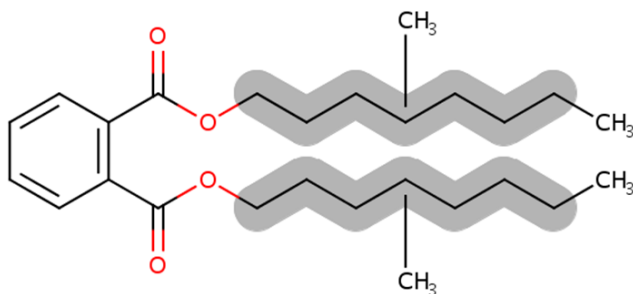


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**Data Quality Evaluation and Data Extraction Information for  
Environmental Release and Occupational Exposure for  
Diisononyl Phthalate (DINP)**

**Systematic Review Support Document for the Risk Evaluation**

**CASRN: 28553-12-0 and 68515-48-0**



*January 2025*

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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 Diisononyl Phthalate (DINP)* 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.

HERO ID	Reference	Page
<b>Occupational Exposure</b>		
<b>Monitoring Data</b>		
<b>5772597</b>	Christia, C., Poma, G., Harrad, S., Wit, De, C. A., Sjoström, 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. <i>Environmental Research</i> 171:204-212.	<b>19</b>
<b>6318028</b>	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. <i>Environmental Science &amp; Technology</i> 53(24):14630-14637.	<b>20</b>
<b>675074</b>	Elsisi, A. E., Carter, D. E., Sipes, I. G. (1989). Dermal absorption of phthalate diesters in rats. <i>Fundamental and Applied Toxicology</i> 12(1):70-77.	<b>21</b>
<b>10177701</b>	Exponent, Inc., (n.d.). Sampling results for diisononyl phthalate (DINP) - Floor tiles.	<b>22</b>
<b>10312764</b>	ExxonMobil, (2022). Data submission from ExxonMobil regarding DINP and DIDP exposure.	<b>23</b>
<b>7978498</b>	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. <i>International Journal of Hygiene and Environmental Health</i> 229:13548.	<b>25</b>
<b>10177754</b>	Fulbright, N.R. (2014). Safe Use Determination (SUD) application for Tandus Centiva Modular Vinyl Carpet Tile.	<b>26</b>
<b>4166920</b>	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. <i>Environment International</i> 112:115-126.	<b>27</b>
<b>7976806</b>	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" [ <i>Environ. Int.</i> 112 (2018) 115-126]. <i>Environment International</i> 143(Elsevier):106071.	<b>28</b>
<b>7978731</b>	Gkrellas, 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. <i>Environment International</i> 155(Elsevier):106598.	<b>29</b>
<b>4168432</b>	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. <i>Journal of Hazardous Materials</i> 344:179-199.	<b>30</b>
<b>6558536</b>	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.	<b>32</b>
<b>787919</b>	Hines, C. J., Hopf, N. B., Deddens, J. A., Silva, M. J., Calafat, A. M. (2012). Occupational exposure to diisononyl phthalate (DiNP) in polyvinyl chloride processing operations. <i>International Archives of Occupational and Environmental Health</i> 85(3):317-325.	<b>34</b>
<b>1005742</b>	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.	<b>35</b>
<b>697394</b>	Hines, C., Hopf, N., Deddens, J., Silva, M., Calafat, A. (2011). Estimated daily intake of phthalates in occupationally exposed groups. <i>Journal of Exposure Science &amp; Environmental Epidemiology</i> 21(2):133-141.	<b>36</b>
<b>2356022</b>	HSDB, (2015). Diisononyl phthalate (CASRN: 28553-12-0).	<b>37</b>
<b>10293367</b>	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.	<b>38</b>

<b>2915537</b>	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. <i>Regulatory Toxicology and Pharmacology</i> 73(1):85-92.	<b>40</b>
<b>5620073</b>	Petrovicova, I., Kolena, B., Pilka, T. (2014). The human biomonitoring of occupational exposure to phthalates. <i>Mediterranean Journal of Social Sciences</i> 5(19):101-107.	<b>41</b>
<b>6957400</b>	Porras, S. P., Hartonen, M., Koponen, J., Ylinen, K., Louhelainen, K., Tornaеus, J., Kiviranta, H., Santonen, T. (2020). Occupational exposure of plastics workers to diisononyl phthalate (DiNP) and di(2-propylheptyl) phthalate (DHP) in Finland. <i>International Journal of Environmental Research and Public Health</i> 17(6):2035.	<b>42</b>
<b>10312765</b>	Prime., K (2015). Wipe samples collected from individuals simulating installation of the carpet tiles (sanitized).	<b>45</b>
<b>6558526</b>	Salisbury, S. (1984). Health hazard evaluation report, No. HETA-79-034-1440, Intex Plastics, Corinth, Mississippi.	<b>46</b>
<b>7273960</b>	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. <i>Science of the Total Environment</i> 718:137173.	<b>47</b>
<b>7978848</b>	Stewart, E. (2011). Air and wipe sampling for phthalates in a medical office building. 1:85-90.	<b>48</b>
<b>7325467</b>	U.S. EPA, (2019). Manufacturer request for risk evaluation: Diisononyl phthalate (DINP).	<b>49</b>
<b>5547263</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. <i>Toxics</i> 7(2):21.	<b>50</b>
<b>Published Models for Exposures or Releases</b>		
<b>5043594</b>	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?. <i>Journal of Exposure Science &amp; Environmental Epidemiology</i> 30(3):567-584.	<b>51</b>
<b>11374403</b>	U.S. EPA, (2023). Consumer Exposure Model (CEM) Version 3.2 User's Guide.	<b>52</b>
<b>680214</b>	Wormuth, M., Scheringer, M., Vollenweider, M., Hungerbuhler, K. (2006). What are the sources of exposure to eight frequently used phthalic acid esters in Europeans?. <i>Risk Analysis</i> 26(3):803-824.	<b>53</b>
<b>Completed Exposure or Risk Assessments</b>		
<b>10217809</b>	CalEPA, (2012). Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical support document for exposure assessment and stochastic analysis.	<b>54</b>
<b>675060</b>	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstrom-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.	<b>55</b>
<b>1987625</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).	<b>56</b>
<b>679920</b>	CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).	<b>59</b>
<b>5353181</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.	<b>60</b>
<b>3687865</b>	ECB, (2003). European union risk assessment report: DINP.	<b>61</b>
<b>1588746</b>	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).	<b>67</b>
<b>679933</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).	<b>69</b>
<b>10177694</b>	EnSIGHT,, California (2014). Literature search: DINP exposure from vinyl roofing (with permission email).	<b>75</b>
<b>3664467</b>	NICNAS, (2015). Priority existing chemical assessment report no. 40: Butyl benzyl phthalate.	<b>76</b>

<b>3687925</b>	NICNAS, (2015). Diisononyl phthalates and related compounds: Human health tier II assessment.	<b>77</b>
<b>6836808</b>	NICNAS, (2015). Priority existing chemical draft assessment report: Diisodecyl Phthalate & Di-n-octyl Phthalate.	<b>78</b>
<b>679108</b>	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-isodecyl phthalate (DIDP). (3):i-III90.	<b>79</b>
<b>679849</b>	NTP-CERHR, (2000). NTP-CERHR expert panel report on di-isononyl phthalate. GRA and I(GRA and I):47.	<b>80</b>
<b>680097</b>	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 Reproduction Vol(2):i-III90.	<b>82</b>
<b>3808976</b>	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.	<b>84</b>
<b>3827299</b>	OECD, (2009). Emission scenario document on adhesive formulation.	<b>85</b>
<b>3840003</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.	<b>86</b>
<b>6385735</b>	OECD, (2020). Emission scenario document on chemical additives used in automotive lubricants.	<b>87</b>
<b>6311222</b>	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.	<b>88</b>
<b>10480466</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).	<b>89</b>
<b>11182966</b>	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).	<b>90</b>
<b>11373482</b>	U.S. EPA, (2021). Generic model for central tendency and high-end inhalation exposure to total and respirable Particulates Not Otherwise Regulated (PNOR).	<b>91</b>
<b>11373493</b>	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).	<b>92</b>
<b>3827195</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.	<b>93</b>
<b>6304171</b>	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.	<b>94</b>
<b>6311218</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.	<b>95</b>
<b>6311221</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).	<b>96</b>
<b>6385708</b>	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).	<b>98</b>
<b>6385709</b>	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.	<b>99</b>
<b>6385710</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.	<b>100</b>
<b>6385711</b>	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.	<b>102</b>
<b>6385719</b>	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.	<b>103</b>
<b>6385741</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.	<b>104</b>

<b>6385748</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.	<b>105</b>
<b>Reports for Data or Information Other than Exposure or Release Data</b>		
<b>7349060</b>	Canada,, G.o. (2020). Phthalate substance grouping – Information sheet.	<b>106</b>
<b>664488</b>	CDC, (2009). Fourth national report on human exposure to environmental chemicals.	<b>107</b>
<b>5080435</b>	Cherrie, J. W., Semple, S., Brouwer, D. (2004). Gloves and dermal exposure to chemicals: Proposals for evaluating workplace effectiveness. <i>Annals of Occupational Hygiene</i> 48(7):607-615.	<b>108</b>
<b>10633678</b>	ExxonMobil, (2022). EM BRCP DINP/DIDP facility – virtual tour (sanitized).	<b>109</b>
<b>3230538</b>	Frasch, H. F., Bunge, A. L. (2015). The transient dermal exposure II: post-exposure absorption and evaporation of volatile compounds. <i>Journal of Pharmaceutical Sciences</i> 104(4):1499-1507.	<b>111</b>
<b>6558535</b>	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.	<b>112</b>
<b>7978431</b>	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. <i>Occupational and Environmental Medicine</i> 77(4):214-222.	<b>113</b>
<b>11328016</b>	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.	<b>114</b>
<b>699155</b>	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. <i>Environmental Health Perspectives</i> 116(7):845-853.	<b>115</b>
<b>787918</b>	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. <i>Toxicology Letters</i> 213(1):100-106.	<b>116</b>
<b>2345960</b>	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. <i>International Journal of Environmental Research and Public Health</i> 11(6):5628-5639.	<b>117</b>
<b>3015875</b>	Liang, Y., Xu, Y. (2014). Emission of phthalates and phthalate alternatives from vinyl flooring and crib mattress covers: The influence of temperature. <i>Environmental Science &amp; Technology</i> 48(24):14228-14237.	<b>118</b>
<b>7323639</b>	Lott, S. (2014). Phthalate-free Plasticizers in PVC.	<b>119</b>
<b>5349749</b>	Lowell Center for Sustainable Production at the University of Massachusetts, (2011). Technical briefing: Phthalates and their alternatives: Health and environmental concerns. :23.	<b>120</b>
<b>4728432</b>	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. <i>Environmental Science and Pollution Research</i> 25(21):20550-20561.	<b>121</b>
<b>5080455</b>	Marquart, H., Franken, R., Goede, H., Fransman, W., Schinkel, J. (2017). Validation of the dermal exposure model in ECETOC TRA. <i>Annals of Work Exposures and Health</i> 61(7):854-871.	<b>122</b>
<b>3222353</b>	Ng, M. G., Tongeren, van, M., Semple, S. (2014). Simulated transfer of liquids and powders from hands and clothing to the mouth. <i>Journal of Occupational and Environmental Hygiene</i> 11(10):633-644.	<b>123</b>
<b>11147625</b>	OECD, (2004). Test No. 428: Skin absorption: In vitro method.	<b>124</b>
<b>10217511</b>	OEHHA, (2013). Proposition 65, Carcinogen Identification Committee (CIC) transcripts from 12/5/2013 hearing.	<b>125</b>
<b>10472400</b>	OEHHA, (2016). Issuance of a safe use determination for exposure to professional installers to diisononyl phthalate in vinyl flooring products.	<b>126</b>
<b>2219803</b>	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. <i>Food and Chemical Toxicology</i> 65:105-114.	<b>128</b>

