated in the article. Spray painting booths in the upper level were Trimatic cross draft spray painting booths. Air is supplied and exhausted through filters that are mounted in plenums (described in article). Filters are changed every four to five weeks. Before some painting jobs, the filters are wetted down with water which likely reduces air flow until the filters dry off.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Sampling conducted by NIOSH
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evalu- ated.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation, but no mention of phtalates.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	N/A	Qualitative data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No need to address variability/uncertainty for process description
Overall Quality Determination			High	

Study Citation:	Heitbrink, W., Cooper, T., Edmonds, M., Bryant, C., Ruch, W. (1993). In-depth survey report: control technology for autobody repair and painting shops at Valley Paint and Body Shop, Amelia, Ohio.
HERO ID:	6558536
Conditions of Use:	commercial use - spray painting

EXTRACTION	
Parameter	Data
Process description:	Autobody shop. Before the cars are painted, structural damage to the cars is repaired elsewhere in the shop. This involves the repair and replacement of damaged parts. During these activities, the workers may be exposed to aerosols from sanding, grinding, and welding. For some jobs, abrasive blasting with sand that contains crystalline silica is used for paint removal. This abrasive blasting was conducted in the open. After the cars have been repaired, they are brought to the paint shop that is shown in the article. There is some sanding of areas to be painted. Parts of the car which are not to be painted are protected with masking. The car and autobody parts are painted in either the spray painting booth or in the vehicle preparation station. Generally, the vehicle preparation station is used only for small paint jobs or for primer painting. Both the vehicle preparation station and the spray painting booth were manufactured by Garomat Inc. Vehicle prep station shown in article how two bays. Bays are separated by moveable cloth curtains that were suspended from rods in the ceiling. Each bay exhausts air through 3 filters in the back of the vehicle preparation station. Spray painting booths have 2 painting cycles. During the painting cycle, outside air is passed through a series of filters. The final set of filters cover the entire ceiling of the spray painting booth. A nominal 12,000 cfm of air flows out of the ceiling around the car or object being painted and out of the booth through exhaust grates located in the floor of the booth. Booth is 23 ft long, 13 ft wide and 9 ft high. Air is exhausted through a 2 ft wide, rectangular slot in the floor that is 17 ft by 6 ft. After the car or body part has been painted, the worker leaves the booth and the paint is cured at a temp between 120 and 140 F. during this period, the airflow in the booth is reduced and about 80 percent of the air flow in the booth is recycled.

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Study conducted by NIOSH.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	Data is likely for an in-scope of use which is paints and coatings, however the study does not mention DEHP or phthalates in this source.
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5: Sample Size	N/A	Qualitative data.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Variability/uncertainty is not applicable to process description.

Overall Quality Determination	High
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Study Citation:	Heudorf, U., Mersch-Sundermann, V., Angerer, J. (2007). Phthalates: toxicology and exposure. International Journal of Hygiene and Environmental Health 210(5):623-634.			
HERO ID:	1323189			
Conditions of Use:	Manufacture, Processing, Commercial Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	800,000 tons phthalates in Western Europe in 2003, 24% DEHP			
Chemical concentration:	10 - 4400 ng/g food packaging (1999); In 2001, significantly lower levels were found compared to those detected in 1999, 6–675 ng/g			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 yearsbut no more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Hines, C. J., Hopf, Nilsen, N. B., Deddens, J. A., Calafat, A. M., Silva, M. J., Grote, A. A., Sammons, D. L. (2009). Urinary phthalate metabolite concentrations among workers in selected industries: A pilot biomonitoring study. <i>Annals of Occupational Hygiene</i> 53(1):1-17.
HERO ID:	1005742
Conditions of Use:	Manufacturer, Processing

EXTRACTION	
Parameter	Data
Life cycle description:	Manufacture, Plasticizer in all other chemical product and preparation manufacturing
Process description:	Manufacture: DEHP was manufactured in batch or continuous processes by the addition of alcohols to phthalic anhydride in the presence of a catalyst. Operators could be exposed while taking or analyzing in-process samples or while performing maintenance. Processing: PVC compounding company produced custom-formulated PVC pellets using primarily DEHP and di-isononyl phthalate (DiNP) as plasticizers. Phthalate-related processes included mixing, extrusion and milling. Phthalate-related processes included compounding, mixing, paste preparation, extrusion, milling and calendaring. In the vehicle filter manufacturing company, exposure could occur while dispensing plastisol (a dispersion of resin and phthalate plasticizer) containing DEHP onto filter end caps and near convection ovens used for plastisol curing. Companies manufacturing rubber products (rubber hoses, rubber boots and rubber gaskets for aerosol cans, inhalers and bottles) used phthalates only in neoprene or nitrile rubber. The hose company used DBP, DEHP and DnOP; the boot company DEHP.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source (NIOSH HHEs) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by gathering data from a number of facilities, but uncertainty is not addressed.

Overall Quality Determination

High

Continued on next page ...

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Study Citation:	Hines, C. J., Hopf, Nilsen, N. B., Deddens, J. A., Calafat, A. M., Silva, M. J., Grote, A. A., Sammons, D. L. (2009). Urinary phthalate metabolite concentrations among workers in selected industries: A pilot biomonitoring study. Annals of Occupational Hygiene 53(1):1-17.		
HERO ID:	1005742		
Conditions of Use:	Manufacturer, Processing		
		EVALUATION	
Domain	Metric	Rating	Comments

Study Citation:	Hites, R. A. (1973). Analysis of trace organic compounds in New England rivers. Journal of Chromatographic Science 11(11):570-574.			
HERO ID:	1334964			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	350,396,000 lbs produced in 1970.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	IARC, (2013). Some chemicals present in industrial and consumer products, food and drinking-water. IARC monographs on the evaluation of carcinogenic risks to humans 101:9-549.
HERO ID:	2525812
Conditions of Use:	All COUs.

EXTRACTION	
Parameter	Data
Production, import, or use volume:	World consumption of phthalates in the early 1990s was estimated to be 3.25 million tons, of which DEHP accounted for approximately 2.1 million tons. Estimated total consumption of DEHP by geographical region was (thousand tons): Western Europe: 465; North America: 155; Eastern Asia: 490; Japan: 245; and others: 765. Global production of DEHP in 1994 was between 1 and 4 million tons. PV of DEHP in western Europe was 595,000 tons/yr in 1997 but had decreased to 221,000 in 2004. The European Commission reported that 1 million tons of DEHP were used in Europe in 2000. During the period 1950-1954, DEHP production in the USA was 106 thousand tons, and by 1965-69, had risen to 655 thousand tons. From 1982 to 1986, production increased from 114 to 134 thousand tons, but in 1994, was 117,500 tons. Production in Japan in 1995 was 298,000 tons and in Taiwan, China, in 1995 was 207,000 tons, down from 241,000 tons in 1994. It was estimated that 109 thousand tons of dioctyl phthalates were produced in the US in 1999. An estimated 90% of DEHP is used as a plasticizer for PVC polymers. In the EU, 95% of DEHP is used as a plasticizer in polymer products (2008). Non-polymer uses represent less than 5% of the total DEHP used in the US. Approximately 45% of total consumption of DEHP in the US is for plasticizing various industrial and commercial products. Medical devices comprise approximately 25% of total manufacturing use of DEHP in the US.
Life cycle description:	DEHP is produced commercially by the reaction of excess 2-ethylhexanol with phthalic anhydride in the presence of an acid catalyst such as sulfuric acid or para-toluenesulfonic acid. DEHP was first used commercially in the US in 1949. The uses of DEHP fall into two major categories: polymer uses (consumer products such as footwear, shower curtains and toys, medical devices and commercial/industrial uses) and non-polymer uses (dielectric fluids, paints, adhesives and inks.) Industrial and commercial uses of DEHP include resilient flooring, wall covering, roofing, aluminum foil coating/laminating, paper coating, extrudable molds and profiles, electronic component parts, and wire and cable coating and jacketing. Medical devices that contain DEHP include PVC sheet materials such as IV bags, and tubing used in a variety of medical applications.
Throughput:	Plastics may contain from 1 to 40% DEHP by weight.
Number of sites:	800 plants in the EU use DEHP in preparations that contain DEHP (2008). Info for 2010 indicated the DEHP was produced by 23 companies in the US, 19 companies in Mexico, 9 companies in China, 4 companies in the UK, 3 companies in Germany, 2 companies in each China, India and Japan, and 1 company in each Belgium, Bulgaria, Canada, the Czech Republic, France, the former state union of Serbia and Montenegro, South Africa and Switzerland. A European source indicated that DEHP was produced by 5 companies each in Germany and Italy, 4 companies each in the Netherlands and the UK, 3 companies each in Austria and France, two companies in Belgium and one company each in Finland, Spain and Sweden (2000)

		EVALUATION		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is published by the World Health Organization so reported data is likely accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data includes information about US and various other OECD countries and other non-OECD countries.
	Metric 3:	Applicability	High	Data is applicable to nearly all COUs.
	Metric 4:	Temporal Representativeness	Medium	Data is mostly from 2000s so greater than 10 years old.
	Metric 5:	Sample Size	Low	Not characterized by statistics.

Domain 3: Accessibility/ Clarity

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Study Citation:		IARC, (2013). Some chemicals present in industrial and consumer products, food and drinking-water. IARC monographs on the evaluation of carcinogenic risks to humans 101:9-549.		
HERO ID:		2525812		
Conditions of Use:		All COUs.		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 6:		Metadata Completeness	High	Report clearly documents data sources, providing source information, documenting results and providing PVs for DEHP.
Domain 4: Variability and Uncertainty				
Metric 7:		Metadata Completeness	Medium	Addresses variability by stating data across multiple countries. Does not address uncertainty.
Overall Quality Determination			High	

Study Citation:	Industries, P.S. (2016). PSI PolyClay Canes and PSI PolyClay Bricks.			
HERO ID:	6302544			
Conditions of Use:	Rubber Manufacturing/ Plastic Articles			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<=2.5%			
Physical form:	solid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Inland, (2005). Material Safety Data Sheet (MSDS): Octoil.			
HERO ID:	6302421			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	100% by volume			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2005 which is more than 10 but less than 20 years old
	Metric 5:	Sample Size	Medium	SDS presents the amount as a range but both values are the same.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained. In addition, the presentation of concentration is presented as a range but both values are the same.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address uncertainty. The variability in extracted data is unclear.
Overall Quality Determination			Medium	

Study Citation:	IOGCC,, G.a. (2022). FracFocus: Chemical disclosure registry.			
HERO ID:	10291772			
Conditions of Use:	Use in hydraulic fracturing			
EXTRACTION				
Parameter	Data			
Number of sites:	FracFocus provides the number of job sites performing hydraulic fracturing.			
Chemical concentration:	FracFocus provides the concentration of chemicals in hydraulic fracturing fluids used.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for use in hydraulic fracturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by describing HF fluid concentrations at multiple sites but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Ishii, S., Katagiri, R., Minobe, Y., Kuribara, I., Wada, T., Wada, M., Imai, S. (2015). Investigation of the amount of transdermal exposure of newborn babies to phthalates in paper diapers and certification of the safety of paper diapers. Regulatory Toxicology and Pharmacology 73(1):85-92.			
HERO ID:	2915537			
Conditions of Use:	Consumer Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-0.6 ug/g topsheet material			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Japan, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer exposure to personal care products, which is similar to commercial use of personal care products.
	Metric 4:	Temporal Representativeness	High	No more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling multiple brands of diapers.
Overall Quality Determination			High	

Study Citation:	Jaakkola, J., Knight, T. (2008). The role of exposure to phthalates from polyvinyl chloride products in the development of asthma and allergies: A systematic review and meta-analysis. Environmental Health Perspectives 116(7):845-853.			
HERO ID:	699155			
Conditions of Use:	Plasticize PVC			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In Western Europe, about 1 million tons of phthalates are produced each year, of which approximately 900,000 tons are used to plasticize PVC. The most common are diisononyl phthalate (DiNP), diisodecyl phthalate (DiDP), and di-2-ethylhexyl phthalate (DEHP).			
Throughput:	The use of DEHP in Europe in 1997 is estimated at 476,000 tons, of which about 97% is used as plasticizer in polymers, mainly PVC for use in outdoor products (about 22%) or indoor products (462,000 tons).			
Chemical concentration:	The typical concentration of DEHP in plasticized PVC is 30%. The concentrations of phthalates that provoked a statistical increase in antibodies in response to one booster of ovalbumin include DEHP at 2,000 ug/mL.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Jager, de, C., Aneck-Hahn, N., Zijl, Van, M., Hayward, S., Swart, P., Genthe, B. (2019). Endocrine disrupting chemicals in commercially available cling film brands in South Africa. Human and Ecological Risk Assessment 25(6):1633-1644.			
HERO ID:	5432958			
Conditions of Use:	Commercial/Consumer Use - Cling Films			
EXTRACTION				
Parameter	Data			
Process description:	Cling films comprise of plasticizers are commonly used for food packaging and endocrine disrupting chemicals (EDCs) may leach into food, increasing exposure, leading to adverse health outcomes.			
Chemical concentration:	Five brands contained DEHP (2.1–2.59 mg/kg).			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Jo, S. H., Lee, M. H., Kim, K. H., Kumar, P. (2018). Characterization and flux assessment of airborne phthalates released from polyvinyl chloride consumer goods. Environmental Research 165:81-90.			
HERO ID:	4683362			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	152 million pounds (in 2012)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	Jo, S. H., Lee, M. H., Kim, K. H., Kumar, P. (2018). Characterization and flux assessment of airborne phthalates released from polyvinyl chloride consumer goods. Environmental Research 165:81-90.			
HERO ID:	4683362			
Conditions of Use:	Laboratory use			
EXTRACTION				
Parameter		Data		
Chemical concentration:		A mixture of phthalates containing 1,000 ug/L BBP was purchased. This was used to make standards at five concentration levels (1, 5, 10, 20, and 50 ng/uL) for calibration.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	Jonsson, A., Fridén, U., Thuresson, K., Sörme, L. (2008). Substance flow analyses of organic pollutants in Stockholm. Water, Air, and Soil Pollution: Focus 8(5-6):433-443.		
HERO ID:	5765660		
Conditions of Use:	Processing and industrial use of DEHP or DEHP containing materials.		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Use of DEHP as plasticizer for PVC plastics in cables and floorings has been phased-out but these applications make up a stock of some 20,000 tons (85% of the total DEHP stock in Stockholm) and emit 28 tons of DEHP annually (93% of overall emissions).		
Life cycle description:	Life cycle is described by flow analysis in figure 2: inflow of DEHP into a facility stock. Waste is deposited from emissions, air, water/sewage and soil.		
Throughput:	Figure 3 gives throughput of different industries. Coated textiles and fabrics: inflow (tonnes/yr) - 190, stock (tonnes) - 1400, life-length (years) - 7-10, emissions (tonnes/yr) - 0.9; Shoe soles: inflow - 80, stock - 400, life-length - 5, emissions - 0.15; roofings and wall coverings: inflow - ~0, stock - 10,000, life-length - 7-20, emissions - 16; Cable isolators: inflow - ~0, stock - 9,500, life-length - 30, emissions - 12; Covered roofings and paint: inflow - ~0, stock - 72, life-length - 10, emissions - 1; Car undercoating: inflow - 14, stock - 170, life-length - 12, emissions - 0.2; Hoses and profiles: inflow - 130, stock - 1,300, life-length - 10, emissions - 0.06. Industries where inflow is ~0 is because the long lifetimes of the products which have been phased-out still make them the major contributors to the stock of DEHP. Floorings, wall coverings and cable isolators make up 85% of total stock and 93% of total emissions.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Source is not peer reviewed however the data appears to be high quality.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	Data is applicable to processing of DEHP or industrial use of DEHP products.
	Metric 4: Temporal Representativeness	Medium	Data is over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range of data depending on the industry.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Provides industry sector, throughput and release media.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by looking at throughput and releases of specific industry sectors. Does not address uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Kao, Y. M. (2012). [A review on safety inspection and research of plastic food packaging materials in Taiwan]. Journal of Food and Drug Analysis 20(4):734-743.			
HERO ID:	5956748			
Conditions of Use:	Plasticizer in PVC products			
EXTRACTION				
Parameter		Data		
Chemical concentration:		DEHP was found in 2 PVC-made products with concentrations of 1.79 and 1.81%.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality techniques that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of plastic products, which is similar to commercial use of plastic products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (concentrations, number of detected samples) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Kim, S., Kim, Y., Moon, H. B. (2021). Contamination and historical trends of legacy and emerging plasticizers in sediment from highly industrialized bays of Korea. Science of the Total Environment 765:142751.			
HERO ID:	7976686			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Following adoption of regulatory actions, the contribution of phthalates to the global consumption of plasticizers decreased from 88% in 2005 to 65% in 2019. (2/8)			
Life cycle description:	”Phthalates have been the most commonly used plasticizers in a variety of industrial and consumer products, such as polyvinyl chloride (PVC), food packing, cosmetics, pharmaceuticals, and medical devices for more than 80 years. Phthalates are now omnipresent in air, water, soil, sediment, biota, and humans. (2/8)”			
Chemical concentration:	DEHP was detected in surface sediment at a range of 3.19-30,000 ng/g with a mean of 2140+-3950 ng/g. (4/8)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Korea, an OECD country.
	Metric 3:	Applicability	Uninformative	Data are for ambient soil sampling, which isn’t an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (range, median, mean, standard deviation) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed with a statistical analysis. Variability isn’t addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Koch, H. M., Angerer, J. (2011). Phthalates: Biomarkers and human biomonitoring. Issues in Toxicology 9:179-233.		
HERO ID:	5533904		
Conditions of Use:	Manufacturing/processing as a plasticizer		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Phthalate consumption in western Europe in kt/yr in Fig 31.1. DEHP consumption in 400 - 500 kt/yr range until 1998. Steady decline after from 1998 to 2008 ending at about 225 kt/yr. In 2008, more than 5 million tons of phthalates were used as plasticizers, 50% in Asia, 20% in Western Europe and 16% in North America.		
Life cycle description:	Typical products in industrial, commercial and consumer uses are in building and construction materials, flooring and roofing materials, cables and wires, clothing, furnishing, car interiors and car underbody coatings, toys and also food contact materials. It is also in medical devices such as bags for blood or parenteral nutrition, tubing and catheters.		
Chemical concentration:	PVC phthalate content can be up to 40%.		
Comments:	Personal sampling conducted in source but it is urinary metabolite data.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Unclear if source is peer reviewed and uses infrequent sources but indicates high quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for Western Europe and conducted by UK, an OECD country.
	Metric 3: Applicability	High	Data is for production and processing of DEHP.
	Metric 4: Temporal Representativeness	Medium	Relevant data up to over 10 years old.
	Metric 5: Sample Size	Medium	Characterized by a range of data.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Provides source and results, and sources are described generally.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by looking at various phthalates consumption over a 20 year period. Does not address uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Koch, H. M., Haller, A., Weiß, T., Käßlerlein, H. U., Stork, J., Brüning, T. (2012). Phthalate exposure during cold plastisol application - A human biomonitoring study. Toxicology Letters 213(1):100-106.			
HERO ID:	787918			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	4.6 mio tonnes of DEHP, DINP, DIDP and DPHP consumed worldwide in 2008.			
Life cycle description:	Plasticizer in all other basic organic chemical manufacturing, plastics product manufacturing			
Chemical concentration:	20wt%-30wt% of high molecular weight phthalates in plastisol			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journalarticles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors(e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			High	

Study Citation:	Koniecki, D., Wang, R., Moody, R. P., Zhu, J. (2011). Phthalates in cosmetic and personal care products: Concentrations and possible dermal exposure. Environmental Research 111(3):329-336.			
HERO ID:	788300			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	382 - 1045 ug/g			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journalarticles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 yearsbut no more than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	Kostic, I., Andelkovic, T., Andelkovic, D., Cvetkovic, T., Pavlovic, D. (2018). A study of the influence of ultraviolet radiation on di(2-ethylhexyl) phthalate leaching from poly(vinyl chloride) medical devices. Journal of the Serbian Chemical Society 83(10):1157-1165.
HERO ID:	5630287
Conditions of Use:	Processing/Use as a plasticizer in PVC products (Medical devices)

EXTRACTION	
Parameter	Data
Chemical concentration:	PVC products used in medicine contain DEHP in amounts up to 40% by weight. Table I has amount of leached DEHP (mg) from PVC parts of peritoneal dialysis set with different extraction times (6, 15, and 30 days). Dialysis bag before/after UV treatment: 6 days - 25.82 +/- 1.05 / 9.69 +/- 1.01; 15 days - 301.00 +/- 23.58 / 11.68 +/- 0.77; 30 days - 324.98 +/- 14.17 / 12.45 +/- 0.69. Coupled tubing: 6 days - 319.13 +/- 28.37 / 9.52 +/- 0.71; 15 days - 325.33 +/- 8.10 / 10.68 +/- 1.03; 30 days - 351.18 +/- 28.74 / 12.04 +/- 1.66. Table II provides same data but for different medical equipment bags: Quadruple blood bag - 193.71 +/- 1.61 / 9.07 +/- 0.87; 15 days - 217.23 +/- 4.81 / 9.93 +/- 0.89; 30 days - 229.02 +/- 3.03 / 11.46 +/- 0.49; Tubing coupled to quadruple blood bag: 22.01 +/- 2.21 / 13.45 +/- 0.34; 15 days - 25.71 +/- 1.96 / 16.03 +/- 1.23; 30 days - 29.39 +/- 2.63 / 17.02 +/- 0.97; SAG-M transfer bag: 6 days - 1.77 +/- 0.04 / 1.14 +/- 0.09; 15 days - 3.79 +/- 0.19 / 1.14 +/- 0.07; 30 days - 4.06 +/- 0.12 / 2.73 +/- 0.51; Tubing coupled to SAG-M transfer bag: 6 days - 22.73 +/- 2.02 / 13.04 +/- 0.92; 15 days - 26.52 +/- 2.17 / 14.92 +/- 0.40; 30 days - 29.43 +/- 2.56 / 15.84 +/- 0.75; Transfer bag: 6 days - 18.46 +/- 1.73 / 11.78 +/- 1.06; 15 days - 22.63 +/- 0.59 / 12.67 +/- 0.64; 30 days - 26.43 +/- 0.59 / 13.75 +/- 0.43; Tubing coupled to transfer bag: 6 days - 23.89 +/- 0.42 / 14.75 +/- 0.69; 15 days - 26.07 +/- 2.54 / 15.24 +/- 0.72; 30 days - 27.89 +/- 0.61 / 16.41 +/- 0.53. Fig 2 gives comparison between of before and after UV treatment based on Table data. Results of amount of DEHP leached after 30 days and total content of DEHP in samples treated with UV-A radiation, it could be observed that after 3 days, less than 10% was leached.
Comments:	Focus of study is DEHP in PVC medical devices such as infusion and transfusion tubings, blood bags, parenteral nutrition tubings, various tube systems for blood cell separation, parts of systems for peritoneal dialysis.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so methodology would consist of high quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for Serbia, a non-OECD country.
	Metric 3: Applicability	Medium	Data is for DEHP content in medical devices which can be attributed to processing industry of DEHP into plastics.
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old (2018)
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report documents data sources, assessment methods and results.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by looking at different medical plastic devices typically used in medical profession and specifically hemodialysis. Does not address uncertainty.

Overall Quality Determination

Medium

Study Citation:	Kostic, I., Andelkovic, T., Andelkovic, D., Cvetkovic, T., Pavlovic, D. (2018). A study of the influence of ultraviolet radiation on di(2-ethylhexyl) phthalate leaching from poly(vinyl chloride) medical devices. Journal of the Serbian Chemical Society 83(10):1157-1165.			
HERO ID:	5630287			
Conditions of Use:	Lab Use			
EXTRACTION				
Parameter	Data			
Process description:	”Standards of DEHP and dibutyl adipate (DBA) were purchased from Sigma–Aldrich (St. Louis, MO, USA)...All stock and working solutions were prepared in n-hexane. Amounts of DEHP and DBA standard were accurately weighed on an analytical balance with precision at ±0.00001 g (Kern, Germany) and diluted with n-hexane. These solutions were labelled as stock solutions and were stored in a refrigerator. The stock standard of DEHP was diluted stepwise with n-hexane to prepare at least 5 concentration levels of intermediate standards. Working solutions were prepared by dilution of intermediate solutions and by adding DBA at concentration 1 µg cm-3. All solutions were stored in the dark at 4 °C.”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so methodology would consist of high quality data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for Serbia, a non-OECD country.	
	Metric 3: Applicability	High	The report describes Lab Use, which is an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old (2018)	
	Metric 5: Sample Size	N/A	process description	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents the process used in the lab.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Process description	
Overall Quality Determination		High		

Study Citation:	Koszelnik, P., Ziembowicz, S., Kida, M. (2020). Analysis of concentrations of selected phthalic acid esters in aquatic ecosystems - Poland’s case study. Desalination and Water Treatment 186:56-64.			
HERO ID:	6825427			
Conditions of Use:	Domestic Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production of phthalates was 1.9 Mt in 1975, 6.2 Mt in 2009, and >8 Mt in 2011. (3/10)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Poland, an OECD country.
	Metric 3:	Applicability	Medium	Data are for domestic manufacturing, an in-scope occupational scenario, but data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by comparing different years but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Kumar, H., Kumagai, S., Kameda, T., Saito, Y., Yoshioka, T. (2021). One-pot wet ball-milling for waste wire-harness recycling. Journal of Material Cycles and Waste Management 23(2):461-469.		
HERO ID:	7978491		
Conditions of Use:	Recycling		
EXTRACTION			
Parameter	Data		
Life cycle description:	Electrical/electronic systems are indispensable parts of automobiles as well as electrical and electronic equipment (EEE). Typically, cables are used in such systems in the form of wire harnesses, which generally comprise an assembly of thin (i.e., mm-order diameter), single-coated layered cables. The cables are usually composed of a conductive material such as copper for the transport of electricity, insulated by a polymeric material such as poly(vinyl chloride) (PVC). Worldwide, approximately 40 million end-of life vehicles (ELVs) and 20–50 million tons of waste electrical and electronic equipment (WEEE) were generated in 2010. (1/9)		
Process description:	Generally, ELVs and WEEE are first processed by dismantlers, and then are prepared for shredding to recover metals and plastics. (1/9)		
Chemical concentration:	PVC may also contain 20–40 wt % diisononyl phthalate (DINP) or bis(2-ethylhexyl) phthalate (DEHP). (1/9)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3: Applicability	High	Data are for recycling of DEHP, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by testing different solvents and rotation speeds for the recycling method. Uncertainty isn’t addressed.
Overall Quality Determination		High	

Study Citation:	Lacey, S., Alexander, B. M., Baxter, C. S. (2014). Plasticizer contamination of firefighter personal protective clothing - a potential factor in increased health risks in firefighters. Journal of Occupational and Environmental Hygiene 11(5):D43-D48.			
HERO ID:	2345987			
Conditions of Use:	Processing or commercial use of DEHP in textiles (firefighter clothing)			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Table II provides concentration of DEHP in firefighter PPE (ug/g sample). Inner glove layer: unused glove - 1.4, glove 1 - 320.0, glove 2 - 30.0; middle glove: unused glove - 4.4, glove 1 - 830.0; outer glove: unused glove - 4.5, glove 1 - 1400.0; cuff: unused glove - 0.5, coat inner wristlet - 220.0; hoods: hood 1 - 340.0, hood 2 - 170.0, hood 3 - 57.0			
Comments:	Analyzed by EPA method 8270. While Fire fighters are not a COU they may still be considered a PESS, occupationally.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed and appears to use high quality data and sound methods of analysis.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data from US.
	Metric 3:	Applicability	N/A	While fire fighters are not a COU they may be considered a PESS for occupational exposure(s)
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Multiple samples from the same type of material, and characterizes a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides worker activity, exposure route, and PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by testing across unused and used firefighter clothes. Addresses uncertainty in addressing quantifying samples below the LOD.
Overall Quality Determination			High	

Study Citation:	Ladd Research, (2023). Safety Data Sheet (SDS): Mercox II Resin.			
HERO ID:	6302441			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	5-20%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Lakeev, S. N., Maydanova, I. O., Mullakhmetov, R. F., Davydova, O. V. (2016). Ester plasticizers for polyvinyl chloride. Russian Journal of Applied Chemistry 89(1):1-15.			
HERO ID:	4141956			
Conditions of Use:	Processing in PVC			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Most widely used (90% of the market) plasticizers are esters, of which o-phthalic acid esters make up more than 80%. DEHP is an o-phthalic acid ester but does not specify what % DEHP makes up.			
Comments:	Contains info about production methods of terephthalates but DEHP is an o-phthalate and DEHP is only mentioned briefly.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so likely contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from Russia, a non-OECD country.
	Metric 3:	Applicability	Low	Data contains processing methods for other acid esters which could be similar to DEHP but not specific information to DEHP
	Metric 4:	Temporal Representativeness	High	Data is from 2015.
	Metric 5:	Sample Size	Low	Data is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Documents results, methods, and assumptions. Sources are generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Latini, G. (2005). Monitoring phthalate exposure in humans. Clinica Chimica Acta 361(1-2):20-29.		
HERO ID:	789380		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Globally, more than 18 billion pounds of phthalates are used each year and well above 2 million tons of DEHP alone are produced annually worldwide.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	Laursen, S. E., Hansen, J., Drøjdahl, A., Hansen, O. C., Pommer, K., Pedersen, E., Bernth, N. (2003). Survey of chemical compounds in textile fabrics.			
HERO ID:	6302196			
Conditions of Use:	Textile Finishing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Chemical concentration in various textiles/fabrics given in Table 7.1 on PDF Pg. 46			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	High	Data are for fabric finishing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	High	Concentration distribution is fully characterized (discrete concentrations)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple concentration samples taken per item but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Lee, M., Kim, J. H., Lee, D., Kim, J., Lim, H., Seo, J., Park, Y. K. (2018). Health risk assessment on hazardous ingredients in household deodorizing products. International Journal of Environmental Research and Public Health 15(4):744.			
HERO ID:	4730751			
Conditions of Use:	Laboratory reagent			
EXTRACTION				
Parameter	Data			
Chemical concentration:	99.5% in laboratory reagent used for analyses			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	Lee, Y. S., Lee, S., Lim, J. E., Moon, H. B. (2019). Occurrence and emission of phthalates and non-phthalate plasticizers in sludge from wastewater treatment plants in Korea. Science of the Total Environment 692:354-360.		
HERO ID:	6959335		
Conditions of Use:	Disposal		
EXTRACTION			
Parameter	Data		
Chemical concentration:	Concentrations (ng/g dry weight) of DEHP in sludge samples collected from three different types of wastewater treatment plants (WWTPs) in Korea: domestic WWTP – mean of 64,000 for a range of 10,000-120,000; mixed WWTP – mean of 50,000 for a range of 31,000-71,000; industrial WWTP – mean of 92,000 for a range of 1400-1,000,000. The DEHP concentration measured in the study was lower than those reported for France (180 $\mu\text{g/g}$ dry wt), Turkey (186 $\mu\text{g/g}$ dry wt), and South Africa (120 $\mu\text{g/g}$ dry wt), but higher than those reported for China (4.70–21.0 $\mu\text{g/g}$ dry wt) and India (26.0 $\mu\text{g/g}$ dry wt).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty in the results.
Overall Quality Determination		High	