<b>10472417</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.	<b>129</b>
<b>675435</b>	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.	<b>130</b>
<b>11138808</b>	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.	<b>131</b>
<b>11224653</b>	U.S. EPA, (2013). Updating CEB's method for screening-level estimates of dermal exposure.	<b>132</b>
<b>4532330</b>	U.S. EPA, (1991). Chemical engineering branch manual for the preparation of engineering assessments.	<b>133</b>
<b>4565597</b>	U.S. EPA, (2012). Phthalates action plan.	<b>134</b>
<b>786546</b>	U.S. EPA, (2011). Exposure factors handbook: 2011 edition.	<b>135</b>
<b>9102524</b>	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.	<b>136</b>
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<b>Environmental Release Data</b>		
<b>6311430</b>	Cadogan, D., Howick, C. (2000). Plasticizers.	<b>137</b>
<b>10442901</b>	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.	<b>141</b>
<b>10442902</b>	CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.	<b>142</b>
<b>10454465</b>	DOE,, WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.	<b>143</b>
<b>3688004</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping 1,2-Benzenedicarboxylic acid, diisononyl ester; 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich (Diisononyl Phthalate; DINP). Chemical Abstracts Service Registry Numbers: 28553-12-0 and 68515-48-0.	<b>144</b>
<b>7330238</b>	ECCC/HC, (2020). Science assessment of plastic pollution.	<b>145</b>
<b>7349020</b>	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.	<b>146</b>
<b>10633678</b>	ExxonMobil, (2022). EM BRCP DINP/DIDP facility – virtual tour (sanitized).	<b>148</b>
<b>4168432</b>	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.	<b>149</b>
<b>2356022</b>	HSDB, (2015). Diisononyl phthalate (CASRN: 28553-12-0).	<b>150</b>
<b>10293367</b>	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.	<b>151</b>
<b>7978640</b>	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.	<b>152</b>
<b>6825427</b>	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.	<b>153</b>
<b>6959335</b>	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.	<b>154</b>
<b>4259743</b>	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.	<b>155</b>
<b>3072211</b>	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.	<b>156</b>

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<b>6984573</b>	Zipertubing, (2018). Safety data sheet: DVH 20 / DVH 40.	<b>544</b>
<b>4853590</b>	Zoller, A., Marcilla, A. (2011). Soft PVC foams: Study of the gelation, fusion, and foaming processes. II. Adipate, citrate and other types of plasticizers. Journal of Applied Polymer Science 122(5):2981-2991.	<b>545</b>
<b>7976469</b>	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.	<b>546</b>

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	5772597			
<b>Conditions of Use:</b>	Household use of Articles (dust exposure)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	ingestion, inhalation and dermal			
Physical form:	dust			
Area sampling data:	Table 2 provides statistics of DINP dust exposure in different indoor environments (mean, median, SD, min, max) (ug/g dust). Belgium homes - 52, 26, 67, 5.2, 296; Ireland homes - 84, 72, 27, 62, 121; Netherland homes - 59, 34, 49, <LOQ, 152; Netherland offices - 81, 56, 82, 38.8, 297; Sweden offices - 648, 287, 656, 157, 1872; Sweden daycares (winter) - 372, 239, 280, 182, 694; Sweden daycares (spring) - 289, 289, 313, 68, 511			
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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	6318028			
<b>Conditions of Use:</b>	Commercial Use of personal care products (nail salon)			
EXTRACTION				
Parameter	Data			
Worker activity description:	nail technicians and nail salon owners			
Exposure route:	inhalation			
Personal sampling data:	182+-4.1 ng/g (Table 4)			
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	High	Data are for the use of nail polish at a salon, which is the same as the commercial use of personal care products.
	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	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		

<b>Study Citation:</b>	Elsisi, A. E., Carter, D. E., Sipes, I. G. (1989). Dermal absorption of phthalate diesters in rats. Fundamental and Applied Toxicology 12(1):70-77.			
<b>HERO ID:</b>	675074			
<b>Conditions of Use:</b>	All-Dermal Absorption Study			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	Dermal exposure data			
Comments:	No data for DINP.			
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	High	The data are from the United States.
	Metric 3:	Applicability	Uninformative	No dermal exposure data is presented for DINP specifically.
	Metric 4:	Temporal Representativeness	Low	Data is greater 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	All testing conditions, including dose applied and testing duration, are well explained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of variability and uncertainty.
Overall Quality Determination		Uninformative		

<b>Study Citation:</b>	Exponent,, Inc., (n.d.). Sampling results for diisononyl phthalate (DINP) - Floor tiles.			
<b>HERO ID:</b>	10177701			
<b>Conditions of Use:</b>	Plastic material (Floor tiles)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Workers installing floor tiles with and without adhesives (6/61)			
Exposure route:	dermal (2/61)			
Physical form:	particles (2/61)			
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 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 commercial use of floor coverings, 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	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of workers, exposure duration, frequency, PPE, and engineering controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by sampling workers handling tiles with and without adhesive.
Overall Quality Determination			High	

<b>Study Citation:</b>	ExxonMobil, (2022). Data submission from ExxonMobil regarding DINP and DIDP exposure.
<b>HERO ID:</b>	10312764
<b>Conditions of Use:</b>	Manufacturing

EXTRACTION	
Parameter	Data
Worker activity description:	Manufacturing related activities of DIDP and DINP. Plasticizer Assistant Operator: Collects samples from post reactor and from back-end and run down tanks. Three samples are collected each shift, and each sample collection takes < 5 min. Also, plasticizer AO prepares equipment for maintenance, which includes draining and steam cleaning. Laboratory Technicians: This worker group is composed of 4 individuals, each of them working on a different shift to cover the 24/7 operation cycle. Normal activities involve spending about 50% of the time carrying out analysis for quality assurance of the process and the remainder of the time at the desk carrying out computer-related activities. The DIDP/DINP analysis from the Plasticizer area involves running various analytical tests (e.g. specific gravity, GC, water) on the benchtop. All tests involve working with very low volumes ranging from 5 drops to 2mL. Sample waste containers containing DINP/DIDP are kept in secondary container in a fume hood until disposal. Sample disposal often occurs after each task, or a container will be placed in a hood at the end of a shift. In this case, the sealed container, only has a very small amount of liquid in it. Maintenance: Polish filter change out of two sets of filters occurs once every 4 days (90 times/year) for 15 minute duration. Paper filters are changes out once every 2 months (6 times/year) for 15 minute duration. One worker carries out the filter change out task.
Exposure route:	Inhalation
Physical form:	Post-reactor: liquid/~80% diester/alcohol Unit back-end and rundown tanks: liquid/~100% diester
Personal sampling data:	Maintenance: Filter change out, 15 min, 4 samples, TWA (mg/m3) < 0.030 to <0.072; Open process equipment, 42 min, 2 samples, TWA (mg/m3) <0.0285 to <0.030 Operator: Regular rounds, 510 min, 6 samples, TWA (mg/m3) <0.002 to <0.06 Lab Technician: Laboratory analysis, 490 min, 10 samples, TWA (mg/m3) <0.059 to <0.063.
Number of workers:	4 workers per worker group, 1 per shift Plasticizer Assistant Operator (AO)- This worker group is composed of 4 individuals, each of them working on a different shift to cover the 24/7 operation cycle. Laboratory technicians- This worker group is composed of 4 individuals, each of them working on a different shift to cover the 24/7 operation cycle. Maintenance Operations-a) polish filters -1 worker b) paper filters - 1 worker
Personal protective equipment:	Plasticizer Assistant Operator: Fire resistant clothing, goggles, leather gloves, steel toe shoes, hard hat. Maintenance Operations: Fire resistant clothing, goggles, leather gloves, steel toe shoes, hard hat. For this activity, nitrile gloves are used under leather gloves. (P 9/10)
Engineering control:	When equipment is opened, barricades are established to prevent unprotected workers from accessing the work area.

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. Sampling protocol is described within HERO ID 10626654.
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	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				

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<b>Study Citation:</b>		ExxonMobil, (2022). Data submission from ExxonMobil regarding DINP and DIDP exposure.		
<b>HERO ID:</b>		10312764		
<b>Conditions of Use:</b>		Manufacturing		
Domain		Metric	EVALUATION Rating	Comments
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	7978498		
<b>Conditions of Use:</b>	Plasticizers		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	Hairdressing apprentices, sales clerks, waste plastic recycling site workers, community service workers, manufacturing workers, custodians, PVC production workers, waste management workers, flavoring factory workers, car manufacturing workers, dental laboratories, rubber workers. (6/22)		
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)		
Number of workers:	Number of workers for various occupations given in Table 2. (6, 7, and 9/22)		
Comments:	Table 2, "Five studies were identified in which DiNP exposure was evaluated (Hines et al., 2012; Koch et al., 2012; Kolena et al., 2014; Petrovicova et al., 2014; Pilka et al., 2015)"		
<b>EVALUATION</b>			
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 France, an 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 personal or area sampling, 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 different published studies and their results.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Fulbright,, N.R. (2014). Safe Use Determination (SUD) application for Tandus Centiva Modular Vinyl Carpet Tile.			
<b>HERO ID:</b>	10177754			
<b>Conditions of Use:</b>	Floor coverings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Persons handling the uninstalled product, such as the certified professional installers handling the tile during installation. (6/28)			
Exposure route:	dermal, inhalation (7/28)			
Physical form:	dust, vapors (7/28)			
Area sampling data:	No DINP was detected in air, with a LOD of 104 ug/m3. (11/28) The report also provides equations to estimate inhalation exposure.(22/28)			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	6.5 hours of the day dedicated to installing tiles (18/28)			
Exposure frequency:	Installation 5 days/week, 48 weeks/year. (18/28)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling method is an EPA method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for commercial use of floor coverings, 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	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of workers, PPE, and engineering controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by sampling workers handling tiles with and without adhesive.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4166920			
<b>Conditions of Use:</b>	Use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	inhalation, dermal, ingestion			
Physical form:	dust, gas			
Personal sampling data:	50th percentile, 95th percentile: 26.4 ng/m3, 150.1 ng/m3			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	24 hours/day			
Exposure frequency:	365 days/year			
Comments:	Study also includes data on dust on floors and vacuum as well as diet for residential homes, which was not extracted as it is not expected to fulfill an engineering data need.			
<b>EVALUATION</b>				
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	Monitoring data include all associated metadata
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7976806			
<b>Conditions of Use:</b>	Consumer Use			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dust ingestion, inhalation, dietary intake (2/5)			
Physical form:	dust (2/5)			
Personal sampling data:	Daily inhalation intake is 1.67 (0.7-38.8 ng/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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7978731			
<b>Conditions of Use:</b>	Personal Care Products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal, oral, inhalation (2/13)			
Physical form:	liquids, gels, creams, etc. (8/13)			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	24 hours (1/13)			
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, which is similar to the in-scope occupational scenario commercial use of personal care products.
	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 (medians, upper and lower bounds) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sampling data and exposure type provided but missing worker information, exposure frequency, engineering controls, and PPE.
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		Medium		

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	4168432
<b>Conditions of Use:</b>	Disposal of plastics

EXTRACTION	
Parameter	Data
Area sampling data:	He et al. [182] analyzed the VOC emission characteristics, health risks, and indoor microenvironment exposure during the melting/extrusion stages of the recycling processes at seven different types of plastic solid waste (PSW). The first group, consisted of both ABS and PS, contained the same monomer; styrene. The total concentration of VOCs (TVOC) with a mean value of $1.0 \pm 0.4 \times 103 \text{ mg m}^{-3}$ in the ABS recycling workshop was much higher than that in the PS workshop ( $4.7 \pm 1.0 \times 102 \text{ mg m}^{-3}$ ). Nevertheless, mono-aromatics was the predominant group in both workshops ( $\geq 84.7\%$ ). The second group of PSW included PE and PP, whose monomers were aliphatic olefins. Results indicated that alkanes are the most abundant VOCs for polyolefins, contributing 50.8% and 37.5% to the PE and PP recycling VOC emissions, respectively. The third group of PSW included PVC, PA and PC, whose monomers contained heteroatoms. During the extrusion of these three types of PSW, the TVOC emissions were also much lower than those of the ABS and PS recycling processes, but not so much different from the PP and PE recycling processes. // Huang et al. [183] demonstrated that the exhaust gases emitted from plastic waste recycling granulation have an effect on the ambient environment in Xingtian, Guangdong, China [183]. Also, PAHs were detected inside and outside of the recycling granulation plants in the area. In the same study, PAEs were largely distributed in the particle-phase. High levels of DBP and DEHP could be detected inside the plants. The detected DiBP, DnBP and DEHP inside the Huachang plant were 30, 20 and 5 times greater than background concentrations of the area, respectively.

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	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	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	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 metadata.
Domain 4: Variability and Uncertainty				

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<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	4168432		
<b>Conditions of Use:</b>	Disposal of plastics		
Domain		EVALUATION	
Metric		Rating	Comments
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.
<b>Overall Quality Determination</b>		<b>Low</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	6558536			
<b>Conditions of Use:</b>	Commercial use - spray painting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity 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 Garmat 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.			
Exposure route:	inhalation			
Physical form:	vapor			
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 stack: 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.			
<b>EVALUATION</b>				
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 DINP 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 DINP data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Contains process description, number of workers, PPE and some engineering controls.
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<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	6558536		
<b>Conditions of Use:</b>	Commercial use - spray painting		
Domain	Metric	EVALUATION	
		Rating	Comments
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Hines, C. J., Hopf, N. B., Deddens, J. A., Silva, M. J., Calafat, A. M. (2012). Occupational exposure to diisononyl phthalate (DiNP) in polyvinyl chloride processing operations. International Archives of Occupational and Environmental Health 85(3):317-325.			
<b>HERO ID:</b>	787919			
<b>Conditions of Use:</b>	PVC materials and film processing as a plasticizer			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Compounding, mixing, paste preparation, extrusion, milling, and calendering.			
Exposure route:	ingestion, inhalation, or dermal contact			
Dermal exposure data:	nan			
Personal protective equipment:	Workers use rubber gloves during certain tasks, does not specify what tasks.			
Comments:	2-4% of a dermal dose absorbed within 7 days. Sampling data is urinary metabolite data and no other type of sampling was taken.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study is peer reviewed so likely contains high quality data and workers sampled were part of a NIOSH study.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	Low	Data is for processing PVC products with DINP as a plasticizer. Engineers do not have a methodology of using urinary metabolite data in an exposure assessment
	Metric 4:	Temporal Representativeness	High	Data is from 2012, less than 10 years old
	Metric 5:	Sample Size	Low	Data is urinary metabolite data which contains statistics but not specifically for DINP.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Contains exposure route, sampling type, worker activity, some PPE data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Sampled at different times of the day over 2 years to get a wide range of data. Does not address uncertainty.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	1005742			
<b>Conditions of Use:</b>	Manufacturing/processing - plasticizer			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Number of sites:	20			
Worker activity description:	Seven manufacturing sectors: phthalate manufacturing, PVC film, PVC compounding, vehicle filters, rubber hoses, rubber gaskets, and rubber boots, and 13 companies from nail-only salons			
Exposure route:	inhalation, ingestion, dermal			
Physical form:	vapor/mist/liquid			
Number of workers:	156			
Comments:	Personal urinary sampling conducted but none was done to identify exposure to DINP.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study was approved by NIOSH.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from US
	Metric 3:	Applicability	Low	Applicable to condition of use. However, sampling data are for urinary metabolite and not PBZ data.
	Metric 4:	Temporal Representativeness	Medium	Data is from 2003-2005 so more than 10 years old but less than 20 years old
	Metric 5:	Sample Size	Medium	Statistical distribution characterized by a range of data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes metadata such as worker activity, exposure route, sampling type, exposure route.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability across different industries but not uncertainty
Overall Quality Determination		Medium		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	697394			
<b>Conditions of Use:</b>	manufacturing/processing - plasticizer			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Number of sites:	20			
Worker activity description:	Seven manufacturing sectors: phthalate manufacturing, PVC film, PVC compounding, vehicle filters, rubber hoses, rubber gaskets, and rubber boots, and 13 companies from nail-only salons (PVC film and PVC compounding are specifically mentioned to definitely use DINP)			
Exposure route:	inhalation, ingestion, dermal			
Physical form:	vapor/mist			
Comments:	Personal sampling data is urine samples. No sampling was done to identify DINP concentrations. However, data from other phthalates could potentially be used as surrogate data.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Approved NIOSH study.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from US
	Metric 3:	Applicability	Low	Data is for plasticizer COU in manufacturing and processing. However, no data was captured for DINP.
	Metric 4:	Temporal Representativeness	Medium	Data is from 2003-2005 so more than 10 years old 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	Medium	Includes metadata such as personal sampling data (urinary), exposure route, number of sites, physical form and specific industry sectors but lacks additional metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability across industries and uncertainty
Overall Quality Determination		Medium		

<b>Study Citation:</b>	HSDB, (2015). Diisononyl phthalate (CASRN: 28553-12-0).			
<b>HERO ID:</b>	2356022			
<b>Conditions of Use:</b>	commercial use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Occupational exposure to DINP may occur through inhalation (mist) and dermal contact with this compound at workplaces where DINP is produced or used; settled dust			
Physical form:	Colorless liquid			
Personal sampling data:	DiNP metabolite urinary concentrations in PVC processing workers from two companies that manufactured PVC materials. The highest DiNP intake estimate was 26 ug/kg/day. Occupational exposure to DiNP associated with PVC film manufacturing tasks were substantially higher(sixfold to tenfold) than adult general population exposures; however, all daily intake estimates were less than 25% of current United States or European acceptable or tolerable daily intake estimates. Further characterization of DiNP occupational exposures in other industries is recommended.			
Dermal exposure data:	nan			
Number of workers:	variable; may be as low as <10 workers up to the range of 1000-9999 workers per plant (pg. 49). In the early 1980s, 88,575 workers (20,954 of these are female).			
Personal protective equipment:	gloves; local exhaust ventilation (p. 58)			
<b>EVALUATION</b>				
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
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The information was pulled recently but the original sources of data ranged from recent to 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	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.
<b>Overall Quality Determination</b>		<b>Low</b>		

<b>Study Citation:</b>	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.		
<b>HERO ID:</b>	10293367		
<b>Conditions of Use:</b>	Processing: Plasticizers		
EXTRACTION			
Parameter	Data		
Worker activity description:	Operator working in the dry mix plant area, operator working in the plastisol mix plant area, operator working in the extrusion and laminating line area, operator working in the plastisol line area, operator working in the scrap regrinding area, offloading of trucks during DINP deliveries, monthly inspections and housekeeping in the tank farm where DINP is stored, mixing of batches of leader paste containing plasticizer and plastisol dust collector wasteand application of leader paste to adhere the scrim to the end of the membrane between shifts on the plastisol line, cleaning of dry blend mixers, periodic (less than once per year) cleanouts of dust collectors serving the dry blend mixers involving gravity drop filling of dust into collection bins, periodic cleanouts of dust collectors serving the day silos involving manual removal ofused filters and replacement with a clean filter, cleaning of the plastisol sifter, periodic changes of the plastisol sifter screen after equipment cleaning, periodic cleanouts of the dust collector serving the plastisol mixer involving gravity drop fill of dust into drum, cleaning of the plastisol Versator, maintenance of the extrusion dry charge hopper filters, housekeeping activities, cleanouts of the extrusion vacuum system, removal of dirty HEAF filter roll and placement into a waste transportation container, . draining DINP condensate from the HEAF sump at ambient conditions into a waste oil container, manual removal of dirty Smog Hog electrostatic filter frames from housing into transportation container, draining DINP condensate from the Smog Hog sump at ambient conditions into a waste oil container, replacement of spent RTO thermal media by contractor, replacement of spent disposable carbon filters, exposure to occupational non-user to oil mist.		
Exposure route:	Inhalation, dermal		
Physical form:	Solid, liquid, vapor, mist		
Personal sampling data:	Range of airborne exposure estimated to workers from <0.0005 to 0.12 mg/m^3.		
Exposure duration:	Exposure duration was from 0.1 hr/day to 16 hr/day.		
Exposure frequency:	<1 day/yr to 200 days/yr		
Number of workers:	For different activities, number of workers varied from 1 to 100.		
Personal protective equipment:	Nitrile gloves, Tyvek suit, P100 full face respirator, glasses.		
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	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	High	Data 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	High	Monitoring data include all associated metadata, including sample types, exposure types, exposure durations, worker activities, and exposure frequency.
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Study Citation:	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.		
HERO ID:	10293367		
Conditions of Use:	Processing: Plasticizers		
Domain	Metric	EVALUATION Rating	Comments
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	High	Uncertainty is addressed by discussing limitations. Variability is addressed by including different worker activities and the related exposure.
Overall Quality Determination		High	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	2915537
<b>Conditions of Use:</b>	Use in diapers

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	Uninformative	Data are for consumer exposure to personal care products, which does not apply to any occupational scenario within the scope of the risk evaluation.
	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 relevant metadata is included
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.

<b>Overall Quality Determination</b>	<b>Uninformative</b>
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<b>Study Citation:</b>	Petrovicova, I., Kolena, B., Pilka, T. (2014). The human biomonitoring of occupational exposure to phthalates. Mediterranean Journal of Social Sciences 5(19):101-107.			
<b>HERO ID:</b>	5620073			
<b>Conditions of Use:</b>	Processing in plastics industry			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Workers in plastic manufactory with division of films and composites and injection molding.			
Exposure route:	inhalation, ingestion, dermal			
Personal sampling data:	MINP metabolite concentration (ug/L): mean - 13.56, SD - 4.84, min - 4.60, max - 23.37			
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	Low	Data is applicable to processing in the plastics industry. However, sampling data is urinary metabolite and not PBZ data.
	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		Low		

<b>Study Citation:</b>	Porras, S. P., Hartonen, M., Koponen, J., Ylinen, K., Louhelainen, K., Tornaesus, J., Kiviranta, H., Santonen, T. (2020). Occupational exposure of plastics workers to diisononyl phthalate (DiNP) and di(2-propylheptyl) phthalate (DPHP) in Finland. International Journal of Environmental Research and Public Health 17(6):2035.
<b>HERO ID:</b>	6957400
<b>Conditions of Use:</b>	Plastics production

EXTRACTION	
Parameter	Data
Worker activity description:	Four of the five workers mixed PVC resins and additives, and granulated and packed the products. One worker worked on product development in the laboratory and performed small scale mixing. (sec 3.2)
Area sampling data:	Three air samples were collected at the plastics producing company. Two samples were collected in the factory and one in the laboratory. One of the factory samples was collected by the granulating machine and the other at the site at which the raw materials feeding took place. The DPHP and DiNP concentrations in all the three air samples were below LOQ 0.01 mg/m3. (Sec 3.2)
Personal protective equipment:	The workers used protective clothing and gloves—however, some of them wore short-sleeved shirts. The laboratory worker occasionally used nitrile gloves. RPE was not used. (Sec 3.2)
Engineering control:	The production procedures were almost entirely automatized and closed, and the workers were near the machines only when starting and ending the process and when cleaning the machines. (Sec 3.2)

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Finland).
	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 - discrete sample results provided.
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 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

<b>Study Citation:</b>	Porras, S. P., Hartonen, M., Koponen, J., Ylinen, K., Louhelainen, K., Tornaesus, J., Kiviranta, H., Santonen, T. (2020). Occupational exposure of plastics workers to diisononyl phthalate (DiNP) and di(2-propylheptyl) phthalate (DPHP) in Finland. International Journal of Environmental Research and Public Health 17(6):2035.		
<b>HERO ID:</b>	6957400		
<b>Conditions of Use:</b>	Textile coating		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	Eight workers took part in the study—six of them working in the factory, one in the laboratory, and one was a production manager. The factory workers prepared the coating material (two workers), operated an extruder (two workers), and other machines (two workers). (Sec 3.3)		
Personal sampling data:	PBZ samples were collected from five of the six factory workers. All the air concentrations were below LOQ 0.01 mg/m3. (Sec 3.3)		
Area sampling data:	One static sample was collected near the control room of the extruder. All the air concentrations were below LOQ 0.01 mg/m3. (Sec 3.3)		
Personal protective equipment:	Protective clothing but no RPE was used. (Sec 3.3)		
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	Medium	The data are from an OECD country other than the U.S. (Finland).
	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 - discrete sample results provided.
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 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	