Study Citation:	Lerner, I. (2005). European plastics industry moves from 2-EH, DEHP. Chemical Market Reporter 267(26):26-27.			
HERO ID:	7978846			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Throughput:	BASF Germany plant had production capacity of 200,000 mtons/yr.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Lerner, I. (2005). European plastics industry moves from 2-EH, DEHP. Chemical Market Reporter 267(26):26-27.			
HERO ID:	7978846			
Conditions of Use:	Industrial/Commercial Use: Plastic and Rubber Products			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In 2003, the market consumed 18 billion pounds of plasticizers. The US represents 16% of the global plasticizer capacity. (see figure on second page).			
Life cycle description:	About 70% of the plasticizer market is phthalates and plasticizers make up about 60% of the plastics additive market. PVC accounts for 80-90% of global plasticizer consumption.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the United States.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is general and not specific to DEHP.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Lewandowski, K., Skórczewska, K. (2022). A brief review of poly(vinyl chloride) (PVC) recycling. Polymers 14(15):3035.			
HERO ID:	10778266			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Life cycle description:	Use of PVC in the EU by application: 27% profiles, 22% Pipe and fitting, 6% Misc. rigid, 7% flexible films and sheets, 2% flexible tube and profiles, 7% cables, 7% flooring, 3% coated fabrics, 9% other, 8% rigid films, and 2 % rigid plates			
Process description:	Methods of PVC recycling, including mechanical recycling and feedstock recycling, are discussed on PDF Pg. 3-8.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Switzerland, an OECD country.
	Metric 3:	Applicability	High	Data are for recycling, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Process Description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Process Description.
Overall Quality Determination			High	

Study Citation:	Lewis, S., Levin, M. E. (2003). DEHP exposure questions lead to calls for caution. Journal of Healthcare Risk Management 23(3):11-13.			
HERO ID:	683662			
Conditions of Use:	Plasticizer in food, beverage, and tobacco product manufacturing; medical devices; plastic material and resin manufacturing.			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Most softened PVC medical devices contain 20-40 percent DEHP by weight, although PVC tubing may contain up to 80 percent DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Liang, Y., Caillot, O., Zhang, J., Zhu, J., Xu, Y. (2015). Large-scale chamber investigation and simulation of phthalate emissions from vinyl flooring. Building and Environment 89:141-149.			
HERO ID:	3072211			
Conditions of Use:	Building material (flooring) manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Phthalates are dominant in the current market of plasticizers. In the last decade, the global production of phthalates has increased from 3.5 to 6.0 million tons/yr. Recently, the U.S. Consumer Product Safety Improvement Act was enacted to restrict the use of phthalates in toys and childcare articles. As a result, phthalates used in polymeric products are changing rapidly, with a shift from low to high molecular phthalates.			
Chemical concentration:	DEHP concentration (mg/mg) in different vinyl flooring samples are: in Sample #3 – 0.11; in Sample # 5 – 0.02; in Sample #6 – 0.004.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	Liang, Y., Xu, Y. (2014). Improved method for measuring and characterizing phthalate emissions from building materials and its application to exposure assessment. Environmental Science & Technology 48(8):4475-4484.			
HERO ID:	2346023			
Conditions of Use:	Incorporation into article/Use (vinyl floors)			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	The global production rate of phthalate plasticizers has increased from 2.5 to 6 million tons/yr within a decade. However, following the restrictions on using certain phthalates in toys and child care products,19 phthalates used in PVC products are changing rapidly, with a trend toward using phthalates of higher molecular weight and lower volatility.			
Chemical concentration:	Concentrations of DEHP in 4 samples of vinyl floorings are: Sample 1 - 13 +/- 2%, Sample 2 - 23 +/- 3%, Sample 3 - 0.1 +/- 0.02%, Sample 5 - 7 +/- 1%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability but none on uncertainty
Overall Quality Determination			High	

Study Citation:	Liang, Y., Xu, Y. (2014). Emission of phthalates and phthalate alternatives from vinyl flooring and crib mattress covers: The influence of temperature. Environmental Science & Technology 48(24):14228-14237.			
HERO ID:	3015875			
Conditions of Use:	Vinyl flooring			
EXTRACTION				
Parameter	Data			
Life cycle description:	Use in vinyl flooring products. Source also covers crib mattress covers, but this is outside the scope of occupational exposure and release.			
Chemical concentration:	TABLE 1, 16 types of vinyl flooring found concentrations of phthalates ranging from 9 – 23% of the flooring by weight. Phthalates that were measured are DEHP, DINP, BBP, and DBP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment uses high quality data and techniques that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation. However, DIDP was not measured.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Variability is addressed through evaluation of various types of vinyl flooring, and measurement uncertainty is addressed through calculation of mean and standard deviation of measurements.	
Overall Quality Determination		High		

Study Citation:	Liss, G. M., Albro, P. W., Hartle, R. W., Stringer, W. T. (1985). Urine phthalate determinations as an index of occupational exposure to phthalic anhydride and di(2-ethylhexyl)phthalate. Scandinavian Journal of Work, Environment and Health 11(5):381-387.			
HERO ID:	63766			
Conditions of Use:	Plasticizer in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	176,450 metric tons in 1977			
Process description:	DEHP is produced in an adjacent area by a continuous-flow operation involving the esterification of 2-ethylhexanol with PA in the presence of a catalyst.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Uses Industry data and NIOSH methods
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report documents methods and results
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and Uncertainty not addressed
Overall Quality Determination		Medium		

Study Citation:	LLC, S.C. (2019). Base/Neutrals Mix 1.			
HERO ID:	6302556			
Conditions of Use:	Laboratory Chemical			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2019, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Lord Corporation, (2020). Safety Data Sheet (SDS): CIRCALOK 6410 A.			
HERO ID:	6302439			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	5-10%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2020 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Lord Corporation, (2021). Safety Data Sheet (SDS): CIRCALOK 6410 B.			
HERO ID:	6302447			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	65-70%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2021 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Lott, S. (2014). Phthalate-free Plasticizers in PVC.			
HERO ID:	7323639			
Conditions of Use:	commercial use in Building/construction materials			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Imports of PVC flooring from Asia to the US have been on the rise over the last decade. According to the statistics from the database USA Trade Online, from 2002 to 2012, the value of plastic floor covering imports from Asia to the US rose from \$145 million to \$612 million. The majority of those imports are likely to contain toxic phthalates such as DEHP, which, according to the most recent estimates, still holds 60% of the plasticizer market in Asia (“Evaluation of new scientific evidence concerning DINP and DIDP in relation to entry 52 of Annex XVII to REACH Regulation (EC) No 1907/2006.”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for use in building materials, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Lowell Center for Sustainable Production at the University of Massachusetts, (2011). Technical briefing: Phthalates and their alternatives: Health and environmental concerns. :23.		
HERO ID:	5349749		
Conditions of Use:	Use as plasticizer		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	The annual global production of phthalates is estimated to be 11 billion pounds. (p. 4).		
Life cycle description:	Primarily used as a plasticizer for PVC for Dolls, shoes, raincoats, clothing, medical devices (plastic tubing and intravenous storage bags), furniture, automobile upholstery, and floor tiles (Table 1).		
Chemical concentration:	PVC products may contain up to 50 percent by weight of plasticizers, most commonly phthalates. (p. 4). // Major medical uses of PVC are in blood and plasma bags, as well as intravenous bags and tubing which may contain as much as 80 percent DEHP (p. 6).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High	

Study Citation:	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. Environmental Science and Pollution Research 25(21):20550-20561.			
HERO ID:	4728432			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	The global annual production of phthalates is estimated to be 11 billion pounds.			
Life cycle description:	Common industrial uses of DEHP - Building products (wallpaper, wire, and cable insulation), car products (vinyl upholstery and car seats), clothing (footwear and raincoats), food packaging, children’s products (toys and grip bumpers), and medical devices.			
Chemical concentration:	DEHP has the highest concentration in foodstuff: 329 ug/kg in meat product, 322 ug/kg in poultry, and 789 ug/kg in fish. DEHP was detected at the highest level (5932 ug/kg) in fish products. The highest measured levels were DEHP 6.45 mg/L in 9-month-old normal saline.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Lundberg, G., Nilsson, C. (1994). Phthalic acid esters used as plastic additives: Volume 1. Ecotoxicological risk assessment, Volume 2. Comparisons of toxicological effects. GRA and I(GRA and I):284.			
HERO ID:	680058			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume: Comments:	Consumption in 1981 and production in 1972 on PDF Pg. 28) the consumption rate cited is for Sweden. See P28 for U.S. data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality [data/techniques/methods] from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Sweden, an OECD country.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving consumption volumes for multiple countries but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Mailler, R., Gasperi, J., Chebbo, G., Rocher, V. (2014). Priority and emerging pollutants in sewage sludge and fate during sludge treatment. Waste Management 34(7):1217-1226.
HERO ID:	2519040
Conditions of Use:	Disposal - sludge treatment

EXTRACTION	
Parameter	Data
Production, import, or use volume:	French WWTPs produce 1 million tons dry matter of sludge per year, Germany produces 2.2 million tons and the UK produces 1.8 million tons. Total across Europe of dry matter of sludge is 11 million tons. In 2008, land farming was the main pathway both in France (>60%) and in the EU (>50%).
Life cycle description:	Management of sludges is achieved through 3 principal pathways: agricultural uses (land farming), incineration and disposal/landfilling.
Process description:	Seine Centre plant has sludge produced first by centrifuging to achieve a volume reduction, resulting in production of 21,000 tons of DM of centrifuged sludge per year. Sludge is incinerated to producing ash and smoke, which is specifically treated to minimize odors. The Seine Aval plant consists in a mesophilic anaerobic digestion to transform an import part of organic matter into biogas and eliminating pathogens and parasites. Digested sludge is then dewatered by thickening, thermal conditions (heat exchange and cooking at 195 C and 20 bars) and press filtration. These successive treatments allow reducing sludge volume by more than a factor 10 and producing a dewatered cake called sludge cake which is reused as agricultural fertilizer. The Seine Gresillons plant sludge treatment is performed by centrifugation and thermal drying. the thermal drying process can operate at a wide range of temperature, but the facility used in this plant operates at a high temperature (260 C) compared to conventional dryers (generally 105 C). This allows reducing the water content drastically to obtain almost 8,000 tons DM of solid pellets per year which are stocked in big bags or silos before to be reused in agriculture. Figure 1 provides layout of the three studied plants.
Throughput:	Seine Centre plant treats 240,000 m ³ of wastewater per day and generates 21,000 tons of DM of centrifuged sludge per year. Seine Aval plant receives 1,700,000 m ³ of wastewater per day and produces 55,000 tons DM of treated sludge per year. The Seine Gresillons plant treats 100,000 m ³ of wastewater per day and generates almost 8,000 tons DM of solid pellets per year.
Number of sites:	3
Chemical concentration:	Literature review of DEHP concentration in sludge (mg/kg DM): Finland: Mean - 126, min - 91, max - 179; Spain: mean - 159 and 148.8, min - 12 and 1.5, max - 345 and 3514; World: mean - 58, min - <0.02, max - 3514. Fig 2 is plot of conc. of contaminants: DEHP ranges from about the LOQ up to 2.5 mg/kg DM.
Comments:	Public waste treatment. LOQ for DEHP listed as 0.05 mg/kg DM

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so likely highly accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for OECD countries
	Metric 3:	Applicability	Medium	Data is for municipal waste treatment and creation of sludge.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides process description of waste treatment at each plant, release media, and throughput.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by testing across different plants. Does not address uncertainty.

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Study Citation:	Mailler, R., Gasperi, J., Chebbo, G., Rocher, V. (2014). Priority and emerging pollutants in sewage sludge and fate during sludge treatment. Waste Management 34(7):1217-1226.		
HERO ID:	2519040		
Conditions of Use:	Disposal - sludge treatment		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	Marx, J. L. (1972). Phthalic acid esters: Biological impact uncertain. Science 46(4056):46-47.			
HERO ID:	1335811			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Approximately 1 billion pounds of phthalic acid esters were made in 1972.			
Chemical concentration:	Phthalate plasticizers may account for as much as 40 percent of the final weight of PVC.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Materials,, M.A. (2016). Safety Data Sheet (SDS): Stopyt product: Regular.			
HERO ID:	6302449			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<10% by weight			
Physical form:	Liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Materials,, M.A. (2016). Safety Data Sheet (SDS): Stopyt Product 62A.			
HERO ID:	6311450			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<10% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Milbrandt, A., Coney, K., Badgett, A., Beckham, G. T. (2022). Quantification and evaluation of plastic waste in the United States. Resources, Conservation and Recycling 183:106363.			
HERO ID:	11360398			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Total Plastic Waste Managed in U.S. in 2019:PET: 5,986 ktHDPE: 7,910 ktPP: 8,189 ktLDPE/LLDPE: 15,139 ktPVC: 699 ktPS/EPS: 3,094 ktOther: 3,115 kt			
Life cycle description:	Percentage of total plastic waste managed by category:PET: 14%HDPE: 18%PP: 19%LDPE/LLDPE: 34%PVC: 2%PS/EPS: 7%Other: 7%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for disposal, an in-scope occupational scenario; however, the data are not chemical specific.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing multiple types of plastic products but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Millar, J. D. (1983). Special Occupational Hazard Review. Alternatives To Di-2-Ethylhexyl Phthalate ("DOP") Respirator Quantitative Fit Testing. Public Health Service(83-109):83-250.			
HERO ID:	1334123			
Conditions of Use:	Respirator Testing			
EXTRACTION				
Parameter	Data			
Process description:	Di-2-ethylhexyl phthalate (DEHP), used for many years to generate a polydisperse aerosol test atmosphere in QNFT, is the branched-chain isomer of di-n-octyl phthalate. Commonly known to respirator users and others as "DOP," DEHP has been considered to be well suited for QNFT because of its physical characteristics. A polydisperse aerosol consists of 'particles generated with a random size distribution over a narrow range, as opposed to a monodisperse aerosol, which has a uniform particle size distribution. Tests using the polydisperse DEHP aerosol have been demonstrated to be both accurate and meaningful in the evaluation of respirator fit (Hyatt et al, 1972). In QNFT, a human subject wearing a test respirator is placed in a chamber containing the DEHP challenge aerosol nebulized at a specific concentration. To determine face seal leakage, the atmosphere inside the respirator is sampled through a probe inserted into the test respirator inlet covering, and the aerosol concentration is quantified by light-scattering photometry. Leakage is expressed as the ratio between the test concentration outside the respirator and that gaining entrance inside the facepiece.			
Chemical concentration:	0.169 * 10^5 um^3/cc			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for respirator testing, which applies to in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not described.
Overall Quality Determination		Medium		

Study Citation:	Muchangos, L. D., Xue, M., Zhou, L., Kojima, N., Machimura, T., Tokai, A. (2019). Flows, stocks, and emissions of DEHP products in Japan. Science of the Total Environment 650(Pt 1):1007-1018.
HERO ID:	5043426
Conditions of Use:	All COUs.