<b>Study Citation:</b>	Porras, S. P., Hartonen, M., Koponen, J., Ylinen, K., Louhelainen, K., Tornaesus, J., Kiviranta, H., Santonen, T. (2020). Occupational exposure of plastics workers to diisononyl phthalate (DiNP) and di(2-propylheptyl) phthalate (DPHP) in Finland. International Journal of Environmental Research and Public Health 17(6):2035.			
<b>HERO ID:</b>	6957400			
<b>Conditions of Use:</b>	Tarpaulin Producer (plastic tarps)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Two workers processed tarpaulins (cutting, seaming, perforation, etc.) in a hangar space. (Sec 3.4)			
Area sampling data:	One stationary air sample collected at the company contained <0.02 mg/m3 of DiNP (i.e., concentration was below the LOQ). (Sec 3.4)			
Personal protective equipment:	Short-sleeved working clothes were used without any PPE. (Sec 3.4)			
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	Medium	The data are from an OECD country other than the U.S. (Finland).
	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 - discrete sample results provided.
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 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		

<b>Study Citation:</b>	Prime,, K (2015). Wipe samples collected from individuals simulating installation of the carpet tiles (sanitized).			
<b>HERO ID:</b>	10312765			
<b>Conditions of Use:</b>	Commercial use- furnishing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Wipe samples from the fingertips and hands of professional installers handling the tiles during simulated installation were collected and analyzed for DINP for the purpose of estimating potential exposure. Samples were collected from the finger tips and the remainder of the hand after 0, 15, 30, 45, 60, 75, and 90 carpet tiles were installed.			
Exposure route:	Dermal			
Dermal exposure data:	Dermal exposure data			
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 evalu- ated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	Data was collected in the past 10 years.
	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, but lacks additional metadata such as exposure duration and frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Variability is addressed by collecting samples for fingertips and hands separately, as well as collecting samples from multiple scenarios. Measurement uncertainty is addressed by the accuracy matrix in the test results.
Overall Quality Determination		High		

<b>Study Citation:</b>	Salisbury, S. (1984). Health hazard evaluation report, No. HETA-79-034-1440, Intex Plastics, Corinth, Mississippi.
<b>HERO ID:</b>	6558526
<b>Conditions of Use:</b>	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
Area sampling data:	bulk air data in calendar operators identifies DINP but does not quantify how much.
Exposure duration:	8 hrs/day
Exposure frequency:	5 days/ 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.
Comments:	Workers operated three, 8 hour shifts per day, five days per week. Source mentions confirmed usage of DINP but never conducts quantifiable sampling data for DINP.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Study conducted by NIOSH, sampling method is only qualitative.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data for US.
	Metric 3:	Applicability	High	Data is for processing in paints and inks, an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old (1970)
	Metric 5:	Sample Size	Low	Not characterized by statistics.
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.

<b>Overall Quality Determination</b>	<b>Medium</b>
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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. In this second part of a Europe-wide study to address these concerns migration of substances from rubber granules to artificial body fluids (sweat, saliva, gastric juice) was tested and exposure measurements at sports fields were performed to improve the database for exposure assessment.			
Exposure route:	dermal			
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	Medium	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		

<b>Study Citation:</b>	Stewart, E. (2011). Air and wipe sampling for phthalates in a medical office building. 1:85-90.			
<b>HERO ID:</b>	7978848			
<b>Conditions of Use:</b>	Plastic and rubber products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Source of exposure for office workers were roof-top walk-off mats that were removed and stored on the property. Employees are workers in a medical office building. (3/7)			
Exposure route:	ingestion, dermal, inhalation (2/7)			
Physical form:	vapor (2/7)			
Area sampling data:	On the second visit, DINP was detected indoors at 9.47 ug/m3. (5/7)			
Dermal exposure data:	Dermal exposure data			
Engineering control:	An onsite air handling unit supplied outdoor air to the building. (3/7)			
<b>EVALUATION</b>				
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	High	Data are for commercial use of plastic and rubber products, an in-scope occupational scenario, however, the source of DINP is reported as unknown but assumed to be a plastic and/or rubber product.
	Metric 4:	Temporal Representativeness	Medium	Monitoring data are greater than 10 years old but 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	Sample data, exposure type, and worker information provided, but missing exposure duration, frequency, number of workers, and PPE.
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.
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	U.S. EPA, (2019). Manufacturer request for risk evaluation: Diisononyl phthalate (DINP).			
<b>HERO ID:</b>	7325467			
<b>Conditions of Use:</b>	Plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	PVC film works and PVC compounding workers. (11/22)			
Exposure route:	oral, dermal, inhalation (7/22)			
Physical form:	dust, plastic articles (7/22)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, 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	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Exposure type and worker activity provided, but missing sampling data, exposure duration, frequency, engineering controls, and PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	This metric is not applicable to the data being extracted
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
<b>HERO ID:</b>	5547263			
<b>Conditions of Use:</b>	Use of plastics			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Human exposure to phthalates arises mainly from ingestion, inhalation, and dermal absorption [17,18].			
Dermal exposure data:	Dermal exposure data			
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	Low	The data are for a non-occupational scenario (Exposure to dust from unclear sources such as cosmetics and personal care products) 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	Data was collected between 2011 - 2014	
	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	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		Low		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	5043594			
<b>Conditions of Use:</b>	Use of synthetic rubber turf pitches for sports			
EXTRACTION				
Parameter	Data			
Exposure route:	For children and adults playing amateur football, exposure scenarios were developed to estimate their potential exposure to substances in rubber granulate via the oral (through accidental ingestion), dermal (through skin contact) and inhalation route (through inhalation of vapours or rubber dust) (p. 5). The results show that the oral route is the most important exposure route for PAHs and phthalates in rubber granulate (p. 9).			
Personal sampling data:	See Table 2 - Assumed rubber dust concentrations of 12 ug/m3; Maximum content or migration values 61 mg/kg (table 4; pg. 10)			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	See Table 2 - assumed exposure durations of 1, 1.5, and 2 hrs/event			
Exposure frequency:	See Table 2 - Assumed frequency of 2-5 times/week over 7 or 10 months/yr.			
Comments:	oral- Maximum content or migration values 12.2 mg/kg (table 4; pg. 10)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Article is peer reviewed and the model appears to be free of mathematical errors and is based on scientifically sound approaches or methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the Netherlands, an OECD country.
	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	High	The journal article with the model was published in 2018, which 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 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		

<b>Study Citation:</b>		U.S. EPA, (2023). Consumer Exposure Model (CEM) Version 3.2 User's Guide.	
<b>HERO ID:</b>		11374403	
<b>Conditions of Use:</b>		All COUs	
Parameter		EXTRACTION	
Dermal exposure data:		Dermal exposure data	
Domain		EVALUATION	
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 model was developed by an OECD country other than 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.
Domain 3: Accessibility/ Clarity			
Metric 5:	Metadata Completeness	Medium	Model approach, equations, and choice of parameter values are transparent. However, rationale for selection of approach, equations, and parameter values is not provided.
Domain 4: Variability and Uncertainty			
Metric 6:	Metadata Completeness	Medium	The model has limited discussion of variability and uncertainty of the model.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	680214
<b>Conditions of Use:</b>	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: 2.2 ng/m <sup>3</sup> (median) in indoor air; 0 ng/m <sup>3</sup> (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	Medium	The model can be appropriately applied to an occupational scenario within the scope of the risk evaluation, however, some parameters are based on consumer use.
	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

<b>Study Citation:</b>	CalEPA, (2012). Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical support document for exposure assessment and stochastic analysis.			
<b>HERO ID:</b>	10217809			
<b>Conditions of Use:</b>	Other-generic scenarios			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Physical form:	semi-volatile			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	Table 6.14. Days/Year of Soil Contact Activities by Adults*For the time spent by California participants in the “yardwork” activities, Jenkins et al. reported a mean and maximum of 111 and 780 minutes/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 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	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario. Not specific to DINP.
	Metric 4:	Temporal Representativeness	Medium	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	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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	675060			
<b>Conditions of Use:</b>	Use (general use, not differentiated)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Area sampling data: See Fig 4 and Table A3 - air concentrations near industry point sources were all <1 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	

<b>Study Citation:</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).		
<b>HERO ID:</b>	1987625		
<b>Conditions of Use:</b>	Household dust		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Dermal exposure data:	Dermal exposure data		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).			
<b>HERO ID:</b>	1987625			
<b>Conditions of Use:</b>	Use of household PVC products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Because plasticizers are not chemically bound to PVC, they may be released when children place PVC products in their mouths. Dermal exposure from these products is also possible, but probably to a lesser extent (CPSC 1983; CPSC 2001, 2002; ECB 2003). Significant inhalation exposure is not likely, due to the low vapor pressure of DINP.			
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	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		Medium		

<b>Study Citation:</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).			
<b>HERO ID:</b>	1987625			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
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 an occupational scenario within the scope of the risk evaluation. The data may have applicability to the dermal exposure assessment
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).		
<b>HERO ID:</b>	679920		
<b>Conditions of Use:</b>	Consumer use of plastics		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	Human exposure to DINP may occur via oral, dermal, and inhalation exposure routes. Dermal exposure is expected from products plasticized with DINP in prolonged contact with external skin		
Dermal exposure data:	Dermal exposure data		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
<b>HERO ID:</b>	5353181			
<b>Conditions of Use:</b>	Plastic and rubber products not covered elsewhere			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	oral, inhalation, dermal			
Physical form:	dust			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
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	Low	Data are for consumer use of plastic and rubber products, which is similar to the 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	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	High	Uncertainty is addressed by including limits of detection and estimation methods in the appendix. Variability is addressed by compiling different studies in the report.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Occupational exposure to DINP may occur: 1) by skin contact with pure DINP, or mixtures (formulations) or end products containing it 2) by inhalation (vapours and aerosols). Oral exposure is not considered to be a significant route of exposure under normal working practices.			
Personal sampling data:	Literature data: Peak values from < 1 mg/m3 up to as high as 60 mg/m3 have been reported for production workers, although with little detail on measurement conditions (Gilioli et al., 1978); timeweighted average is reported to be 5 mg/m3. 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: Limited monitoring data collected over several years to assess occupational exposure of process operations and maintenance technicians at a plasticiser plant indicate DINP concentrations in air of less than 2 mg/m3” (ECPI, 1997a). KEMI (1997) indicates that exposure is 0.1 mg/m3 during manufacture (closed process). This reflects well controlled procedures, but higher exposures may occur. King (1996) reported data from different producers and from the HSE (Table 4.1). Sampling times are not indicated. Table 4.1 indicates DINP concentration of <0.05 mg/m3 during tanker filling. Exposure to DINP has been estimated in 1996 through measurements of DEHP, when this substance was produced, in a large-scale chemical industry. Of 38 determinations, a median value of 0.18 mg/m3 appears for routine determinations (meaning on a 8-hour shift duration), with one outlier at 2.8 mg/m3. Of 12 short-term measurements, the median is 0.6 mg/m3. // Considering all the data available for this scenario, a reasonable worst-case exposure is estimated at 5 mg/m3 (8-hour TWA). The typical concentration will be less than 2 mg/m3, and often still less, DINP is in general not detected when no aerosol is formed.			
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	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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<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Manufacturing		
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.
<b>HERO ID:</b>	3687865
<b>Conditions of Use:</b>	PVC processing

EXTRACTION	
Parameter	Data
Exposure route:	Occupational exposure to DINP may occur: 1) by skin contact with pure DINP, or mixtures (formulations) or end products containing it 2) by inhalation (vapours and aerosols). Oral exposure is not considered to be a significant route of exposure under normal working practices.
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 vapors 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 calender 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. // Unpublished 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). Table 4.3 has no DINP concentrations, but concentrations for other phthalates. RIVM (1997) collected exposure data to various phthalates during processing of polymers. Table 4.4 summarises the data after selection of phthalates heavier than DBP or BBP (and excluding data already cited from King (1996)). Sampling times are generally not provided. Table 4.4 contains DEHP data. 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). Tables 4.5, 4.6, and 4.7 contain DEHP data. // Considering all the data available for this scenario, a reasonable worst-case exposure is estimated to be 10 mg/m3 (8-hour TWA). There are wide variations amongst exposure measurements, depending on circumstances and representativeness of samplings (site, personal or area sampling, duration). The typical concentration would be around 3 mg/m3.
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	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.