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Results of estimation for DEHP production and shipment to processing into products from 1948 to 2030 are presented in figure 1 which corresponds to the production phase. Highest peak observed in 1996 with 313,100 tons for production and 285,300 tons for shipment. Majority of data in figure 1 is from 1990 to 2000 ranging from close to 200,000 tons to the max amount previously mentioned. Fig 2 shows stocks in the use phase for each category of products with DEHP. Total peak stock amount of approximately 2 million tons occurred in 2001, with the highest contribution of 540,746 tons from building materials, 424,914 tons from industrial raw materials, and 388,158 tons from electric wire covering. In the subsequent five years, the annual reductions of DEHP stocks were under 100,000 tons. In 2000 Production produced 219,300 tons with 1 ton to air, 3 to soil, 49 to water, 164 to STP, and 99 to Industrial waste. Formulation of end use products produced 207,458 tons of end use DEHP in product with 135 to air, 32 to soil, 29 to water, and 95 to STP. From use, 66,360 goes to domestic waste and 120,234 tons/yr to industrial waste. 743 to air, 41,380 to soil, 6,836 to water, and 5,985 to STP. For waste that goes to recycling: 1,959 from re-introduced materials, 3,127 DW (domestic waste) to mechanical treatment, 3,127 IW (industrial waste) to mechanical treatment, 1,176 DW to chemical treatment, 1,876 IW to chemical treatment. 3,092 are exported from recycling, 2 to air, 1 to water, 3 to STP, 0 to soil. From waste to incineration: 27,824 DW to thermal treatment, 44,400 IW to thermal treatment, 21,946 DW incineration, 35,020 IW incineration. Releases from incineration are 9 to air, 0 to soil, water and STP. From waste to landfill: 13,455 DW landfill disposal, 21,470 to IW landfill disposal, and 14,440 from illegal dumping. Releases from landfill are 0 from air, 2 from soil and STP and 1 from water. This is all in tons and in Figure 7.
Life cycle description:	Analysis of DEHP use was divided into 3 lifecycle stages: production phase, use phase, and treatment & final disposal phase. Fig7 shows flows, stocks and emissions of DEHP products in Japan for the year 2000.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.

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Study Citation:	Muchangos, L. D., Xue, M., Zhou, L., Kojima, N., Machimura, T., Tokai, A. (2019). Flows, stocks, and emissions of DEHP products in Japan. Science of the Total Environment 650(Pt 1):1007-1018.		
HERO ID:	5043426		
Conditions of Use:	All COUs.		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 8343, Bis(2-ethylhexyl) phthalate.			
HERO ID:	7681905			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	251,067,000 lbs in 1982 (139/149)			
Process description:	DEHP is commercially produced from esterification of phthalic acid anhydride and 2-ethylhexanol. Esterification is completed with an acid or metal catalyst or with no catalyst at high temperature.(138/149)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data is from more than 20 years back.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 8343, Bis(2-ethylhexyl) phthalate.			
HERO ID:	7681905			
Conditions of Use:	Processing: Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Plastics may contain from 1 to 40% DEHP by weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	NICNAS, (2015). Priority existing chemical assessment report no. 40: Butyl benzyl phthalate.			
HERO ID:	3664467			
Conditions of Use:	Plastic and rubber products			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Some phthalates such as DEHP and DINP can be present in high concentrations (up to 40-50% by weight) in polymer materials. (16/57)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Australia, an OECD country.	
	Metric 3: Applicability	High	Data are for plastic and rubber processing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed for DEHP.	
Overall Quality Determination		High		

Study Citation:	NICNAS, (2013). 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester: Human health tier II assessment.			
HERO ID:	5155529			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	DEHP is listed on the 2006 High Volume Industrial Chemicals List (HVICL) with a total reported volume between 10,000 and 99,000 tonnes per annum in Australia. (3/13)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Australia, an OECD country.	
	Metric 3: Applicability	Low	Data is for domestic manufacturing data for Australia only. No U.S. Production volume.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	NICNAS, (2013). 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester: Human health tier II assessment.			
HERO ID:	5155529			
Conditions of Use:	Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP in children’s products must be less than 1 % (4/13) according to The Australian Competition and Consumer Commission (ACCC).			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of toys, which is similar to the in-scope occupational scenario of fabrication of final products from articles.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	Just states concentration limit. No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Just states concentration limit. No sample data.
Overall Quality Determination			Medium	

Study Citation:	NICNAS, (2013). Priority existing chemical assessment report no. 36: Dibutyl phthalate.			
HERO ID:	5155533			
Conditions of Use:	Processing - plasticizer in children’s toys.			
EXTRACTION				
Parameter	Data			
Chemical concentration:	pg 30; DEHP found in toys with conc. ranging from 0.008% to 35.5% by weight. DEHP in a toy had 22.4%. Another study found plastic toys with DEHP conc of 2.6%.			
Comments:	Source is primarily for DBP but contains some data points for DEHP in children’s toys.On page 26 - 27 there is a very vague sentence about how DEHP was found in 8 of 252 products that ”included fragrances, hair care products (hair sprays, mousses, and gels), deodorants (including antiperspirants), nail polishes, lotions (body lotions and body creams), skin cleansers, and baby products (oils, lotions, shampoos and diaper creams).”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report is not peer reviewed but it contains high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Australia, an OECD country.
	Metric 3:	Applicability	High	Contains concentrations of DEHP in plastics. Processing as a plasticizer in plastic material and resin manufacturing is in scope.
	Metric 4:	Temporal Representativeness	Medium	Report is from 2013 but majority of data is from 2000s.
	Metric 5:	Sample Size	Medium	Characterized by a range of data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Clearly documents results. Sources are generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by referencing many different studies about concentration of DEHP in toys. Does not address uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Nielsen, J., Fahraeus, C., Bensryd, I., Akesson, B., Welinder, H., Linden, K., Skerfving, S. (1989). Small airways function in workers processing polyvinylchloride. International Archives of Occupational and Environmental Health 61(7):427-430.
HERO ID:	5175880
Conditions of Use:	Processing/industrial use - processing PVC/incorporation into articles for film and floor coverings.

EXTRACTION	
Parameter	Data
Process description:	Thin film calender operators used 6 machines where the film was cut into diapers or ribbons for mat production or exported in rolls for use as packing materials. Thick film created floor sheeting from PVC containing mostly DEHP. Plasticized PVC in this department was treated to a maximum of 180 C.
Chemical concentration:	DEHP along with other plasticizers could take up to 10 to 60% in thin film calendered PVC.
Comments:	DEHP is mentioned being present but sampling data does not specify what percentage or how much of the total sampled is DEHP and does not specify if they were PBZ or area samples.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination	Medium
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Study Citation:	Nike-Tech, (2015). Safety Data Sheet (SDS): TRU SEAL.			
HERO ID:	11803692			
Conditions of Use:	Sealant			
EXTRACTION				
Parameter	Data			
Chemical concentration:	5-10%, p.4			
Physical form:	liquid, p.16			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Source just provides concentration and does not document how this value was obtained.
Overall Quality Determination			High	

Study Citation:	NIOSH, (1983). Health hazard evaluation report: HETA 82-223-1340. Rubbermaid, Incorporated, Wooster, OH.			
HERO ID:	8632596			
Conditions of Use:	Commercial Use: Plastic and rubber products			
EXTRACTION				
Parameter	Data			
Process description:	The Wire Line operation involves the coating, curing, finishing, and packaging of vinyl resin-coated wire products. The process involves attaching a hang wire to the item to be processed by induction welding, passing it through a preheat oven where it is raised to a temperature of about 350°F [177°Celsius (C)], dipping the item in an organosol (a dispersion of vinyl resin, plasticizer, and a solvent) filled vat maintained at between 90-100°F (33-38°C), and passed through a curing oven at temperatures of 230-250°F (110-121°C). The parts, carried by conveyor through the ovens and organosol dip, are delivered to the finisher-packers where the hanq wires are removed, the plastic tube remaining after removal of the hang wire is fused with a silicone-dipped soldering iron, packaging sleeves or inserts are applied, and the items are packed in boxes. Materials used include organosol, adipate ester and phthalate ester plasticizers, a stoddard-type solvent, and a silicone fluid.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but information is general (for phthalates) and not specific to DEHP.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Process description.	
Overall Quality Determination		High		

Study Citation:	Noguchi, M., Yamasaki, A. (2016). Passive flux sampler measurements of emission rates of phthalates from poly(vinyl chloride) sheets. Building and Environment 100:197-202.			
HERO ID:	3983119			
Conditions of Use:	PVC Use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Emission rates of bis(2-ethylhexyl)phthalate (DEHP) from PVC sheets containing DEHP as a plasticizer at various contents were measured using the passive gas flux sampling method. The data are for PVC emissions in general, but this could be applied to PVC articles in the Industrial and Commercial Use lifecycle stage.			
Chemical concentration:	The PVC sheets used in analysis of DEHP emissions had DEHP concentrations ranging from 0.16% to 32.3%.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment uses high quality data and sound methods that are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	Inhalation exposure during work with PVC is in-scope of the risk evaluation. Also, DEHP concentrations in PVC materials will inform dermal exposure assessment.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by analysis of various PVC sheet materials, but measurement uncertainty is not characterized.
Overall Quality Determination			High	

Study Citation:	NTP, (1982). NTP technical report on the carcinogenesis bioassay of di(2-ethylhexyl)phthalate (CAS no. 117-81-7) in F344 rats and B6C3F1 mice (feed study).			
HERO ID:	5160110			
Conditions of Use:	Manufacturing/production			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	389 million pounds of DEHP produced in the US in 1977			
Comments:	The entire source is an animal study on the toxicity of DEHP on rats and mice, intro (pg. 17) is the only part that contained production information on DEHP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Study conducted by the national toxicology program by the US department of health and human services so methodology is likely high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Data is for production volume of DEHP.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old (1977)
	Metric 5:	Sample Size	Low	Not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides source of data. For the rest of the study the results, methods and assumptions are transparent and generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-isodecyl phthalate (DIDP). (3);i-III90.			
HERO ID:	679108			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	the ACGIH value for DEHP is 5mg/m3			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NYSDEC, (2011). Revised draft. Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program: Well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs.			
HERO ID:	1777818			
Conditions of Use:	Use in hydraulic fracturing			
EXTRACTION				
Parameter	Data			
Process description:	PD for hydraulic fracturing is given on PDF Pg. 445-451			
Chemical concentration:	Typical concentrations of flowback constituents are given in Table 5-10 on PDF Pg. 460.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for use in hydraulic fracturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Sample distribution characterized by limited statistics (min, max, median) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by sampling multiple states’ flowback water but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	OECD, (2018). Socio-economic assessment of phthalates.				
HERO ID:	7681900				
Conditions of Use:	Domestic Manufacturing				
EXTRACTION					
Parameter	Data				
Production, import, or use volume:	The phthalate plasticizer market currently stands at around 5.5 million tonnes per year. The main use of phthalates is as a plasticizer, with flexible PVC accounting for over 80% of world plasticizer consumption. (15/90) Phthalates are esters of phthalic acid, made by reacting phthalic anhydride with alcohols from methanol and ethanol to tridecyl (C13) alcohol. (15/90) Phthalates can contribute as much as 50% of the weight of PVC materials.(15/90)				
Process description:					
Chemical concentration:					
EVALUATION					
Domain		Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources. (OECD)	
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from France, an OECD country.	
	Metric 3:	Applicability	High	Data are for manufacturing of phthalates, an in-scope occupational scenario.	
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination			High		

Study Citation:	OEHHA, (1997). Public health goal for di(2-ethylhexyl)phthalate (DEHP) in drinking water.		
HERO ID:	5155636		
Conditions of Use:	Production and processing of DEHP.		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	95% of consumption of DEHP is for plasticizer in PVC and 5% for other polymeric products. Estimated annual production of DOP of which 90% was DEHP was 300 million lbs in 1985 - 1990, 340 million lbs in 1977 and 250 million lbs in 1982. Production facilities were described by ATSDR (1993) in PA, NJ, TN, and MD. No production in CA. Imports of 6 million lbs in 1988 and exports of 10 to 40 million lbs annually in 1980 to 1990 noted. CA lists 15 facilities where quantities of 0 to 999,000 lbs were stored, handled or incorporated into products.		
Chemical concentration:	Building materials and furnishing, medical devices and equipment components are manufactured of flexible PVC, and most of these contain up to 40% DEHP as the plasticizer. 95% is applied to this use.		
Comments:	Environmental release data is TRI. Majority of study regards cancer risk of DEHP. Sampling data is on animals in animal studies.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source uses frequently used sources and is from a government agency.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.
	Metric 3: Applicability	High	Data is applicable to processing and releases during production for or using DEHP.
	Metric 4: Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5: Sample Size	Low	Data is not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Sources and results are provided and generally described.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Ohlson, C. G., Hardell, L. (2000). Testicular cancer and occupational exposures with a focus on xenoestrogens in polyvinyl chloride plastics. Chemosphere 40(9-11):1277-1282.			
HERO ID:	1415211			
Conditions of Use:	Processing/consumer Use of plastics			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Plasticizers, mostly DEHP, are used in PVC from 0% to almost 50% of the weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	Low	Characterized by no statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Pak, V. M., Mccauley, L. A. (2007). Risks of phthalate exposure among the general population: Implications for occupational health nurses. American Association of Occupational Health Nurses Journal 55(1):12-17.			
HERO ID:	1598544			
Conditions of Use:	Industrial/commercial uses			
EXTRACTION				
Parameter	Data			
Life cycle description:	DEHP is used in health care devices and tubing, building materials (e.g., floor tiles), shower curtains, food packaging, children’s products (e.g., toys, baby pants).			
Number of sites:	According to a 1997 U.S. economic census, more than 407,000 individuals are employed in approximately 81,000 beauty salons across the country, and more than 93% of U.S. nail salon workers are female.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Park, C., Sheehan, R. J. (2000). Phthalic acids and other benzenepolycarboxylic acids. :1-45.			
HERO ID:	679796			
Conditions of Use:	use (as a plasticizer)			
EXTRACTION				
Parameter	Data			
Throughput:	pg. 13/45: "The largest-volume plasticizer is di(2-ethylhexyl) phthalate [117-81-7] which is known commercially as dioctyl phthalate (DOP) and is the base to which other plasticizers are compared."			
Comments:	This article only provides very general/anecdotal info			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Phenova (2017). SDS - Custom Low ICAL Mix.			
HERO ID:	6302481			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1% DEHP by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2018). Safety Data Sheet (SDS): Custom 8270 Cal Mix 1.			
HERO ID:	11803682			
Conditions of Use:	Laboratory Chemical			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%, p.3			
Physical form:	liquid, p.17			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2017). Safety Data Sheet (SDS): BN Extractables – Skinner List.			
HERO ID:	6280738			
Conditions of Use:	Laboratory Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2018). Safety Data Sheet (SDS): Custom SS 8270 Cal Mix 1.			
HERO ID:	6280755			
Conditions of Use:	Laboratory Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2018 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Does not address variability or uncertainty.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2017). Safety Data Sheet (SDS): Custom 8270 Cal Standard.			
HERO ID:	6287089			
Conditions of Use:	Laboratory Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2017). Safety Data Sheet (SDS): Custom 8270 Plus Cal Mix.			
HERO ID:	6289707			
Conditions of Use:	Laboratory Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2017). Safety Data Sheet (SDS): Custom 8061 Phthalates Mix.			
HERO ID:	6302494			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	From a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Phenova, (2018). Safety Data Sheet (SDS): EPA 525.2 Semivolatile Mix.			
HERO ID:	6302555			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2018 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Plastics,, Adams (2016). Material Safety Data Sheet (MSDS): Flexible polyvinyl chloride.			
HERO ID:	6302185			
Conditions of Use:	Adhesives and Sealants			
EXTRACTION				
Parameter		Data		
Chemical concentration:		28%		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Product is from a US supplier.
		Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
		Metric 4: Temporal Representativeness	High	Source is from 2016 which is less than 10 years old.
		Metric 5: Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Porras, S. P., Koponen, J., Hartonen, M., Kiviranta, H., Santonen, T. (2020). Non-occupational exposure to phthalates in Finland. Toxicology Letters 332:107-117.			
HERO ID:	6957499			
Conditions of Use:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Phthalates have been widely used as plasticizers to soften PVC plastics at volumes of millions of tons per year. (1/11)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality techniques that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Finland, an OECD country.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Products, Q.A. (2015). Red Glazing Putty 1# Tube.				
HERO ID:	6302564				
Conditions of Use:	Use of automotive care products				
EXTRACTION					
Parameter	Data				
Chemical concentration:	1-<5%				
Physical form:	liquid paste				
EVALUATION					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.	
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is about 10 years old.	
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.	
Overall Quality Determination			High		