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<b>Study Citation:</b>		ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>		3687865		
<b>Conditions of Use:</b>		PVC processing		
Domain		Metric	EVALUATION	
			Rating	Comments
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.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.
<b>HERO ID:</b>	3687865
<b>Conditions of Use:</b>	Application of coatings, adhesives, inks

EXTRACTION	
Parameter	Data
Worker activity description:	At high temperatures and mechanical pressures, aerosol formation is observed with DINP like with other phthalates. Exposure to aerosol is therefore possible in any situation where pure DINP is heated or materials containing DINP are heated and under influence of mechanical pressure. This is also the case when mixtures containing DINP are sprayed.
Exposure route:	Occupational exposure to DINP may occur: 1) by skin contact with pure DINP, or mixtures (formulations) or end products containing it 2) by inhalation (vapours and aerosols). Oral exposure is not considered to be a significant route of exposure under normal working practices.
Personal sampling data:	Data collected in the French database COLCHIC are presented in Table 4.8. Table 4.8 contains DEHP data that was ND for inks, <0.1 for commercial vehicles, 0.083 and 0.046 mg/m3 for boiler making, and <0.1 mg/m for carpets. 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. // There are very few exposure data available for this scenario. Although exposure is likely to be very low in many circumstances, there is no clear evidence that worst-case exposure during aerosol forming activities would be lower than for the previous scenario. Therefore, an exposure of 10 mg/m3 (8-hour TWA) is assumed for this scenario. The typical concentration would be around 1.5 mg/m3.
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	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.

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<b>Study Citation:</b>		ECB, (2003). European union risk assessment report: DINP.	
<b>HERO ID:</b>		3687865	
<b>Conditions of Use:</b>		Application of coatings, adhesives, inks	
Domain	Metric	<b>EVALUATION</b> Rating	Comments
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	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).		
<b>HERO ID:</b>	1588746		
<b>Conditions of Use:</b>	Manufacturing		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Personal sampling data:	King (1996) reported data from different producers and from the HSE (Table 4.1, pg. 120/234). Sampling times are not indicated. Table 4.1 shows DINP concentrations of <0.05 mg/m3 during tanker filling.		
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	Data cited is over 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	

<b>Study Citation:</b>	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).			
<b>HERO ID:</b>	1588746			
<b>Conditions of Use:</b>	Use of Coatings			
EXTRACTION				
Parameter		Data		
Area sampling data:		In a 1996 study, air concentrations of DINP (which is more volatile than DIDP) in a laboratory with DINP coatings were determined to be 0.66 μg/m3 (Menzel, 1996). Pg. 133/234		
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	Medium	The assessment 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	Data cited is over 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			Medium	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).
<b>HERO ID:</b>	679933
<b>Conditions of Use:</b>	Application of paint, adhesive, ink

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 DINP. 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). Actual phthalate concentrations may however be limited due to their low vapour pressure, the range of particle sizes generated (they may not be respirable if not formed by a recondensation mechanism), or their percentage in formulations.
Exposure route:	Occupational exposure to DINP may occur: 1) by skin contact with pure DINP, or mixtures (formulations) or end products containing it 2) by inhalation (vapours and aerosols). Oral exposure is not considered to be a significant route of exposure under normal working practices. Direct or indirect (via contaminated clothes or gloves) skin contact with pure DINP refers only to some activities during manufacture (drumming, cleaning, maintenance) and handling it at the first step of its industrial use (pumping, emptying containers).
Personal sampling data:	Diocetyl phthalate concentrations in Table 4.8: undetected in use of inks; <0.1 mg/m in application to commercial vehicles; 0.083 and 0.046 mg/m <sup>3</sup> in boiler making; <0.1 mg/m <sup>3</sup> in carpet making. // There are very few exposure data available for this scenario. Although exposure is likely to be very low in many circumstances, there is no clear evidence that worst-case exposure during aerosol forming activities would be lower than for the previous scenario. Therefore, an exposure of 10 mg/m <sup>3</sup> (8-hour TWA) is assumed for this scenario. The typical concentration would be around 1.5 mg/m <sup>3</sup> .
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/m <sup>3</sup> .
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	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				
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<b>Study Citation:</b>		ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).		
<b>HERO ID:</b>		679933		
<b>Conditions of Use:</b>		Application of paint, adhesive, ink		
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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	reactor opening, drumming, pumping into tanks, cleaning, maintenance			
Exposure route:	Occupational exposure to DINP may occur: 1) by skin contact with pure DINP, or mixtures (formulations) or end products containing it 2) by inhalation (vapours and aerosols). Oral exposure is not considered to be a significant route of exposure under normal working practices. Direct or indirect (via contaminated clothes or gloves) skin contact with pure DINP refers only to some activities during manufacture (drumming, cleaning, maintenance) and handling it at the first step of its industrial use (pumping, emptying containers).			
Personal sampling data:	Peak values from < 1 mg/m3 up to as high as 60 mg/m3 have been reported for production workers, although with little detail on measurement conditions (Gilioli et al., 1978); timeweighted average is reported to be 5 mg/m3. // King (1996) reported data from different producers and from the HSE (Table 4.1). For tanker filling, <0.05 mg/m3. Sampling times are not indicated. // Considering all the data available for this scenario, a reasonable worst-case exposure is estimated at 5 mg/m3 (8-hour TWA). The typical concentration will be less than 2 mg/m3, and often still less, DINP is in general not detected when no aerosol is formed.			
Area sampling data:	Limited monitoring data collected over several years to assess occupational exposure of process operations and maintenance technicians at a plasticiser plant indicate DINP concentrations in air of less than 2 mg/m3” (ECPI, 1997a). KEMI (1997) indicates that exposure is 0.1 mg/m3 during manufacture (closed process). This reflects well controlled procedures, but higher exposures may occur.			
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	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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<b>Study Citation:</b>		ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).		
<b>HERO ID:</b>		679933		
<b>Conditions of Use:</b>		Manufacturing		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	



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

EXTRACTION	
Parameter	Data
Worker activity description:	Following manufacture, DINP is incorporated to a polymer (PVC compounding, PVC processing) or to other mixtures (production of inks, adhesives, pigments dispersions...). Highest exposure will occur during processing or mixing operations at high temperatures.
Exposure route:	Occupational exposure to DINP may occur: 1) by skin contact with pure DINP, or mixtures (formulations) or end products containing it 2) by inhalation (vapours and aerosols). Oral exposure is not considered to be a significant route of exposure under normal working practices. Direct or indirect (via contaminated clothes or gloves) skin contact with pure DINP refers only to some activities during manufacture (drumming, cleaning, maintenance) and handling it at the first step of its industrial use (pumping, emptying containers).
Personal sampling 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 vapors 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 calender operators. In the mixture preparation section, the plasticiser level was found to be 1.7-40 mg/m3". The most used phthalates were DBP and higher alkyl phthalates (DAP-789). This paper does not give any indication on measurement conditions (duration, personal or static sampling, sampling technique, method of analysis, specificity). // 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. // Considering all the data available for this scenario, a reasonable worst-case exposure is estimated to be 10 mg/m3 (8-hour TWA). There are wide variations amongst exposure measurements, depending on circumstances and representativeness of samplings (site, personal or area sampling, duration). The typical concentration would be around 3 mg/m3.
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 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.
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	Medium
	Metric 3:	Applicability	High
	Metric 4:	Temporal Representativeness	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.
			The assessment is for an occupational scenario within the scope of the risk evaluation.
			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.

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<b>Study Citation:</b>		ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>		679933		
<b>Conditions of Use:</b>		Manufacture of products containing DINP		
Domain		Metric	EVALUATION	
			Rating	Comments
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	EnSIGHT,, California (2014). Literature search: DINP exposure from vinyl roofing (with permission email).			
<b>HERO ID:</b>	10177694			
<b>Conditions of Use:</b>	Building/construction materials not covered elsewhere (roofing)			
EXTRACTION				
Parameter	Data			
Worker activity description:	Vinyl roofing installers (4/19)The report provides this example of roof welding : If a roofing seam was 20 meters long (about 60 feet), at a speeds of 1.5 to 5 min/meter it would take about 30 min to 100 min to weld that seam. At any point in time, 5 inches of the seam is being heated, and the time that any part of the seam is being heated is between 0.9 to 3 seconds. (6/19)			
Exposure route:	inhalation, dermal, ingestion (3/19)			
Physical form:	fumes, vapors (5/19)			
Personal sampling data:	The report calculates that during roof welding, total inhalation exposure would be 0.003-0.1 ug/day. (7/19)			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	The roofing worker on average works for 4 hours per day installing and handling the product. (7/19)			
Exposure frequency:	The average work installs vinyl roofing product 3 of 5 working days in a work week. (7/19)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for commercial use of building and construction 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 (means, ranges) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed by listing limitations of the literature used in the report. Variability is addressed by using data from many studies.
Overall Quality Determination			High	

<b>Study Citation:</b>	NICNAS, (2015). Priority existing chemical assessment report no. 40: Butyl benzyl phthalate.			
<b>HERO ID:</b>	3664467			
<b>Conditions of Use:</b>	Use of plastic articles			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	oral and dermal (children playing with toys)			
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.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Report 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. 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 assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	NICNAS, (2015). Diisononyl phthalates and related compounds: Human health tier II assessment.			
<b>HERO ID:</b>	3687925			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
Parameter	Data			
Worker activity description:	Transfer and blending activities, quality control analysis, and cleaning and maintenance of equipment. Worker exposure to the chemicals at lower concentrations may also occur while using formulated products containing the chemicals.(8/13)			
Exposure route:	During product formulation, dermal and inhalational exposure of workers to the chemicals might occur, particularly where manual or open processes are used. (8/13)			
Engineering control:	Examples of control measures which may minimize the risk include, but are not limited to: using closed systems or isolating operations; health monitoring for any worker who is at risk of exposure to the chemical if valid techniques are available to monitor the effect on the worker’s health; minimizing manual processes and work tasks through automating processes; work procedures that minimize splashes and spills; regularly cleaning equipment and work areas; and using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemicals. (9/13)			
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	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	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	This metric is not applicable to the data being extracted	
Overall Quality Determination		High		

<b>Study Citation:</b>	NICNAS, (2015). Priority existing chemical draft assessment report: Diisodecyl Phthalate & Di-n-octyl Phthalate.			
<b>HERO ID:</b>	6836808			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Workers at a plasticizer manufacturing facility. (39/65)			
Exposure route:	Oral, dermal, inhalation (10/65)			
Physical form:	Oily liquid (19/65)			
Number of workers:	23 sampled workers (39/65)			
<b>EVALUATION</b>				
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 Australia, an OECD country.	
	Metric 3: Applicability	Medium	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario although not specific to DINP	
	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 (averages) 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 by listing critiques of the studies and data used in the assessment. Variability is addressed by using data from many studies.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	NTP-CERHR, (2003). NTP-CERHR monograph on the potential human reproductive and developmental effects of di-isodecyl phthalate (DIDP). (3):i-III90.
<b>HERO ID:</b>	679108
<b>Conditions of Use:</b>	Production of phthalates and PVC

EXTRACTION	
Parameter	Data
Worker activity description:	Some exposures may occur during the loading and unloading of railroad cars and trucks (p. 16).
Exposure route:	Occupational exposure occurs primarily through inhalation and dermal contact. Somewhat higher exposures (than manufacturing) may occur during the production of polyvinyl chloride (PVC) products because of elevated temperatures and more open processes (p. 16).
Area sampling data:	The American Chemistry Council (ACC, formerly CMA) (1) cites six studies that indicate that exposures are below 1 mg/m3 during production of phthalates and below 2 mg/m3 during production of PVC. (page 16) // Public comment on page 73 indicates that data submitted to CERHR show that actual occupational exposures during phthalate production and downstream use are far below the conservative estimate provided by the panel. // There are two studies of concentration in air. Wechsler (1984) reported DINP as present at 15 ng/m3 and Tienpont et al (2000) as <20 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	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	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 assessment provides only limited discussion of the variability and uncertainty in the results.