Study Citation:	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.			
HERO ID:	6580284			
Conditions of Use:	Formulation of paint and varnish			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Trade sale finishes and industrial finishes are produced in almost equal volume with the production for 1972 estimated at 465 million gallons for trade sales and 485 million gallons for industrial finishes.			
Process description:	Mixing or dispersing pigment and vehicle to give the final product. The paint vehicle is defined as the liquid portion of the paint and consists of volatile solvent or dispersing medium and non-volatile binder such as oils and resins. The non-volatile portion is also called the vehicle solid or film former. The incorporation of the pigment in the paint vehicle is accomplished by a combination of grinding and dispersion or dispersion alone. When it is necessary to further grind the raw pigment, pebble or steel ball mills are normally used. With the advent of fine particle grades of pigment and extenders, as well as the wide spread use of wetting agents, the trend is toward milling methods that are based on dispersion without grinding. Dispersion consists of breaking up of the pigment clusters and agglomerates, followed by wetting of the individual particles with the binder or vehicle. Some of the more popular methods currently being used are high-speed disc impellers, high speed impingement mills and the sand mill. // There are two basic types of varnishes, spirit varnishes and oleoresinous varnishes.2 Spirit varnishes are formed by dissolving a resin in a solvent and they dry by evaporation of the solvent. The dry film formed undergoes no substantial change in the process of drying and is classified as non-convertible. Varnish is cooked in both portable kettles and large reactors. Kettles are used only to a limited extent and primarily by the smaller manufacturers. The very old, coke fired, 30 gallon capacity copper kettles are no longer used. The varnish kettles which are used, have capacities of 150 to 375 gallons. These are fabricated of stainless steel, have straight sides and are equipped with three or four-wheel trucks. Heating is done with natural gas or fuel oil for better temperature control. The kettles are fitted with retractable hoods and exhaust pipes, some of which may incorporate solvent condensers. Cooling and thinning is normally done in special rooms. // Source contains more information on raw materials, specific processes, and equipment.			
Number of sites:	The industry is made up of about 1,500 companies operating about 1,700 plants			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The data were more than 20 years old	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized	
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Study Citation:	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.		
HERO ID:	6580284		
Conditions of Use:	Formulation of paint and varnish		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

Study Citation:	Raabe Corporation, (1995). Material Safety Data Sheet (MSDS): BAD 6012 Rust Resistant Gray Primer.			
HERO ID:	6302547			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<5% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Source is from 1995 which is more than 20 years old
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Radian Corp, (1989). Environmental analysis for the Shell Martinez RM-17 incinerator, with cover letter dated 3/15/1991 (sanitized).			
HERO ID:	1335691			
Conditions of Use:	Disposal - incineration			
EXTRACTION				
Parameter	Data			
Process description:	Section 2.1, pg 21: The Shell incinerator contains a single combustion chamber with waste injection nozzles located at the base. The unit operates with a firebox temperature ranging between 1400 to 1800 F. Various air pollution control equipment exist in the process. Combustion gases exit the incinerator system through a 100-fot stack. Figure 2-1 in the source illustrates the combustion process. Two liquid waste feed streams and process offgases, generated in the production of RM-17, are injected into the incinerator as a primary means of waste treatment. Only waste screams generated from the production of RM-17 at the Shell Manufacturing Complex are combusted in the incinerator. The health risk calculations presented in this document assume a constant feed rate of one gallon per minute, or 525,600 gallons per year. This feed rate is approximately 150 times greater than the historical feed rate for the incinerator. The one gallon per minute feed rate was chosen to provide, a health conservative analysis.			
Throughput:	Note: Waste stream consists of Toluene recycle and light ends, unclear what the weight fraction of DEHP in waste stream, see pgs 21-24 for more info. Feed rate of 1 gallon per minute -> 525,600 gallons per year			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report is by Radion Corp contracted by Shell Oil company for a TSCA submission. Likely to cover all releases since it is a TSCA submission.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.	
	Metric 3: Applicability	Medium	Data is for the on-site waste incineration of liquid waste and process offgas generated in the manufacture of a chemical known as RM-17. Unclear what that chemical is for or about.	
	Metric 4: Temporal Representativeness	Low	Data is over 20 years old.	
	Metric 5: Sample Size	Low	Not characterized by statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Includes release media, process, unit operations, release frequency and activity of re-lease.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses uncertainty in its environmental exposure assessment, does not address vari-ability.	
Overall Quality Determination		Medium		

Study Citation:	Reddy, J. K., Rao, M. S. (1986). Peroxisome proliferators and cancer: mechanisms and implications. Trends in Pharmacological Sciences 7(11):438-443.			
HERO ID:	630910			
Conditions of Use:	Consumer Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	50% by weight of some plastic materials.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evalu- ated.
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			Low	

Study Citation:	Restek Corp, (2019). Safety Data Sheet (SDS): 31850/8270 MegaMix®.			
HERO ID:	6302537			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2024 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Restek Corp, (2024). Safety Data Sheet (SDS): 31621/8270 Calibration Mix #4.			
HERO ID:	6302542			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2024 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Restek Corp, (2024). Safety Data Sheet (SDS): 31420/Bis(2-ethylhexyl) Phthalate Standard.			
HERO ID:	6302545			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2024 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Restek Corp, (2023). Safety Data Sheet (SDS): 31845/EPA Method 506 Phthalate and Adipate Esters.			
HERO ID:	6302548			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter		Data		
Chemical concentration:		0.1%		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Restek Corp, (2023). Safety Data Sheet (SDS): 31903/CLP 04.1 B/N MegaMix Mix A (Revision 2).			
HERO ID:	6302560			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Restek Corp, (2019). 33227/EPA Method 8061A Phthalate Esters Mixture.			
HERO ID:	6302566			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Restek Corp, (2023). Safety Data Sheet (SDS): 31031/606 Phthalate esters calibration mix.			
HERO ID:	6311458			
Conditions of Use:	Use of Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.2%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.			
HERO ID:	10472417			
Conditions of Use:	PVC Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizers, such as DINP, are widely used to make inherently rigid materials, such as PVC, soft and flexible. Indeed, 95% of DINP is used in PVC applications. DINP does not chemically bind to the PVC, but is incorporated into it during processing, to allow it to flex. Because DINP processes efficiently (it improves PVC melt viscosity), it takes less time and lower temperatures to incorporate it into the PVC, and to produce the finished product. Accordingly, manufacturing using the product-chemical combination is energy efficient.			
Process description:	No process description, but rather life cycle information provided.			
Chemical concentration:	OEHHA considered an “upper-end estimate” of exposure to DINP in vinyl flooring containing 18.9% or less DINP by weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	OEHHA provided as reference for concentration of DINP in vinyl flooring. Data does not indicate quality issues, but methodology for determining chemical concentration is not transparent.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, data extracted is not for DEHP specifically.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample size was not provided for determination of chemical concentration.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	ROCKWOOL, (2017). Material Safety Data Sheet (MSDS): ROCKWOOL® Intumescent Pipe Wraps.			
HERO ID:	6302575			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Unknown- Source states article contains DEHP but no value provided.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017 which is less than 10 years old.
	Metric 5:	Sample Size	Low	No value(qualitative).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source does not provide concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	RPM, (2002). Material Safety Data Sheet (MSDS): Ramuc Type A - White & Colors.			
HERO ID:	6311457			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents/ Paints			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<10% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Source is from 2002 which is more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.			
HERO ID:	6311222			
Conditions of Use:	Industrial/Commercial Use: Paints and coatings			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Auto OEM: 166,000 cars painted/yr per siteAuto-refinish: 70-2,000 L paints/yr per site			
Life cycle description:	Automotive Coating Application			
Process description:	Pretreatment (wash) of car body, E-coat (dip), oven/cure, primer (spray), oven/cure, basecoat (spray), oven/cure, clearcoat (Spray), oven/cure			
Throughput:	no information provided			
Number of sites:	Auto OEM: 61 sitesAuto-refinish: 1000’s of sites			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering OEM and refinish applications.
Overall Quality Determination			Medium	

Study Citation:	Sealants., R.A. (2019). Safety Data Sheet (SDS): BD Loops Loop Goop2 Iso.			
HERO ID:	6302565			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	25-50%			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2019 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Sealants,, T.C. (2015). Safety Data Sheet (SDS): Universal C/P Cotton.			
HERO ID:	6302281			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed
Overall Quality Determination			High	

Study Citation:		Sealants,, T.C. (2015). Safety Data Sheet (SDS): Universal C/P Eggshell Cream.			
HERO ID:		6302286			
Conditions of Use:		Use of Dyes and Pigments, and Fixing Agents			
		EXTRACTION			
Parameter		Data			
Chemical concentration:		0.1-1%			
		EVALUATION			
Domain		Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology		High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope		High	Product is from a US supplier.
	Metric 3:	Applicability		High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness		High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size		Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness		Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness		Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination		High			

Study Citation:	Sealants,, T.C. (2015). Safety Data Sheet (SDS): Universal C/P Beach.			
HERO ID:	6302577			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is about 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Sealants,, T.C. (2015). Safety Data Sheet (SDS): Vulkem 45 SSL White.			
HERO ID:	6311468			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1%			
Physical form:	solid paste			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Sealants,, Tremco (2015). Safety Data Sheet (SDS): Universal C/P LT. Cream.			
HERO ID:	6302288			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Sealants., Tremco (2015). Safety Data Sheet (SDS): Universal C/P Mint.			
HERO ID:	6302289			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Sealants,, Tremco (2015). Safety Data Sheet (SDS): Universal C/P Parchment.			
HERO ID:	6302290			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-1%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.	
Overall Quality Determination		High		

Study Citation:	Sealants., Tremco (2016). Safety data sheet: Universal C/P Sunset Yellow. :1-15.			
HERO ID:	6302292			
Conditions of Use:	Use of Dyes and Pigments, and Fixing Agents			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1-<0.3%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2016, which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.	
Overall Quality Determination		High		

Study Citation:		Sealants,, Tremco (2015). Safety Data Sheet (SDS): Universal C/P Super White.			
HERO ID:		6302293			
Conditions of Use:		Use of Dyes and Pigments, and Fixing Agents			
		EXTRACTION			
Parameter		Data			
Chemical concentration:		0.1-1%			
		EVALUATION			
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
		Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
		Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination		High			

Study Citation:		Sigma-Aldrich, (2024). Safety Data Sheet (SDS): Dioctyl phthalate.			
HERO ID:		6302551			
Conditions of Use:		Use of Laboratory Chemicals			
		EXTRACTION			
Parameter		Data			
Chemical concentration:		90-100%			
		EVALUATION			
Domain		Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology		High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope		High	Product is from a US supplier.
	Metric 3:	Applicability		High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness		High	Source is from 2024 which is less than 10 years old.
	Metric 5:	Sample Size		Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness		Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness		Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination		High			

Study Citation:	Smooth-On, (2007). Material Safety Data Sheet (MSDS): PMC-744 Part A.			
HERO ID:	6302554			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	1-5% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2007 which is more than 10 but less than 20 years old
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Smooth-On, (2007). Material Safety Data Sheet (MSDS): ReoflexTM Series Part A.			
HERO ID:	6302561			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	1-5% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2007 which is more than 10 but less than 20 years old
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Smooth-On, (2008). Material Safety Data Sheet (MSDS): VytaFlex™ Series Part A.			
HERO ID:	6302571			
Conditions of Use:	Rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Chemical concentration:	5% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2008 which is more than 10 but less than 20 years old
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Spectrum Chemical Mfg Corp, (2015). Safety Data Sheet (SDS): Dioctyl phthalate.			
HERO ID:	6302536			
Conditions of Use:	Plastic Compounding			
EXTRACTION				
Parameter	Data			
Chemical concentration:	100% by weight			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015 which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.			
HERO ID:	675435			
Conditions of Use:	manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production figures (in Million or Pounds) for DEHP are as follows: 1979 - 300.6, 1978 - 408.6 (also includes other dioctyl phthalates in addition to DEHP), 1977 - 388.5, and 1976 - 296.7. Dioctyl phthalates, DEHP in particular, account for approximately one-third of all phthalate production. Import data for DEHP (as millions of pounds) are as follows: 1979 – 3.246, 1978 – 11.29, 1977 – 0.57.			
Life cycle description:	DEHP is the most widely used general-purpose plasticizer for polyvinyl chloride. It is used in products such as automobile vinyls and plastics, wire and cable insulations, and a wide variety of consumer goods and home furnishings. DEHP is also used as a dielectric fluid component in capacitors as a replacement for PCBs. The volume of DEHP consumed annually for capacitor applications is on the order of 1 million pounds. This is a minor use compared to the plasticizer uses, which consume nearly 300-400 million pounds annually.			
Process description:	The dialkyl phthalates, including DEHP, are produced by esterifying phthalic anhydride with the appropriate alcohols in the presence of catalytic amounts of sulfuric acid. The production process begins by challenging phthalic anhydride and the appropriate alcohol into a reactor that is actually the still of a distillation column. A stoichiometric excess of alcohol is normally utilized. A 1 percent solution of concentrated sulfuric acid is added as a catalyst. The reactor is heated to such a temperature that the azeotrope of water and alcohol distills at the column-head. The distillate is cooled and separated by decantation. The alcohol-rich layer is recycled to the column, while the water-rich layer is either wasted or sent to recovery. When the optimum amount of water has been removed from the reactor, the residual crude phthalate (still bottoms) is discharged to an alkali washer that neutralizes the sulfuric acid content with sodium carbonate. This neutralizing operation is followed by a water-washing operation. The crude phthalate is then stripped in a vacuum column to separate the volatile products such as olefins, alcohol, and other impurities. When economically feasible, the alcohol is recovered for reuse. The phthalate can be further purified by decolorizing with activated charcoal.			
Number of sites:	Number of producers listed is 10. Number of importers listed is 7.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		
Continued on next page ...				