<b>Overall Quality Determination</b>	<b>High</b>
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<b>Study Citation:</b>	NTP-CERHR, (2000). NTP-CERHR expert panel report on di-isononyl phthalate. GRA and I(GRA and I):47.		
<b>HERO ID:</b>	679849		
<b>Conditions of Use:</b>	PVC product manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	Some exposures may occur during the loading and unloading of railroad cars and trucks.		
Exposure route:	Occupational exposure occurs primarily through inhalation and dermal contact		
Physical form:	DINP is an oily, viscous liquid at standard temperature and pressure.		
Area sampling data:	ACC cites six studies that indicate exposures are below 1 mg/m3 during production of phthalates and below 2 mg/m3 during production of PVC.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	NTP-CERHR, (2000). NTP-CERHR expert panel report on di-isononyl phthalate. GRA and I(GRA and I):47.		
<b>HERO ID:</b>	679849		
<b>Conditions of Use:</b>	Manufacturing		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	Occupational exposure occurs primarily through inhalation and dermal contact		
Physical form:	DINP is an oily, viscous liquid at standard temperature and pressure.		
Area sampling data:	ACC cites six studies that indicate exposures are 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-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:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Exposures may occur during the loading and unloading of railroad cars and trucks. Slightly higher exposures may occur during the production of PVC products because of elevated temperatures and more open processes. (17/153)			
Exposure route:	inhalation, dermal (16/153)			
Personal sampling data:	ACC cites six studies that indicate exposures are below 2 mg/m3 during production of PVC. (17/153)			
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	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	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 addressed by describing the need for more human data and including public comments. Variability is not addressed.	
Overall Quality Determination		High		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	680097			
<b>Conditions of Use:</b>	Domestic Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	Exposures may occur during the loading and unloading of railroad cars and trucks. (17/153)			
Exposure route:	inhalation, dermal (16/153)			
Personal sampling data:	ACC cites six studies that indicate exposures are below 1 mg/m3 during production of phthalates.(17/153)			
Area sampling data:	Two studies of DINP concentrations in air reported concentrations of 15 ng/m3 and <20 ng/m3. (99/153)			
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 domestic 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	Medium	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 addressed by describing the need for more human data and including public comments. Variability is not addressed.
Overall Quality Determination			High	

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.			
<b>HERO ID:</b>	3808976			
<b>Conditions of Use:</b>	Use-Automotive Coating Application			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
Exposure frequency:	dermal: surrogate measured skin loading conditions inhalation: 8-hr TWA surrogate data			
Number of workers:	250 days/yr			
Personal protective equipment:	8 workers/site			
Comments:	air-purifying respirators or air-supplied respirators, Gloves (typically latex or nitrile), paint suits, and face masks/eye protection			
	PBZ samples			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on adhesive formulation.			
<b>HERO ID:</b>	3827299			
<b>Conditions of Use:</b>	Processing - Formulation of Adhesives			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.		
<b>HERO ID:</b>	3840003		
<b>Conditions of Use:</b>	Processing - Formulation of Coatings, inks, and adhesives		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2020). Emission scenario document on chemical additives used in automotive lubricants.			
<b>HERO ID:</b>	6385735			
<b>Conditions of Use:</b>	Functional Fluids			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	PROC: unloading, container cleaning, formulation, sampling, equipment cleaning, loadingUSE: Unloading, container cleaning			
Exposure route:	dermal and inhalation			
Personal sampling data:	Provides methods for modeling exposures to volatile liquids			
Dermal exposure data:	nan			
Exposure frequency:	Processing: 203-360 days/yrUse: 253 days/yr			
Number of workers:	PROC: 22 workers/siteUSE: 4 workers/site			
Personal protective equipment:	PROC: Respirators, gloves, safety glassesUSE: gloves, protective footwear, protective headwear, dust masks or respirators			
Engineering control:	LEV			
<b>EVALUATION</b>				
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	High	Assessment is based on current industry conditions and data no more than 10 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 additive types.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.			
<b>HERO ID:</b>	6311222			
<b>Conditions of Use:</b>	Automotive Coating Application			
EXTRACTION				
Parameter	Data			
Worker activity description:	Auto OEM: robotics operations, paint mixing, paint booth cleaning, inspection, and manual "touch-up" painting. Autorefinish: wat sanding, car washing, stripping (paint removal), machine sanding, blowing, buffing, polishing, paint spraying, paint and primer mixing, and inspection.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Provides methods for modeling exposures to mists			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	oem: 8 hrs, auto refinish: 1-2hrs (estimated)			
Exposure frequency:	Auto OEM: 250 days/yr. Autorefinish: 170 days/yr.			
Number of workers:	Auto OEM: 17 workers/site. Autorefinish: ~2-10 workers/site.			
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	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		



<b>Study Citation:</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
<b>HERO ID:</b>	10480466			
<b>Conditions of Use:</b>	Use - Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Container unloading (liquids and solids), container cleaning, equipment cleaning, laboratory analyses, disposal of laboratory chemicals			
Exposure route:	Dermal, Inhalation; dermal: Provides methods for modeling exposures to non-volatile and volatile liquids and solidsInhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids			
Physical form:	Liquid or solid			
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			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	11182966			
<b>Conditions of Use:</b>	Repackaging			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading transport containers, container cleaning, equipment cleaning, loading of transport containers.			
Exposure route:	Dermal, Inhalation			
Physical form:	Liquid or solid			
Personal sampling data:	”Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids”			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	8-12 hr/day			
Exposure frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr.			
Number of workers:	3 workers/facility and 1 ONUs/facility (total number of employees and facilities given in Table 5-3)			
Personal protective equipment:	Commonly used PPE includes safety glasses, face shields, aprons, and gloves.			
Engineering control:	Local exhaust ventilation			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2021). Generic model for central tendency and high-end inhalation exposure to total and respirable Particulates Not Otherwise Regulated (PNOR).			
<b>HERO ID:</b>	11373482			
<b>Conditions of Use:</b>	All COUs			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Inhalation			
Physical form:	Solid particulates			
Personal sampling data:	Presents various PBZs broken down by industry code. Also presents an equation to calculate exposure amounts from the concentrations, breathing rate, and exposure time, and concentration.			
Exposure duration:	8 hr/day			
<b>EVALUATION</b>				
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	Model 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 certain statistics, such as mean, min, max, and median. Discrete data isn't 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	Variability is addressed by presenting various industry code data. Uncertainty and limitations are addressed in a designated paragraph within the model.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	11373493			
<b>Conditions of Use:</b>	Plastics Converting			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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:	30-69 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	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		

<b>Study Citation:</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.			
<b>HERO ID:</b>	3827195			
<b>Conditions of Use:</b>	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:	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	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 and additive types.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.			
<b>HERO ID:</b>	6304171			
<b>Conditions of Use:</b>	Flexible and Rigid Polyurethane Foam Manufacture			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	transfer from shipping containers, operation/supervision of the foam mix head/dispenser, foam production, transfer/handling of foamed articles			
Exposure route:	dermal and inhalation			
Exposure duration:	8 hr/day			
Exposure frequency:	250 days/yr			
Number of workers:	<50 workers/site			
<b>EVALUATION</b>				
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	Number of workers 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 foam types.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.
<b>HERO ID:</b>	6311218
<b>Conditions of Use:</b>	Incorporating into formulation, mixture or reaction product as a plasticizer; Incorporating into articles as a plasticizer in plastics product manufacturing

EXTRACTION	
Parameter	Data
Worker activity description:	Exposure to solid or liquids during unloading of additives from transport container and charging additives to operation; Exposure to liquids during equipment cleaning of compounding equipment; Exposure to solids during filling containers with compounded plastic resin (page 10 of 18)
Exposure route:	inhalation and dermal (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 (page 15 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 are for multiple in-scope occupational scenarios; 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.

<b>Overall Quality Determination</b>	<b>Medium</b>
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<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	6311221			
<b>Conditions of Use:</b>	Formulation of Printing Inks			
EXTRACTION				
Parameter	Data			
Worker activity description:	unloading, cleaning, packaging (page 30 of 54)			
Exposure route:	dermal and inhalation (page 31-33 and 39-40 of 54)			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids and solids (page 31-32 of 54)			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	250 days/yr (page 31 of 54)			
Number of workers:	13-22 workers/site (page 30 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		



<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	6311221			
<b>Conditions of Use:</b>	Use of Printing Inks			
EXTRACTION				
Parameter	Data			
Worker activity description:	Printing operations, unloading (page 38 - 40 of 54)			
Exposure route:	dermal and inhalation (page 31-33 and 39-40 of 54)			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids and solids (page 39-40 of 54)			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	250 days/yr (page 38 of 54)			
Number of workers:	16-43 workers/site (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		

<b>Study Citation:</b>	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).			
<b>HERO ID:</b>	6385708			
<b>Conditions of Use:</b>	Manufacturing; import; Processing as a reactant; processing – incorporating into formulation, mixture, or reaction product; processing – incorporation into articles; repackaging; distribution in commerce;			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	The greatest potential for worker exposure to materials last transported occurs during heel removal.			
Personal protective equipment:	Facility personnel typically wear coveralls, safety shoes, protective glasses, and gloves during tank cleaning			
<b>EVALUATION</b>				
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 multiple in-scope occupational scenarios; 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	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	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385709			
<b>Conditions of Use:</b>	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	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 assessment does not address variability or uncertainty.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385710			
<b>Conditions of Use:</b>	Formulation of Printing Inks			
EXTRACTION				
Parameter	Data			
Worker activity description:	Dermal exposure solid raw materials and inhalation exposure to particulate; Dermal exposure to liquid raw materials and inhalation exposure to volatile materials; Inhalation exposure to fugitive air emissions from dispersion tank; Inhalation exposure to fugitive air emissions from milling; Dermal and inhalation exposure during equipment cleaning; Dermal exposure to ink during loading and inhalation exposure from volatile components. (page 10 of 23)			
Exposure route:	Inhalation and dermal (page 10 of 23)			
Physical form:	Liquid, vapor, solid particulate (page 9 of 23)			
Number of workers:	See Table 2-2 on page 7: 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	Medium	Uncertainty not addressed. Variability not addressed.	
Overall Quality Determination		High		

<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385710			
<b>Conditions of Use:</b>	Use of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Dermal exposure to ink and inhalation exposure to volatile components during unloading; Inhalation exposure to fugitive air releases from ink reservoir; Inhalation exposure to ink mist generated from printing press; Dermal and inhalation exposure during equipment cleaning; Inhalation exposure to fugitive air releases from drying (page 15 of 23)			
Exposure route:	Inhalation and dermal (page 10 of 23)			
Physical form:	Liquid, mist (page 15 of 23)			
Number of workers:	See Table 2-2 on page 7: Total number of workers is 64,973, with the number of workers for each printing type varying from ~13,000 to ~225,000			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.			
<b>HERO ID:</b>	6385711			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Inhalation exposures to solids during unloading/transferring of compounded resins; Inhalation exposure to dusts generated during converting processes; Inhalation exposure to solids during trimming activities (page 25 of 96) Page 25-27 contains a narrative of the process where possible exposures are explained in context.			
Exposure route:	inhalation (page 25 of 96)			
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 (page 55-60 of 96)			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	137-254 days/yr (page 30 of 96)			
Number of workers:	30-69 workers/site (page 53-54 of 96)			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

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

<b>Study Citation:</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385741			
<b>Conditions of Use:</b>	Incorporation into articles for textiles, apparel, and leather manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	mixing			
Exposure route:	dermal and inhalation			
Area sampling data:	inhalation: negligible			
Dermal exposure data:	Dermal exposure data			
Number of workers:	3-6 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	Exposure 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 finishing agent types.	
Overall Quality Determination		Medium		



<b>Study Citation:</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385748			
<b>Conditions of Use:</b>	Processing - Plastics Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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:	148-264 days/yr			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Canada,, G.o. (2020). Phthalate substance grouping – Information sheet.			
<b>HERO ID:</b>	7349060			
<b>Conditions of Use:</b>	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	Medium	The data sources, used in the assessment or report are not specified but presumed to be listed in the screening assessment. Report is the summary of findings from the screening assessment.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Report is from Canada, an OECD country.
	Metric 3:	Applicability	Uninformative	Exposure routes were determined for the general population and not specifically to occupational settings.
	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		Uninformative		

<b>Study Citation:</b>		CDC, (2009). Fourth national report on human exposure to environmental chemicals.		
<b>HERO ID:</b>		664488		
<b>Conditions of Use:</b>		Use of consumer articles		
EXTRACTION				
Parameter		Data		
Exposure route:		People are exposed through ingestion, inhalation, and, to a lesser extent, dermal contact with products that contain phthalates. workers may be exposed to higher air phthalate concentrations than the general population.		
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	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	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	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 report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Cherrie, J. W., Semple, S., Brouwer, D. (2004). Gloves and dermal exposure to chemicals: Proposals for evaluating workplace effectiveness. Annals of Occupational Hygiene 48(7):607-615.			
<b>HERO ID:</b>	5080435			
<b>Conditions of Use:</b>	All COUs			
EXTRACTION				
Parameter		Data		
Dermal exposure data:		Dermal exposure data		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The report uses high quality data that are from frequently used sources 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	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	No sample size applicable to the proposed conceptual model.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty and variability of glove protection factors are covered in the study.
Overall Quality Determination			High	

<b>Study Citation:</b>	ExxonMobil, (2022). EM BRCP DINP/DIDP facility – virtual tour (sanitized).
<b>HERO ID:</b>	10633678
<b>Conditions of Use:</b>	Manufacturing

**EXTRACTION**

Parameter	Data
Worker activity description:	<p>CRUDE FILTRATION #1Two filters used in crude filtration: Fundabac/closed-system pressure vessel and downstream polish filter. Filtration leads to waste discharge with 50:50 solid/adsorbed oil, where adsorbed oil is 80% diester/20% alcohol. Filters are manually cleaned and/or replaced with potential for dermal exposure. Filter cake from the Fundabac filter is discharged directly into hopper below vessel. Liquid is manually vacuumed up into a vacuum truck and then discharged into waste water sump. The solid filter cake is enclosed in hopper and disposed by 3rd party. The polish filters are removed and placed in sealed barrels which are disposed of at 3rd party landfill.Activities:Water wash filter - 1 worker, 15 min/day, 90 days/yearExtract filter internals from filter housing and replace filter cloths - 3 workers, 12 hours/day, 1 day/yearReplace filter cartridges - 1 worker, 15 min/day, 90 days/yearVacuum liquid from hopper - 1 worker, claims that no exposure takes place hereFINAL FILTRATION #2Final filtration involves series of three filters: leaf filter, paper filter, &amp; cartridge filter. Filtration step leads to waste discharge of 50:50 solid/adsorbed oil where adsorbed oil is 100% diester. Filters are cleaned and replaced regularly. Waste from leaf filter is discharged to hopper and vacuumed by 3rd party. Workers open bottom head and then goes above and activates screen shaker to get last bits of filter cake into hopper. Leaf filters are air lanced manually through the bottom head. Dry filter cake disposed of in hopper. Leaf filters are water washed manually from top of filter. Filter is hooked up to vacuum truck which removes water waste into the sump. Paper &amp; cartridge filters are removed and placed in sealed barrels for 3rd party disposal.Activities:Leaf filter cleaning - 1 worker, 2 times/day, claims that no exposure expectedPaper &amp; cartridge filters - 1 worker, 15 min/day, 6 day/yearVacuum Hopper - 1 contractor, claims that no exposure expectedPRODUCT SAMPLINGSampling is performed at two main stages: quality control post reactor (T = 375F, cooled to 250F) and quality control at unit back-end and rundown tanks (T &lt; 140F). At each sampling point, there is 1 worker taking 6 samples (5min/sample) that is done 180 days/year.REACTOR CLEANINGReactor cleaning is rare (~once/year) and when vessels require human entry for maintenance. PRODUCT LOADING &amp; VESSEL CLEANINGMarine vessels (58.5%), rail cars (28.5%), and trucks (13%) loaded through closed piping. Only railcars are cleaned onsite, with approximately 1 single railcar cleaned onsite per week. Railcars are cleaned with water only using Butterworth spray nozzle lowered through the open railcar manway. Railcar bottom valve is open and the rinsate drains to a WW sump. Worker does not stay near the railcar while cleaning occurs.</p>
Exposure route:	Dermal, Inhalation
Physical form:	Vapor, liquid, adsorbed oil
Dermal exposure data:	Dermal exposure data
Exposure duration:	See worker activities for exposure durations
Exposure frequency:	See worker activities for exposure frequencies
Number of workers:	See worker activities for number of workers assigned to each worker activity
Personal protective equipment:	Standard PPE consists of fire resistant clothing, safety glasses, leather gloves, steel toe shoes and hard hat.
Engineering control:	No engineering controls mentioned other than automated processes in manufacturing and waste removal.

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Data are directly from manufacturer and are expected to be accurate.
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.

Continued on next page ...

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<b>Study Citation:</b>		ExxonMobil, (2022). EM BRCP DINP/DIDP facility – virtual tour (sanitized).		
<b>HERO ID:</b>		10633678		
<b>Conditions of Use:</b>		Manufacturing		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 5:		Sample Size	N/A	Sample size is not applicable to worker activity and occupational data 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 with respect to occupational exposure information.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3230538			
<b>Conditions of Use:</b>	Dermal Exposure			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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, 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	N/A	Geographic scope is not applicable to scientific research of dermal exposures.	
	Metric 3: Applicability	High	The report is for dermal exposure which is 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	Article studies science of skin permeation and evaporation. Sample size is not applicable.	
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		

<b>Study Citation:</b>	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
<b>HERO ID:</b>	6558535			
<b>Conditions of Use:</b>	Commercial use - spray painting.			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	sanding, grinding, welding, spray painting.			
Exposure route:	inhalation			
Physical form:	vapor			
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 DINP or any phthalates. Marked for potential useful COU data in spray painting.			
<b>EVALUATION</b>				
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	Occupational scenario falls under a condition of use but DINP or phthalates are not mentioned.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	No samples for DINP.
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	The report does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7978431			
<b>Conditions of Use:</b>	Plastics production (PVC Compounding) using DINP as a plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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).			
Exposure route:	In occupational settings, workers may be exposed to DINP through inhalation, ingestion and dermal contact (p. 5).			
Physical form:	DINP exposure was related to vapour emission (eg, from coating or dipping) or residual dust (eg, from compounding) during the manufacturing process (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).			
<b>EVALUATION</b>				
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 data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Data no more than 10 years old.
	Metric 5:	Sample Size	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.			
<b>HERO ID:</b>	11328016			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	”In addition, ”Dermal absorption of 14C-DINP was studied in male Fischer 344 rats in both conditioned (pretreatment with non-labeled DINP) and non-conditioned skin (ExxonMobil, 1983a; McKee et al., 2002). Following exposure, the dosed area was occluded. Under all conditions, the amount of DINP absorbed after 7 days ranged from 2 to 4% with approximately 93–99% of the administered radioactivity recovered at the site of application. Radioactivity in feces and gut of the exposed rats suggested some excretion occurred via the biliary route. These results are in agreement with the work published by Elsisi et al (1989) which demonstrated that dermal absorption decreases as carbon chain length increases.”			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for all 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 - No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - No sample data.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	699155			
<b>Conditions of Use:</b>	commercial use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Workers involved in the production and processing of PVC plastics			
Exposure route:	Inhalation, dermal, ingestion			
Physical form:	Gas, solid (as particulates)			
Personal sampling data:	no information available			
Exposure duration:	no information available			
Number of workers:	no information available			
<b>EVALUATION</b>				
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 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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

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:	Plasticizer- Car manufacturing				
EXTRACTION					
Parameter	Data				
Worker activity description:	Checking and refinishing plastisol seam sealants with a brush or the fingers				
Exposure route:	Inhalation and dermal				
Personal protective equipment:	Cotton gloves are worn by some workers. Some workers do not wear gloves.				
Comments:	report includes urine measurements.				
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 frequently used sources (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, Kirk-Othmer) , 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. (Germany).	
	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 (source is dated 2012).	
	Metric 5:	Sample Size	N/A	This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents 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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	2345960			
<b>Conditions of Use:</b>	Disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Worker activity description:		Waste management workers		
Exposure route:		Inhalation, dermal		
Exposure duration:		Work shift: 8 hours		
Number of workers:		30		
<b>EVALUATION</b>				
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
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3015875			
<b>Conditions of Use:</b>	Vinyl flooring			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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. Parameter yo, the gas-phase concentration of DINP in equilibrium with the material phase, which range for DINP containing vinyl flooring from 0.43 ug/cm3 to 48.3 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	

<b>Study Citation:</b>	Lott, S. (2014). Phthalate-free Plasticizers in PVC.			
<b>HERO ID:</b>	7323639			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	During the manufacturing of DINCH, another plasticizer, workers convert DINP to DINCH. (18/26)			
Exposure route:	inhalation, ingestion, dermal (19/26)			
Physical form:	dust, gas (19/26)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for the use of plasticizers in building materials, 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	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	This metric is not applicable to the data being extracted
Overall Quality Determination			High	

<b>Study Citation:</b>	Lowell Center for Sustainable Production at the University of Massachusetts, (2011). Technical briefing: Phthalates and their alternatives: Health and environmental concerns. :23.			
<b>HERO ID:</b>	5349749			
<b>Conditions of Use:</b>	Consumer use			
EXTRACTION				
Parameter	Data			
Exposure route:	Since phthalates are not chemically bound to the PVC polymer, they can be released from products or dissolve upon contact with liquids or fats. Phthalates have low volatility and are slowly released from PVC products during use, diffusing into the air. They are also released into the environment during their production, processing and waste disposal. Once in the environment, phthalates bind to particles—primarily dust particles in the home—and can be carried in the air over long distances. Human exposure to phthalates occurs through inhalation and ingestion of contaminated air and food as well as from skin contact. An additional exposure route for young children is through mouthing toys, childcare articles, and other products containing phthalates. In addition to the length of time of mouthing activity, oral absorption depends on the migration rate of the phthalate in the product that is being mouthed. Studies suggest100 % oral absorption of phthalates such as DEHP and DINP at daily exposure levels (p. 6 of 24).			
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	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	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents 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:	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:	Use of plastic products			
EXTRACTION				
Parameter	Data			
Exposure route:	Populations are exposed to environmental phthalates from routes of ingestion, inhalation, derma, and intravenous contact throughout life, including intrauterine development.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	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 (China), 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	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	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	N/A	Qualitative information
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Marquart, H., Franken, R., Goede, H., Fransman, W., Schinkel, J. (2017). Validation of the dermal exposure model in ECETOC TRA. Annals of Work Exposures and Health 61(7):854-871.			
<b>HERO ID:</b>	5080455			
<b>Conditions of Use:</b>	All COUs			
EXTRACTION				
Parameter		Data		
Dermal exposure data:		Dermal exposure data		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The report uses high quality data that are from frequently used sources 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	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	No sample size data applicable for protection factor.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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 in protection factors.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3222353			
<b>Conditions of Use:</b>	May apply to more than 1 COU			
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 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	Medium	The report is for an occupational scenario within the scope of the risk evaluation, but the information is not chemical specific.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Mean and standard deviation provided but individual data points not 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	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