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Study Citation:		SRC, (1982). Information profiles on potential occupational hazards: Phthalates.		
HERO ID:		675435		
Conditions of Use:		manufacturing		
		EVALUATION		
Domain	Metric	Rating	Comments	

Study Citation:	StatSpin, (2004). Material Safety Data Sheet (SDS): Hematocrit tube sealant pad.			
HERO ID:	6311466			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	>30%			
Physical form:	solid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Source is from 2004 which is more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a minimum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Summers, J. W. (2006). Vinyl chloride polymers. :1-41.		
HERO ID:	7322451		
Conditions of Use:	Production of polyvinyl chloride (PVC) plastic		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	In 2002 of 27x10^6 t of PVC were produced worldwide (p. 1). // Overall, the potential demand for recycled vinyl is estimated to be over twice the potential supply of all vinyl bottles produced in the United States each year (247E3 tons needed vs 103.5E3 tons available via recycling of bottles). A more recent directory published by the Vinyl Institute lists nearly 50 companies that make commercial products out of recycled vinyl (p. 16)		
Life cycle description:	Use of PVC in 2003 breaks down as follows: construction, 74% (includes pipe and tubing, 46%; siding, 14%; windows and doors, 6%; other including flooring, 8%); consumer goods, 9%; packaging, 6%; electrical fittings and wire and cable coatings, 5%; transportation, 2%; home furnishings, 2%; miscellaneous, 2% (147). (p. 18).		
Process description:	Produced by free radical polymerization. The principal type of polymerization of PVC is the suspension polymerization route. Mass-polymerized PVC has a similar morphology to suspension PVC...The first step in processing is usually powder mixing in a high speed, intensive mixer. PVC resin, stabilizers, plasticizers, lubricants, processing aids, fillers, and pigments are added to the powder blend for distributive mixing. For both suspension and mass PVC resins, intensive mixing above the glass-transition temperature results in a progressive (p. 1-2). Additional explanation of suspension and mass polymerization is provided in Section 3, along with explanation of other types of polymerization. // Linear alcohol-based phthalates offer good low temperature flexibility and also have reduced volatility. DEHP (di-2-ethylhexylphthalate) has been used worldwide in applications such as blood bags, saline solutions, meat wraps, and other highly credible uses. DEHP-plasticized PVC is used in medical applications like blood bags where it is known to protect red blood cells from deterioration. (p. 10).		
Throughput:	See Table 7: Ranging from 52.2E3 to 1,361E3 tons/yr (see Table 7).		
Number of sites:	PVC is a global product, manufactured by roughly 150 companies in approximately 50 countries (p. 11). Table 7 (pg. 33) lists the North American producers of PVC and their capacities for 2003.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium	
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Study Citation:	Summers, J. W. (2006). Vinyl chloride polymers. :1-41.		
HERO ID:	7322451		
Conditions of Use:	Production of polyvinyl chloride (PVC) plastic		
		EVALUATION	
Domain	Metric	Rating	Comments

Study Citation:	SUNY, (2019). Phthalates in infant cotton clothing: Occurrence and implications for human exposure. Science of the Total Environment 683:109-115.			
HERO ID:	5432967			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Detection rates (DR, %) and concentrations ($\mu\text{g/g}$) of DEHP in infant cotton clothing in this study: min – 0.89, 25th% - 1.87, median – 2.74, 75th% - 5.12, max – 42.3, DR – 100%			
Comments:	Though the study focuses on cotton material used in infant clothing, the same materials may be used for adult cotton clothing.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Systems., Ultraflex (2018). Material Safety Data Sheet (MSDS): BriteLine Banner.			
HERO ID:	6302301			
Conditions of Use:	Fabrication of Final Product from Articles			
EXTRACTION				
Parameter	Data			
Chemical concentration:	10-20% by weight			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.	
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Source is from 2018 which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.	
Overall Quality Determination		High		

Study Citation:	Tools,, Imperial (2015). Safety Data Sheet (SDS): Imperial Liqui-Vac.			
HERO ID:	6311493			
Conditions of Use:	Sealant			
Parameter	Data	EXTRACTION		
Chemical concentration:	1-5% (p.2)			
Physical form:	liquid (p.3)			
Domain	Metric	EVALUATION		Comments
		Rating		
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is about 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination		High		

Study Citation:	Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates and other specified elements in undyed manufactured fibers and their colorants.
HERO ID:	5155511
Conditions of Use:	Processing - incorporation into formulation or used in finishing

EXTRACTION

Parameter	Data
Process description:	Evidence for DEHP used as a carrier/accelerant in polyester fiber blends such as wool/polyester. Evidence for use of phthalates was limited. Phthalates as additives could be introduced after dye manufacture. Table 18 provides use of DEHP as softener and plasticizer in finishing as well as a carrier/accelerant. PET fiber is produced commercially from transesterification of DMT with EG or direct esterification of purified TPA with EG. DMT process is the older of the two. Both batch and continuous operations are used to produce PET using DMT, while a continuous process is used to produce PET using TPA. First stage of the manufacturing process using DMT is transesterification (ester interchange) and the process using TPA is direct esterification. A catalyst (antimony-based ie antimony trioxide) is required by the DMT process. Catalyst is omitted in the direct esterification using TPA bc the reaction is self-catalyzed by the carboxylic acid groups. Salts of divalent metals such as zinc, calcium, and manganese, are the prevalent transesterification catalysts. DMT initially reacts with an excess of EG in the presence of sodium methoxide as catalyst. Both DMT and TPA produce BHET monomer as the intermediate in the 1st stage. In addition to BHET, the DMT process produces methanol while the TPA process produces water; these by-products are subsequently removed from the reaction vessel. The BHET formed is subjected to a polycondensation process that produces polyester PET fiber, and this process is driven by the removal of glycol. Titanium dioxide is commonly added during transesterification to dull the fiber and that carbon black is sometimes added for coloration. After formation, it is pumped directly to fiber spinning units or solidified and collected as pelleted to be remelted later for spinning. For acrylic and modacrylic fibers: solution polymerization and aqueous suspension (also called dispersion) polymerization methods are most used to polymerize the monomer, acrylonitrile and the monomer and comonomers. Suspension method is the most common commercial methods. Bulk polymerization process can be used for the acrylics but has not been commercialized because the autocatalytic nature of the reaction makes control difficult. Modacrylic acid also is commercially manufactured using emulsion polymerization. In the manufacture of acrylic fibers, a copolymer with some dye sites, specific molecular weight and controlled composition is required. Stages for Rayon manufacturing: 1) wood cellulose and concentrated caustic soda react to form soda cellulose; 2) the soda cellulose reacts with carbon disulfide to form sodium cellulose xanthate; 3) the sodium cellulose xanthate is dissolved in dilute caustic soda to give viscose solution; 4) the solution is ripened; and 5) It is extruded into sulfuric acid that regenerate the cellulose, now in the form of long filaments (viscose rayon).
Chemical concentration:	DEHP identified in Polyester fiber, Nylon fiber, Acrylic/Modacrylic fiber, and Viscose Rayon (cellulose). Carrier content in the finished fibers is expected to be low (<0.2 percent) using the best available practices but could be as high as 2.7 percent. Table E-1 provides conc. of DEHP in certain tested fabrics (mg/kg) (ppm): 100% rayon: 3.7/1.0 (avg 2.4); 100% PET: 1.7/2.6 (avg 2.2). Table E-4 has conc of DEHP in textile samples: PET - 0.55 mg/kg (ppm); Nylon - 0.62 mg/kg (ppm); Acrylic - 0.60 mg/kg (ppm). 2016 study found DEHP at concentrations of 0.55 - 0.73 mg/kg (ppm) in PET, 0.62-0.83 mg/kg (ppm) in Nylon, 0.58 to 0.65 ppm in acrylic samples
Comments:	Source specifies that phthalates, specifically DEHP as out of scope if it is involved in the finishing process. Included process descriptions of materials of interest in case a step would identify use of DEHP.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Data is of high quality and is from frequently used sources (EPA, Kirk-Othmer).
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US.
	Metric 3: Applicability	High	Data is for occupational scenario - processing or incorporation
	Metric 4: Temporal Representativeness	High	Report is less than 10 years old.
	Metric 5: Sample Size	Medium	Data is over a range.

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Study Citation:		Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates and other specified elements in undyed manufactured fibers and their colorants.		
HERO ID:		5155511		
Conditions of Use:		Processing - incorporation into formulation or used in finishing		
Domain		Metric	EVALUATION	
			Rating	Comments
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Documents data sources, and results and are generally described.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at multiple different fibers for DEHP contamination. Does not address uncertainty.
Overall Quality Determination			High	

Study Citation:	Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates in specified materials at concentrations above 0.1 percent.
HERO ID:	5155525
Conditions of Use:	Processing as catalyst in plastics.

EXTRACTION	
Parameter	Data
Process description:	Several catalytic systems have been developed for manufacture of EBR: vanadium or titanium based catalysts at low temps; homogeneous vanadium based systems or heterogeneous Ziegler-Natta catalysts at higher temps to produce EBR; Group IV metallocenes (in toluene) that produce copolymers with small amounts of inserted butadiene with cyclopentane rings being formed in various amounts; lanthanide-based organometallic complexes that have been reported to be promising, but result in the synthesis of butadiene-ethylene copolymer with small amounts of inserted ethylene; Neodymocene complexes with alkylating/chain transfer agents that produce copolymers with high butadiene contents (up to 60 mol percent) and with 6 members rings and unsaturations along the polymer chain. For EBC: Butene/ethylene copolymers are produced by the catalytic polymerization of 1-butene liquid monomer in teh presence of small amounts of ethylene monomer. EVA copolymers are commercially manufactured worldwide by copolymerizing ethylene and vinyl acetate using solution polymerization, suspension polymerization, bulk polymerization, or emulsion polymerization. EVOH follows a two-step process, comprising polymerization and saponification. In the polymerization process, ethylene and vinyl acetate are polymerized to give the ethylene vinyl acetate copolymer using an initiator/activator complex. In the saponification process, the EVA copolymer is saponified to the EVOH copolymer. Significant process descriptions not given for GPS, MIPS and SHIPS. EPM and EPDM rubbers or elastomers are produced by three major commercial processes: the solution process, the suspension process (slurry process), and the gas-phase process. Multiple processes are used to produce silicone rubbers: hydrolysis and/or methanolysis; polycondensation; ring-opening polymerization; anionic polymerization of cyclic siloxanes; cationic polymerization of cyclic siloxanes; emulsion polymerization; radiation-induced polymerization; and plasma polymerization.
Chemical concentration:	DEHP identified in 5 different plastic. Majority of them are used as Ziegler-Natta Catalysts so concentrations are likely less than 0.0001%. Butadiene - Ethylene Resins (EBR), Ethylene-butene copolymers (EBC), ethylene copolymers [ethylene vinyl acetate (EVA) and ethylene vinyl alcohol (EVOH)], ethylene-propylene monomer (EPM) and ethylene-propylene-diene monomer (EPDM), Polystyrene [Crystal and general-purpose (GPS)], medium impact polystyrene (MIPS), super-high-impact polystyrene (SHIPS) grades] and styrene-butadiene copolymers, are the identified plastics with Ziegler-Natta catalysts. DEHP identified in silicone rubber in baby toys at 0.3%. Other silicone rubber had conc levels from migration tests of 25-50 ug/kg (ppm) (0.0000025-0.000005%).
Comments:	Main source of DEHP contamination is from Zeigler-Natta catalyst but it is not significant.

		EVALUATION		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Uses multiple sources of data but uses some frequent sources such as OSHA.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Data is for processing into plastics with the use of a catalyst.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Low	Data is mostly qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Clearly documents data sources and results, they are generally described.
Domain 4: Variability and Uncertainty				

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Study Citation:	Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates in specified materials at concentrations above 0.1 percent.			
HERO ID:	5155525			
Conditions of Use:	Processing as catalyst in plastics.			
Domain		Metric		EVALUATION
				Rating
				Comments
	Metric 7:	Metadata Completeness	Medium	Data addresses variability by looking at multiple different plastics. Does not address uncertainty.
Overall Quality Determination			High	

Study Citation:	Turnbull, D., Rodricks, J. V. (1985). Assessment of possible carcinogenic risk to humans resulting from exposure to di-2-ethylhexylphthalate. Journal of the American College of Toxicology 4(2):111-146.			
HERO ID:	1335161			
Conditions of Use:	Processing as plasticizer in PVC, leather, furnishing, wallpaper, lawn furniture, rainwear, pool liners, flooring, footwear, toys, containers and tubing.			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Estimated that 1188 million pounds of plasticizers were used in PVC in 1980 and of this total, 30% (about 356 million pounds) was DEHP.			
Chemical concentration:	PVC plastics may contain up to 40% DEHP by weight			
Comments:	Majority of the source is a pharmacokinetic model in DEHP exposure in animals and then extrapolating that data to biological exposure in humans.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data not from frequently used sources but is peer reviewed so data is likely accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	High	Data stated is for processing of DEHP in various products.
	Metric 4:	Temporal Representativeness	Low	Data is greater than 20 years old.
	Metric 5:	Sample Size	Low	Data not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are provided and generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
HERO ID:	11138808			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of sites: Used to develop a method to estimate number of sites and workers.				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	BLS is expected to use reliable survey methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	U.S. based economic data.
	Metric 3:	Applicability	High	These economic data cover all industry and occupation types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	The BLS OES data are from 2021.
	Metric 5:	Sample Size	High	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Limited discussion of variability and uncertainty in results.
Overall Quality Determination			High	

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

Study Citation:	U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization, volume 1.			
HERO ID:	11803647			
Conditions of Use:	Commercial Use - Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Process description:	Page 43: "Synthetic turf systems have been installed in the United States since the 1960s. Currently, there are between12,000 and 13,000 synthetic turf sports fields in the United States, with approximately 1,200 to 1,500 new installations each year (Synthetic Turf Council et al., 2016). These fields, which are designed to simulate the experience of practicing and playing on grass fields, are installed at a variety of venues, including parks, schools, colleges, stadiums and practice fields, and are used by a wide variety of people, such as professional, college and youth athletes; coaches; referees; and recreational users of allages. It is estimated that 95% of synthetic turf fields utilize recycled rubber infill exclusively or in mixture with sand or alternative infills (Synthetic Turf Council et al., 2016). Infill is added for ballast, support for the synthetic grass blades and as cushioning for field users. The recycled rubber infill material used on these fields is produced from waste automobile and truck tires, which are reprocessed using either an ambient or cryogenic method to create "crumb"-sized material, with reportedapproximate diameters ranging from 1 to 6 mm (Lim & Walker, 2009). In addition to its use in synthetic turf, recycled tire material is increasingly being used for playground surfaces in the Unites States."			
Chemical concentration:	Table 2-3 Mean values of selected tire crumb rubber extractable SVOC Analysis Results Across Multiple Studies & Table 2-5 pg. 69: "12 mg/kg for DIBP (recycling plants), 65 mg/kg (indoor fields), 29 mg/kg (outdoor fields), 8.7 mg/kg (outdoor fields- Celeiro et al 2018), 7.6 mg/kg (outdoor fields - RIVM 2017)pg. 68 Maximum value for DEHP in synthetic turf field samples was 170 mg/kgpg. 161 average values for DEHP for tire crumb infill is 43 mg/kgTable 4-36 pg.162 provides standard deviation, % relative standard deviation, 10, 25, 50, 75, and 90th percentile as well as max for DEHP measured in tire crumb from recycling plants and synthetic turf fields (mean values ref above).Table 4-44 pg. 179 Table includes measurements without correction for infill sand content.Table 4-91 pg. 264 Table includes measurements by U.S. Census Region			
Comments:	Report notes pg. 68 "Several phthalate chemicals were found, on average, at higher levels in samples from synthetic turf fields than in 'fresh' material coming from tire recycling plants. If additional research confirmed this trend of higher levels of phthalates at individual fields, possible explanations could be: atmospheric deposition; track-in by field users or releases from shoes, clothing or other personal products; presence in and release from other synthetic turf field materials; or from chemical treatments applied to fields"			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for fabrication of final product from articles, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is mostly characterized; report provides different percentiles, max, mean and standard deviations.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
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Study Citation:		U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization, volume 1.		
HERO ID:		11803647		
Conditions of Use:		Commercial Use - Toys, playground, and sporting equipment		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	High	Uncertainty is addressed by discussion of methodologies. Variability addressed by standard deviation statistics.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization appendices, volume 2.		
HERO ID:	11845553		
Conditions of Use:	Commercial Use - Toys, playground, and sporting equipment		
EXTRACTION			
Parameter	Data		
Process description:	<p>Pages 24-26: "Synthetic turf fields are installed for various activities played at both the recreational and professional level, including football, soccer, and lacrosse. There are approximately eight major synthetic field installers in the United States with the largest four being national in scope, installing coast to coast (Sprinturf, 2016). An estimated 95 percent of the existing fields in North America use recycled rubber infill exclusively or in a mixture with sand or alternative infills; the remaining five percent contain only alternative infills (STC et al., 2016a). STC also reports that the use of exclusively alternative infills in new installations increased in 2016 (STC et al, 2016b). ... Fields can be infilled with material in a few different ways. Sand is often used as a lower layer infill material to act as ballast for the turf component. On top of this lower layer either will be tire crumb rubber or a sand/tire crumb rubber mix, topped by additional tire crumb rubber. Other fields can use an infill exclusively comprised of tire crumb rubber. On a small number of fields, tire crumb rubber could be coated with paint, typically green, either for aesthetic purposes or heat (Figure 5: Tire crumb rubber is placed on a field in layers during control (FieldTurf, n.d.-d; Sprinturf, n.d.). installation (USEPA, 2016c). To a much lesser extent, natural materials (e.g., ground coconut husk), ethylene propylene diene monomer (EPDM), or thermoplastic elastomers (TPE) granules are used as the complete infill. These materials also can be used as the uppermost layer of infill (STC et al., 2016a). Infill material typically is spread using small utility vehicles that make multiple passes across entire fields, laying the material down in thin layers that are placed one on top of the other until the appropriate height is reached (Figure 5). Additional machinery can be used to drag or brush the blades upright to allow the material to fall between the blades (STC, 2011). ... It is important to maintain an appropriate amount of infill in the field for proper cushioning and firmness. Tire crumb rubber can be lost for a number of reasons, such as migration in the shoes and clothing of athletes, in weather events such as rain or snow, and through routine maintenance practices (Pennsylvania State University Center for Sports Surface Research, 2016). Because of tire crumb rubber migration, new infill material sometimes is added to existing fields to refresh or replace the tire crumb rubber that is lost over time"</p>		
Throughput:	<p>Page 20: "An estimated 4.77 million tons of waste tires were generated in 2013, and 40.5 percent, or 1.93 million tons, were recovered through recycling and production of retreaded tires (U.S. EPA, 2015). Much of the waste tire material is used in fuel markets, including cement kilns, utility boilers, industrial boilers, pulp and paper mills, and dedicated scrap tire-to-energy facilities (RMA, 2016a). In 2013, approximately 172,000 tons of scrap tires were converted to tire shreds for use in road and landfill construction, septic tank leach fields, and other construction applications (RMA, 2016a). Approximately 975,000 tons of scrap tires (i.e., approximately 59.5 million tires) were used in the ground rubber applications market, which includes the manufacture of new rubber products, rubber-modified asphalt, and playground and sports surfacing (RMA, 2014 and 2016a). The Rubber Manufacturers Association (RMA) estimated that in 2013, 33 percent of these scrap tires were used in molded/extruded products, 31 percent in playground mulch, 17 percent in sports surfaces, 7 percent in asphalt, 6 percent in automotive products, and 6 percent were exported (RMA, 2014)"</p>		
Chemical concentration:	<p>Summary statistics for DEHP concentration in rubber crumbs, Page 232: "n = 27; Mean = 12 mg/kg; Std Dev = 14 mg/kg; 10th Percentile = 2.9 mg/kg; 25th Percentile = 3.5 mg/kg; 50th Percentile = 6.1 mg/kg; 75th Percentile = 15 mg/kg; 90th Percentile = 34 mg/kg; Max = 58 mg/kg"</p>		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data and research methods from frequently-used sources working in conjunction with the CDC and ATSDAR to develop QA/QC procedures for research activities.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for fabrication of final product from articles, an in-scope occupational scenario
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Study Citation:		U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization appendices, volume 2.		
HERO ID:		11845553		
Conditions of Use:		Commercial Use - Toys, playground, and sporting equipment		
Domain		Metric	EVALUATION	
			Rating	Comments
		Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
		Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
		Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
		Metric 7: Metadata Completeness	High	Uncertainty is addressed by Appendix C of the report. Variability addressed by summary statistics and standard deviation for presented data.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1982). Development document for effluent limitations, guidelines and standards for the pulp, paper, and paperboard, and the builders paper and board mills (final report) (EPA 440/1-82/025).			
HERO ID:	1316234			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Paper product manufacturing			
Process description:	Standard manufacturing process: The production of pulp, paper, and paperboard involves several standard manufacturing processes including raw material preparation, pulping, bleaching, and papermaking.			
Number of sites:	674 as of April 12, 1982			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality EPA data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Low	The report is from paper product manufacturing, an occupational scenario that does not apply to any occupational scenario within the scope of the risk evaluation. However the information contained can be used for similar occupational scenarios like fabric manufacturing.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - information not dependent on metada
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2012). Phthalates action plan.			
HERO ID:	4565597			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Phthalates are produced in high volume, over 470 million pounds per year (EPA 2006).			
Life cycle description:	Nearly half of DEHP consumption in the United States occurs in medical devices, such as intravenous (IV) tubing and blood bags. The rest is split between consumer products and construction-related products (TURI, 2006). Based on a comparison of TRI releases to IUR data, production and import volumes indicate that the vast majority (likely between 95% and 99.9%) of phthalates can be expected to be incorporated into plastics and other products.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2012). Phthalates action plan.			
HERO ID:	4565597			
Conditions of Use:	Production of plastics			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Among other provisions, the Consumer Product Safety Improvement Act of 2008 (CPSIA) banned the use of six phthalates in toys and child care articles at concentrations greater than 0.1 percent: DEHP, DBP, BBP, DINP, DIDP and DnOP. Vermont and California prohibits the manufacture, sale, or distribution in commerce of any toy or child-care article that contains DEHP, DBP, or BBP at greater than 0.1% and of any toy or child-care article, intended for use by children under three years of age that can be mouthed, that contains DINP, DIDP or DnOP at greater than 0.1%. Washington prohibits a manufacturer, wholesaler, or retailer from manufacturing, knowingly selling, offering for sale, or distributing for sale or for use in the state a children’s product or product component containing phthalates (DEHP, DBP, BBP, DINP, DIDP, DnOP) individually or in combination, at a concentration exceeding 0.1% by weight (CRS, 2008).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Paint and Varnish Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Process description on page 29. // The manufacture of paint involves the dispersion of a colored oil or pigment in a vehicle, usually an oil or resin, followed by the addition of an organic solvent for viscosity adjustment. Only the physical processes of weighing, mixing, grinding, tinting, thinning, and packaging take place. No chemical reactions are involved. // The manufacture of varnish also involves the mixing and blending of various ingredients to produce a wide range of products. However in this case, chemical reactions are initiated by heating. Varnish is cooked in either open or enclosed gas-fired kettles for periods of 4 to 16 hours at temperatures of 93 to 340°C (200 to 6500 P).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	Information is qualitative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Plastics Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Process description on page 41. The manufacture of most resins or plastics begins with the polymerization or linking of the basic compound (monomer), usually a gas or liquid, into high molecular weight noncrystalline solids. The manufacture of the basic monomer is not considered part of the plastics industry and is usually accomplished at a chemical or petroleum plant. Additional description provided.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Printing ink Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Process description on page 75. There are 3 general processes in the manufacture of printing inks: (1) cooking the vehicle and adding dyes, (2) grinding of a pigment into the vehicle using a roller mill, and (3) replacing water in the wet pigment pulp by an ink vehicle (commonly known as the flushing process).3 The ink "varnish" or vehicle is generally cooked in large kettles at 200 to 600°F (93 to 315°C) for an average of 8 to 12 hours in much the same way that regular varnish is made. Mixing of the pigment and vehicle is done in dough mixers or in large agitated tanks. Grinding is most often carried out in 3-roller or 5-roller horizontal or vertical mills. Additional description provided.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Soap and Detergent Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Process description on page 77. The term "soap" refers to a particular type of detergent in which the water-solubilized group is carboxylate and the positive ion is usually sodium or potassium. The largest soap market is bar soap used for personal bathing. Synthetic detergents replaced soap powders for home laundering in the late 1940s, because the carboxylate ions of the soap react with the calcium and magnesium ions in the natural hard water to form insoluble materials called lime soap. Some commercial laundries that have soft water continue to use soap powders. Metallic soaps are alkali-earth or heavy-metal long-chain carboxylates that are insoluble in water but soluble in non-aqueous solvents. They are used as additives in lubricating oils, greases, rust inhibitors, and jellied fuels. The term "synthetic detergent products" applies broadly to cleaning and laundering compounds containing surface-active (surfactant) compounds along with other ingredients. Heavy-duty powders and liquids for home and commercial laundry detergent comprise 60 to 65 percent of the U. S. soap and detergent market and were estimated at 2.6 megagrams (Mg) (2.86 million tons) in 1990. Additional description provided.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	Information is qualitative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Synthetic fiber Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Process description on page 85. Semi-synthetics are formed from natural polymeric materials such as cellulose. True synthetics are products of the polymerization of smaller chemical units into long-chain molecular polymers. Fibers are formed by forcing a viscous fluid or solution of the polymer through the small orifices of a spinnerette (see Figure 6.9-1) and immediately solidifying or precipitating the resulting filaments. This prepared polymer may also be used in the manufacture of other non-fiber products such as the enormous number of extruded plastic and synthetic rubber products. Additional description provided.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Synthetic rubber Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Process description on page 107. Two types of polymerization reaction are used to produce styrene-butadiene copolymers, the emulsion type and the solution type. This section addresses volatile organic compound (VOC) emissions from the manufacture of copolymers of styrene and butadiene made by emulsion polymerization processes. The emulsion products can be sold in either a granular solid form, known as crumb, or in a liquid form, known as latex. Additional description provided			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	Information is qualitative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2016). Chemical Data Reporting (CDR): Complete 2016 submissions.		
HERO ID:	7315471		
Conditions of Use:	Manufacture and Import		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Provides U.S. domestic manufactured and imported PV and %PV to downstream uses.		
Number of sites:	Provides number of manufacturing and import sites.		
Chemical concentration:	Provides concentration.		
Physical form:	Provides physical form.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	These reports are published by EPA who collects it directly from manufacturers and importers, these are generally accepted by the scientific community.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.
	Metric 3: Applicability	High	CDR covers chemical manufacturers and importers, which are in scope for all chemicals.
	Metric 4: Temporal Representativeness	High	EPA used data from the 2016 CDR, which includes data reported for 2015.
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7315820			
Conditions of Use:	Use (Paints and coatings)			
EXTRACTION				
Parameter	Data			
Process description:	Though DEHP is not specifically mentioned, the group of articles provide information on various types of coating on metal and non-mental surfaces. Solvent base surface coating is conceptually a simple process. Solvents used include toluene, xylene, heptane, hexane, and methyl ethyl ketone. The coating solids portion of the formulations consists of elastomers (natural rubber, styrene-butadiene rubber, polyacrylates), tackifying resins (polyterpenes, rosins, petroleum hydrocarbon resins, asphalts), plasticizers (phthalate esters, polybutenes, mineral oil), and fillers (zinc oxide, silica, clay). DEHP is used as a plasticizer. The process of solvent based surface coating includes a continuous roll of backing material (called the web) is unrolled, coated, dried, and rolled again. To initiate the coating process the continuous web material is unwound from its roll. It travels to a coating head, where the solvent base coating formulation is applied. These formulations have specified levels of solvent and coating solids by weight. Solvent base adhesive formulations contain approximately 67 weight percent solvent and 33 weight percent coating solids. The order of application is generally release coat, primer coat (if any), and adhesive coat. A web must always have a release coat before the adhesive can be applied. Primer coats are not required on all products, generally being applied to improve the performance of the adhesive.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is from the United States.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but not specific to DEHP.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old	
	Metric 5: Sample Size	N/A	Process description.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Process description.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.
HERO ID:	7315841
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Process description:	Many of the rubber manufacturing facilities in the United States produce pneumatic tires for automobile, trucks, airplanes, and farm machinery. However, many rubber manufacturing facilities produce other engineered rubber products. The processes involved in these industries are very similar. Differences basically consist of the raw rubber material (natural or synthetic) used, the chemical additives, and the type of curing employed. The following is a description of a generic rubber manufacturing facility applicable to both tire and other manufactured rubber products, except where noted. The manufacturing of rubber products involves six processing steps (mixing, milling, extrusion, calendaring, curing, and grinding), with ancillary steps in between. Initially, the raw rubber (natural or synthetic) is mixed with several additives which are chosen based upon the desired properties of the final product. The mixed rubber is often milled and transferred to an extruder where it can be combined with other rubbers. Many rubber products contain synthetic fabric or fibers for strengthening purposes. These fibers are typically coated with mixed rubber using a calender. The extruded rubber and rubber coated materials are then assembled into a final shape and cured. Among the steps in the tire assembly process are bead building; cementing and marking; cutting and cooling; tire building; and green tire spraying. It is during the curing process that the rubber vulcanizes (crosslinks), producing the characteristic properties of finished rubber. Once the final product is cured, it is often ground to remove rough surfaces and/or to achieve symmetry.

EVALUATION		Comments
Domain	Metric	
Domain 1: Reliability	Metric 1: Methodology	High Report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	High Data are from the United States
	Metric 3: Applicability	High The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low The report is more than 20 years old.
	Metric 5: Sample Size	N/A N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A N/A - information not dependent on metadata

Overall Quality Determination	High
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Study Citation:	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.		
HERO ID:	9102524		
Conditions of Use:	Toys, playground, and sporting equipment; Building/construction materials not covered elsewhere; Plastic and rubber products not covered elsewhere		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	In 2013, approximately 172,000 tons of scrap tires were converted to tire shreds for use in road and landfill construction, septic tank leach fields, and other construction applications (RMA, 2016a).Approximately 975,000 tons of scrap tires (i.e., approximately 59.5 million tires) were used in the ground rubber applications market, which includes the manufacture of new rubber products,rubber-modified asphalt, and playground and sports surfacing (RMA, 2014 and 2016a). The Rubber Manufacturers Association (RMA) estimated that in 2013, 33 percent of these scrap tireswere used in molded/extruded products, 31 percent in playground mulch, 17 percent in sports surfaces, 7 percent in asphalt, 6 percent in automotive products, and 6 percent were exported(RMA, 2014). Recycled rubber from tires is used in several types of recreational venues, including use as infill material in synthetic turf fields, on playgrounds either as loose rubber mulch or rubber mats, for running surfaces, and in equestrian arenas. Recycled tire material may also be used in other applications, such as tire-derived rubber flooring materials (CalRecycle, 2010). (pdf pg 11)		
Process description:	In tire manufacturing, the natural and synthetic ingredients are mixed together under heat and high pressure and rolled intorubber sheets. These rubber sheets either can be calendared with textile sheets or extruded together and forced through a die. A tire is built by applying layers of rubber, rubber-encased materials, steel belts, and tread rubber. The built tire then is cured at a temperature between 150° and 180°C (300° and 360°F) (Chemrisk, 2008). This tire-curing process is referred to asvulcanization, and it involves the formation of crosslinks between polymer chains in rubber (pdf pg 12)Two tire recycling processes, (1) ambient and (2) cryogenic, are used to create tire crumb rubber in the 10- to 20-mesh (0.84- to 2.0-mm) size, which is generally the size used in synthetic turfinfill...The ambient process uses granulation or cracker mills to produce tire crumb rubber at room temperature (Scrap Tire News, 2016). Cracker mills use revolving rollers with serrations in them to size-reduce the tires. Once the granules are produced, they are fed through screens and sorted to the appropriate size (Scrap Tire News, 2016). The cryogenic process uses liquid nitrogen to freeze partially shredded tires, which then are fed into a hammer mill to create tire crumb rubber. (pdf pg 14)		
Number of sites:	According to the Synthetic Turf Council (STC)9, there are nine tire crumb rubber producers in the United States produce approximately 95 percent of the recycled rubber used asinfill in synthetic turf field applications (STC et al., 2016a). (pdf pg 13)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (e.g., OEHHA, CPSC) and are generally accepted by the scientific community
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Low	The report is for recycled tire crumb rubber used as infill for playing fields and playgrounds, which is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.
	Metric 5: Sample Size	N/A	Process information and qualitative data, sampling not applicable.
Domain 3: Accessibility/ Clarity			

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Study Citation:		U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.		
HERO ID:		9102524		
Conditions of Use:		Toys, playground, and sporting equipment; Building/construction materials not covered elsewhere; Plastic and rubber products not covered elsewhere		
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			High	

Study Citation:	UltraScientific (2014). Base/Neutrals mixture #1.			
HERO ID:	6311469			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.15-0.2%			
Physical form:	liquid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2014, which is more than 10 years old but less than 20 years old. (2014)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	Vainiotalo, S., Pfaffli, P. (1990). Air impurities in the PVC plastics processing industry. Annals of Occupational Hygiene 34(6):585-590.		
HERO ID:	5175697		
Conditions of Use:	Processing in PVC		
EXTRACTION			
Parameter	Data		
Number of sites:	DEHP measured at 9 plants.		
Chemical concentration:	Typical amounts of plasticizer are around 30% but they may rise to 70% of the total weight of the material.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so likely high quality sampling data.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for Finland, an OECD country.
	Metric 3: Applicability	High	Data is for processing of DEHP into PVC as a plasticizer.
	Metric 4: Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by sampling across multiple different plants with different processing methods. Does not address uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Valero, (2014). Safety Data Sheet (SDS): Modified Asphalt.			
HERO ID:	6302304			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter		Data		
Chemical concentration:		<0.1%		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Product is from a US supplier.
		Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
		Metric 4: Temporal Representativeness	Medium	Source is from 2014 which is more than 10 but less than 20 years old
		Metric 5: Sample Size	Medium	Characterized by maximum.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Valspar, (2017). Safety Data Sheet (SDS): Red glazing putty 1# tube.			
HERO ID:	6311470			
Conditions of Use:	Use of Automotive Care Products			
EXTRACTION				
Parameter	Data			
Chemical concentration:	3-5%			
Physical form:	paste/gel			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			High	

Study Citation:	Valspar, (2024). Safety Data Sheet (SDS): Pronto Kombi Spot Putty.			
HERO ID:	6311471			
Conditions of Use:	Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<=5%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2024 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:	VI, (2025). Comment from Vinyl Institute regarding the Draft Risk Evaluation for Diethylhexyl Phthalate; EPA-HQ-OPPT2018-0433-0117.			
HERO ID:	13028213			
Conditions of Use:	Plastic Compounding, Plastic Converting			
EXTRACTION				
Parameter	Data			
Process description:	PDF Pg. 10”When flexible PVC is compounded, the dry ingredients are all added first. Those dry ingredients typically would include PVC resin, stabilizer, filler, pigment, and any process aids. Once all the dry ingredients are blended together to form a uniform mix, the liquid plasticizer is added last. Liquid plasticizer is often added through automatic charge systems at larger compounding facilities, which minimizes any employee exposure. Because of this sequence, the dust that PVC compound workers might be exposed to are likely to be “dry” dusts free of any liquid plasticizer. Once the plasticizer is added to the mixture, then all the ingredients are blended until the plasticizer is absorbed into the resin typically in closed vessels. At this point, the mixture could contain from 1 to 44% plasticizer or more for certain applications, and the material is essentially dust free. Once the compound step is completed, the mass transfer for any DEHP plasticizer to a worker exposed to “wet” dusts containing DEHP would be a function of its migration.”			
Number of sites:	Per the Vinyl Institute, Teknor Apex has 3 plastic compounding sites in the US (City of Industry, CA; Brownsville, TN; and Providence, RI).			
Chemical concentration:	PDF Pg. 10Plastics compounding mixture ”could contain from 1 to 44% plasticizer or more for certain applications”.			
Comments:	No information on lifecycle or throughput in article.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic compounding, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2025]
	Metric 5:	Sample Size	Low	Concentration characterized by a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by a range of concentrations given but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Wang, W., Xu, X., Fan, C. Q. (2014). Health hazard assessment of occupationally di-(2-ethylhexyl)-phthalate-exposed workers in China. Chemosphere 120:37-44.			
HERO ID:	2345920			
Conditions of Use:	Processing as plasticizer in PVC			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	More than 2 million tons of DEHP were used each year worldwide (2005).			
Number of sites:	4 sites were chosen, 3 factories and a control site			
Chemical concentration:	PVC plastics can contain up to 50% PAEs by weight. DEHP is the major phthalate plasticizer for PVC and the content of DEHP is 50-60%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Data is peer reviewed so likely does not contain errors and is accurate.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for China, a non-OECD country.	
	Metric 3: Applicability	High	Data is directly applicable for DEHP used as a plasticizer in PVC manufacturing	
	Metric 4: Temporal Representativeness	High	Data is from 2014, less than 10 years old.	
	Metric 5: Sample Size	Medium	Characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by sampling for many years (2009 - 2012) and sampling at different sites conducting the same process. Does not address uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.
HERO ID:	5547263
Conditions of Use:	commercial use

EXTRACTION	
Parameter	Data
Production, import, or use volume:	The annual global production of phthalate, which includes DEHP, was 4.7 million metric tons in 2006 and ~8 million metric tons in 2015.
Life cycle description:	In most commercial products, DEHP is used as additives.
Chemical concentration:	Urine has been the preferred matrix in human biomonitoring studies, and concentrations on the order of several tens to hundreds of nanograms per milliliter have been reported for several phthalate metabolites. Metabolites of DEHP were the most abundant compounds measured in urine. In the United States, DEHP exposure has declined since 2005. A 67% decline in DEHP exposure in the US population between 2005/6 and 2011/12 has been reported. Concentrations of MDEHP (sum of five DEHP metabolites - MEHP, MEHHP, MEOHP, MECPP, and MCMHP) were as follows for select groups: (1) a study conducted with 7600–10,031 individuals showed the median concentration of MDEHP to be 73.1 ug/g Creatinine (CR); (2) another study conducted with 2772 adults showed the median concentration of MDEHP to be 35.4 ug/g CR.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination	Medium
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Study Citation:	Wasser, (2009). Material Safety Data Sheet (MSDS): MC-Luster 100 White.			
HERO ID:	6302305			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	1-5% by weight			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Source is from 2009 which is more than 10 but less than 20 years old
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	

Study Citation:		Wasser, (2021). Material Safety Data Sheet (MSDS): Polyflex 411A Iso-Catalyst.			
HERO ID:		6302307			
Conditions of Use:		Incorporation into Formulation, Mixture, or Reaction Product			
EXTRACTION					
Parameter		Data			
Chemical concentration:		5-10% by weight			
EVALUATION					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
		Metric 4:	Temporal Representativeness	High	Source is from 2021 which is less than 10 years old.
		Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination				High	

Study Citation:	Wasser, (2021). Safety Data Sheet (SDS): MC-Shieldcoat 100.			
HERO ID:	6302308			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter		Data		
Chemical concentration:		1-5%		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2021 which is less than 10 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report addresses variability with the range of chemical concentration but uncertainty in the results is not addressed.
Overall Quality Determination			High	

Study Citation:	Williams,, Sherwin (2019). Safety Data Sheet (SDS): PLANET COLOR™ FX Rubber Black.			
HERO ID:	6311459			
Conditions of Use:	Application of Paints, Coatings, Adhesives, and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	<8.7%			
Physical form:	solid			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2019 which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a maximum with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Wright, S. L., Kelly, F. J. (2017). Plastic and Human Health: A Micro Issue?. Environmental Science & Technology 51(12):6634-6647.			
HERO ID:	3862800			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Global production of plastics urrently exceeds 320 million tonnes (Mt) per year, over 40% of which is used as single-use packaging, resulting in plastic waste.1 A substantial proportion of the plastic produced each year is lost to and persists in the marine environment, with an estimated accumulative potential of 250 Mt by 2025.			
Chemical concentration:	PVC medical devices can contain up to 80% of the plasticizer DEHP by weight.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	the data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Wynne, K., Suleman, M. A., Suleman, M. A., Johnson, D., Ramsinghani, P., Wickham, R., Zhang, W.,ei, Wang, C., Pestov, D. (2015). Diffusion of di(2-ethylhexyl)phthalate in poly(vinyl chloride) (PVC). Abstracts of Papers of the American Chemical Society 250:65.			
HERO ID:	4852769			
Conditions of Use:	Plastics Compounding (PVC)			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP is used as a plasticizer in PVC Plastics:Tough/hard PVC: ~10% by weight DEHPSoft/Flexible PVC: ~40% by weight DEHP			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for plastics compounding (PVC), an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by discussing DEHP concentrations in hard vs. soft PVC plastics but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Xie, M., Wu, Y., Little, J. C., Marr, L. C. (2015). Phthalates and alternative plasticizers and potential for contact exposure from children’s backpacks and toys. Journal of Exposure Science & Environmental Epidemiology 26(1):119-124.			
HERO ID:	3045454			
Conditions of Use:	Consumer Use - plasticizers in children’s backpacks and toys			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Backpack WA-b2: 3.07+-2.34 mass % Backpack TA-b: 0.13+-0.10 mass %			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality techniques from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for consumer use of toys, playground, and sporting equipment, which is similar to the in-scope occupational scenario commercial use of toys, playground, and sporting equipment.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, standard deviation) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in the data collection method. Variability is addressed in a variability analysis.
Overall Quality Determination			High	

Study Citation:	Xu, Y., Hubal, Cohen, E. A., Little, J. C. (2010). Predicting residential exposure to phthalate plasticizer emitted from vinyl flooring: Sensitivity, uncertainty, and implications for biomonitoring. Environmental Health Perspectives 118(2):253-258.			
HERO ID:	387965			
Conditions of Use:	manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	As per 2002 data, more than two million tons produced globally each year.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Xu, Y., Hubal, Cohen, E. A., Little, J. C. (2010). Predicting residential exposure to phthalate plasticizer emitted from vinyl flooring: Sensitivity, uncertainty, and implications for biomonitoring. Environmental Health Perspectives 118(2):253-258.			
HERO ID:	387965			
Conditions of Use:	commercial use - vinyl flooring			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DEHP is mainly used in PVC products such as vinyl flooring (VF), where it is typically present at concentrations of about 20–40% (wt/wt)			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Yan, Y., Lu, Y., Gao, Y., Wang, B., Zhao, L., Balaram, V., Rambabu, U., Reddy, P., M.R., Munirathnam, N. R., Chatterjee, S. (2018). RoHS regulation: Challenges in the measurement of substances of concern in industrial products by different analytical techniques. Mapan-Journal of Metrology Society of India 33(3):329-346.			
HERO ID:	5043636			
Conditions of Use:	Various commercial/consumer uses.			
EXTRACTION				
Parameter	Data			
Life cycle description:	Table 1 lists potential uses of DEHP after manufacturing and processing - medical devices, monitoring and control instruments, toys and childcare items, furniture, water and air mattresses, rubber footwear, erasing rubber, packaging materials and insulation on wires and cable			
Comments:	Source provides other process descriptions and concentrations for metals such as cadmium, chromium lead and mercury. Mentions specific phthalates such as DEHP but does not provide any quantitative data on any phthalates.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination		High		

Study Citation:	Yang, M., Park, M. S., Lee, H. S. (2006). Endocrine disrupting chemicals: Human exposure and health risks. Journal of Environmental Science and Health, Part C: Environmental Carcinogenesis & Ecotoxicology Reviews 24(2):183-224.			
HERO ID:	198597			
Conditions of Use:	manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	More than 2 million tons of DEHP alone are produced each year worldwide.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	data are from the United States
	Metric 3:	Applicability	High	report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Yano, K., Hirosawa, N., Sakamoto, Y., Katayama, H., Moriguchi, T., Joung, K. E., Sheen, Y. Y., Asaoka, K. (2002). Phthalate levels in beverages in Japan and Korea. Bulletin of Environmental Contamination and Toxicology 68(4):463-469.			
HERO ID:	1598698			
Conditions of Use:	Manufacturing. Processing - plasticizer in PVC			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production of phthalates in Japan was 474 thousand tons in 1998 around 56% of which was DEHP used mainly as plasticizers in PVC product.			
Chemical concentration:	PVC contains up to 40% phthalates by weight without covalently binding to other ingredients in the PVC.			
Comments:	Rest of source is amount of phthalates in food, bottled water, beers, alcoholic drinks, nutritive drinks, vinegars, juices, red wine, white win and rice punches.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed and uses high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Japan, an OECD country
	Metric 3:	Applicability	High	Data is for manufacturing and processing of DEHP as a plasticizer
	Metric 4:	Temporal Representativeness	Low	Data is greater than 20 years old
	Metric 5:	Sample Size	Low	Data not characterized by statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes production volume and percentage that is of DEHP and other phthalates, as well as percent used in PVC. Documents sources.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Young, A. S., Allen, J. G., Kim, U. J., Seller, S., Webster, T. F., Kannan, K., Ceballos, D. M. (2018). Phthalate and Organophosphate Plasticizers in Nail Polish: Evaluation of Labels and Ingredients. Environmental Science & Technology 52(21):12841-12850. [Environmental science & technology].			
HERO ID:	5164231			
Conditions of Use:	Commercial Use - Nail Polish			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Nail polish conc. of DEHP (median [range]): 1.67 [<0.001 , 331] ug/g. Other referenced studies had max DEHP in nail polish at 140 and 100 ug/g as well as 2 different ND studies.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so generally accepted and contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from US
	Metric 3:	Applicability	Medium	Data is for personal use in nail polish, which can be used to determine concentration during processing of nail polish.
	Metric 4:	Temporal Representativeness	High	Study is less than 10 years old (2018) as well as referenced studies.
	Metric 5:	Sample Size	Medium	Data is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents results, methods and assumptions. Sources generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at other studies and comparing concentration levels as well as looking at a variety of nail polish samples specifying being "free" of certain phthalate chemicals. Does not address uncertainty.
Overall Quality Determination			High	

Study Citation:	Zhang, L.,i, Su, W.,ei, Qian, Y., Zhao, Y., Zhu, Z., Wang, D. (2016). Quantitative detection and impact evaluation of phthalate plasticizers in insulating oil. IEEE Transactions on Dielectrics and Electrical Insulation 23(6):3429-3434.			
HERO ID:	5533553			
Conditions of Use:	Electrical and Electronic products			
EXTRACTION				
Parameter	Data			
Chemical concentration:	99.5%			
Comments:	This study investigated phthalate in insulating oils of transformers.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country, and locality-specific factors may impact manufactured concentrations relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	underlying methods and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Ügdüler, S., Geem, Van, K. M., Roosen, M., Delbeke, P., E.I., Meester, De, S. (2020). Challenges and opportunities of solvent-based additive extraction methods for plastic recycling. Waste Management 104:148-182.			
HERO ID:	7976469			
Conditions of Use:	Plasticizers			
EXTRACTION				
Parameter	Data			
Process description:	The most commonly used class of plasticizers are phthalates, which have polar groups attached to the polarizable aromatic ring... Particularly, in PVC, phthalates behave like dipolar compounds, establishing a link between the chlorine atoms and increasing the flexibility of the polymer. However, since phthalate plasticizers are not chemically attached to PVC, they can leach or evaporate, which causes environmental contamination and health risks. (13/35)			
Chemical concentration:	Plasticizers are typically organic liquids with high molecular weight and boiling point. The used concentration varies between 20 and 50% of the total plastic weight (13/35)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Belgium, an OECD country.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		High		