<b>Study Citation:</b>	OECD, (2004). Test No. 428: Skin absorption: In vitro method.			
<b>HERO ID:</b>	11147625			
<b>Conditions of Use:</b>	All COUs			
EXTRACTION				
Parameter		Data		
Dermal exposure data:		Dermal exposure data		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The guideline uses high quality data that are from frequently used sources 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 guideline was developed by the OECD with involvement 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 guideline was created over 10 years ago, but less than 20 years ago, and it is still relevant to occupational exposure conditions today.
	Metric 5:	Sample Size	Low	There are no sample statistics to support the value of 10 uL/cm2 or 1-5 mg/cm2 for finite dose dermal loading.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Guideline clearly documents assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The guideline provides only limited discussion of the variability and uncertainty of finite dose dermal loading.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	OEHHA, (2013). Proposition 65, Carcinogen Identification Committee (CIC) transcripts from 12/5/2013 hearing.			
<b>HERO ID:</b>	10217511			
<b>Conditions of Use:</b>	Industrial/Commercial Use			
EXTRACTION				
Parameter	Data			
Worker activity description:	An occupational study in car manufacturing employees showed higher DINP exposure values for all workers engaged in seam sealing with DINP based plastisol compared to other workers from the same plant. Higher DINP exposure levels were also reported in PVC film manufacturing workers compared to unexposed controls.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Data sources for the extracted information are not specified in the transcript.	
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	Low	Based on information, measurement data was taken but only qualitative indication of increased exposure is mentioned.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability was addressed by including two different production processes but uncertainty was not addressed.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	OEHHA, (2016). Issuance of a safe use determination for exposure to professional installers to diisononyl phthalate in vinyl flooring products.		
<b>HERO ID:</b>	10472400		
<b>Conditions of Use:</b>	Vinyl flooring installation		
EXTRACTION			
Parameter	Data		
Worker activity description:	Following worker assumptions made: Dermal exposure of the professional installer to DINP occurs only during the time spent handling the vinyl flooring materials; Dermal exposure is limited to the palmar surface of both hands (data on DINP loading on other parts of the body during vinyl flooring installation are not available).2 of assumptions are listed above but more assumptions are documented in report		
Exposure route:	Inhalation, Dermal, and Hand-to-Mouth		
Personal sampling data:	RFCI: Data provided is not personal sampling data from the workplace. In estimating installers’ inhalation exposure to DINP, RFCI used the emission parameter (Y0) from Liang and Xu (2014) and a box model to estimate the indoor gas-phase DINP concentration. However, RFCI used an incorrect Y0 value (0.52 μg/cubic meter [m3]), instead of the correct value of 0.42 μg/m3 from the Liang and Xu (2014) publication- 0.085 ug/m3OEHHA: Inhalation of DINP by professional installers during floor installation is considered to be negligible because the degree to which DINP, a semi-volatile organic compound, will volatilize from vinyl flooring products over the course of a few days is expected to be minimal. The slow rate of DINP volatilization from the new flooring products is not expected to result in significant air concentrations of DINP during the installation period.		
Dermal exposure data:	Dermal exposure data		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The report uses high quality data and sound methods that are from OEHHA (frequent source) but also RFCI (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 analysis/estimation was generally less than 10 years old, but some of the underlying data/parameters used is greater 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	Exposure assessment clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is covered by exposure assessment methodology, but measurement uncertainty is not characterized.
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<b>Study Citation:</b>		OEHHA, (2016). Issuance of a safe use determination for exposure to professional installers to diisononyl phthalate in vinyl flooring products.		
<b>HERO ID:</b>		10472400		
<b>Conditions of Use:</b>		Vinyl flooring installation		
Domain	Metric	<b>EVALUATION</b>		
		Rating		Comments
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	2219803			
<b>Conditions of Use:</b>	Lab study - animal study.			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal			
Physical form:	vapor			
Dermal exposure data:	Dermal exposure data			
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	Data is from Taiwan, a non-OECD country.
	Metric 3:	Applicability	Low	Data is only for animal study.
	Metric 4:	Temporal Representativeness	High	Data is from 2014, so less than 10 years old
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
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 Determination			Medium	



<b>Study Citation:</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.			
<b>HERO ID:</b>	10472417			
<b>Conditions of Use:</b>	Floor Coverings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Inhalation, Dermal and Ingestion			
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	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. However, exposure to DINP 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	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	Variability and uncertainty not applicable to qualitative data relating to exposure route.	
Overall Quality Determination		High		

<b>Study Citation:</b>	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.			
<b>HERO ID:</b>	675435			
<b>Conditions of Use:</b>	manufacturing, plasticizer, dielectric fluid in capacitors			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Number of workers:	The National Occupational Hazard Survey indicates that 16,022 workers were potentially exposed to DINP			
<b>EVALUATION</b>				
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	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	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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
<b>HERO ID:</b>	11138808			
<b>Conditions of Use:</b>	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 ( <a href="https://www.bls.gov/oes/current/oes_research_estimates.htm">https://www.bls.gov/oes/current/oes_research_estimates.htm</a> ).	
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		

<b>Study Citation:</b>	U.S. EPA, (2013). Updating CEB’s method for screening-level estimates of dermal exposure.			
<b>HERO ID:</b>	11224653			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
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	Medium	Discrete distribution of samples available from referenced studies, but individual sample data is not provided in guideline memo.
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (1991). Chemical engineering branch manual for the preparation of engineering assessments.			
<b>HERO ID:</b>	4532330			
<b>Conditions of Use:</b>	All COUs			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The CEB manual uses high quality data that are from frequently used sources 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	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	N/A	No data samples for potential dermal exposure time.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	The CEB Manual clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty regarding the number of contacts is explained, but there are no explanations of variability among dermal exposure times.	
Overall Quality Determination		High		

<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.			
<b>HERO ID:</b>	4565597			
<b>Conditions of Use:</b>	General industrial manufacturing, processing, or use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2011). Exposure factors handbook: 2011 edition.			
<b>HERO ID:</b>	786546			
<b>Conditions of Use:</b>	All COUs			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The Exposure Factors Handbook uses high quality data and/or thatare from frequently used sources 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 evalu- ated.
	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 data that are expected to be reasonably representative of current conditions. The Exposure Factors Handbook 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 rep- resentative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	The Exposure Factors Handbook clearly documents its data sources, assessment meth- ods, 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 char- acterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.			
<b>HERO ID:</b>	9102524			
<b>Conditions of Use:</b>	Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Worker activity description:	Recommended maintenance practices include brushing the field for infill redistribution, raking to rejuvenate the fibers and to relevel the top portion of the infill, and sweeping for debris removal (STC et al., 2016a; FieldTurf, n.d.-b). It is recommended that someof these practices be performed more frequently than others, depending on the frequency with which the field is used and specific guidelines for the sport played on the field.			
Exposure route:	inhalation, oral, dermal			
Exposure duration:	0.54-10			
Exposure frequency:	24-365 d/yr; 4-7 d/wk			
Comments:	unique exposure/behavioral factors provided pg. 63			
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 phthalate use in toys, playground, and sporting equipment, information is not seperated between commercial or consumer use.
	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 (ranges, number of sites) 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 but uncertainty in exposure factors is not discussed.
Overall Quality Determination		High		



**Study Citation:** Cadogan, D., Howick, C. (2000). Plasticizers.  
**HERO ID:** 6311430  
**Conditions of Use:** Use as plasticizer

**EXTRACTION**

Parameter	Data
Description of release source:	See section 7.1.2: During the production of flexible PVC products plasticizers are exposed for up to several minutes to temperatures of ~180°C. The exact conditions depend on the processing technique employed, but it is evident that the loss of plasticizer by evaporation and degradation can be significant. Of the various processing techniques used, injection molding and extrusion involve little or no exposure of hot product to the surrounding air, hence they give rise to no significant emission of plasticizer to the atmosphere. This is not the case in the production of sheet and film by calendaring or spread coating.
Release quantity:	Per Table 5: Emissions during processing totals 950 t/y, with the following breakdown for production of plastic products: 280 t/y from calendered film and sheet, 10 t/y from calendered flooring, 520 t/y for spread coating, 50 t/y for other plastisol, and 90 t/y for extrusion/injection molding.
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 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. (Europe).
	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	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	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**

<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.			
<b>HERO ID:</b>	6311430			
<b>Conditions of Use:</b>	Plasticizer Production and Distribution			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	See section 7.1.1: Phthalate plasticizers are produced by esterification of phthalic anhydride in closed systems hence losses toatmosphere are minimal.			
Release quantity:	Per Table 5: 220 t/y. Inquiries of all the principal plasticizer producers indicate a maximum total emission in Western Europe of 220 t/yr, 90% of which is to the water compartment. It is estimated that, as a result of cleaning and spillages, the maximum emission to the environment is 80 t/yr. (section 7.1.1)			
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. (Europe).
	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	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	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	

<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.		
<b>HERO ID:</b>	6311430		
<b>Conditions of Use:</b>	Use of plastics		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	When plasticized PVC comes into contact with other materials, plasticizer may migrate from the plasticized PVC into the other material. The rate of migration depends not only on the plasticizer employed but also on the nature of the contact material. Plasticizer can also be extracted from PVC by a range of solvents including water. The aggressiveness of a particular solvent depends on its molecular size and its compatibility with both the plasticizer and PVC. Water extracts plasticizer very slowly, oils are slightly more aggressive, and low molecular weight solvents are the most aggressive. (p. 14). // Section 7.1.3: Some products, particularly flooring, may lose plasticizer not only by evaporation but also through extraction by soapy water during cleaning. It is possible to estimate the quantity of plasticizer extracted but many assumptions have to be made including the frequency, duration, and temperature of washing and the proportion of floors cleaned in this way. Wastewater associated with the cleaning process typically goes to the municipal sewage system. Thus, the phthalates are biodegraded and do not end up in the environment.		
Release quantity:	Per Table 5: 640 t/y for interior use (flooring, wall coverings, other film/sheet/coating, wire, cable, profiles, hose); 5600 t/y from exterior use.		
Release or emission factors:	Release or emission factors		
<b>EVALUATION</b>			
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. (Europe).
	Metric 3: Applicability	Medium	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. Engineers may need to cover end of use releases and this information could be helpful
	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	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.
<b>Overall Quality Determination</b>		<b>Low</b>	

**Study Citation:** Cadogan, D., Howick, C. (2000). Plasticizers.  
**HERO ID:** 6311430  
**Conditions of Use:** Disposal

**EXTRACTION****Parameter****Data**

Description of release source: See section 7.1.5: 250 t/yr plasticizer could be emitted to the environment from landfills in Western Europe.  
 Release quantity: Per Table 5: 250 t/y.  
 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 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. (Europe).

Metric 3:

Applicability

Medium

The release data are for an occupational scenario within the scope of the risk evaluation. Data relate to an area jointly covered by engineer, exposure and fate assessors. Not directly engineering but helpful.

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

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:** CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.  
**HERO ID:** 10442901  
**Conditions of Use:** Paint and Coatings

**EXTRACTION**

Parameter	Data
Description of release source:	Industrial application of coatings by spraying
Release or emission factors:	Release or emission factors
Release frequency:	225 days/year
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. The release data methodology is known for some estimates (from OECD ESD) while others had no OECD ESD- industry data, which were assumption.
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 is general and not chemical specific.
	Metric 4: Temporal Representativeness	High	Fact Sheet is from 2020.
	Metric 5: Sample Size	Low	Emission factors were not characterized by statistics; in certain cases a range was provided.
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	Variability is addressed by including emission factors for different processes, but uncertainty is not addressed.

**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:** Paint and coatings, Ink, toner, and colorant products

**EXTRACTION**

Parameter	Data
Description of release source:	Professional application of coatings and inks by spraying
Release or emission factors:	Release or emission factors
Release frequency:	Indoor: 365 days/yrOutdoor: 225 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	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site. The release data methodology is known for some estimates (from OECD ESD) while others had no OECD ESD- industry data, which were assumption.
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 is general and not specific to the chemical.
	Metric 4: Temporal Representativeness	High	Fact sheet is from 2020.
	Metric 5: Sample Size	Low	Emission factors were not characterized by statistics.
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	Variability is addressed by including emission factors for different processes, but uncertainty is not addressed.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	DOE,, WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.			
<b>HERO ID:</b>	10454465			
<b>Conditions of Use:</b>	Floor coverings			
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	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 release data are for an occupational scenario within the scope of the risk evaluation but the release data is for Washington state only. Also information extracted is not chemical-specific.	
	Metric 4: Temporal Representativeness	Medium	Information extracted is between 10 to 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		

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping 1,2-Benzenedicarboxylic acid, diisononyl ester; 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich (Diisononyl Phthalate; DINP). Chemical Abstracts Service Registry Numbers: 28553-12-0 and 68515-48-0.
<b>HERO ID:</b>	3688004
<b>Conditions of Use:</b>	Disposal

**EXTRACTION**

Parameter	Data
Description of release source:	Releases from processing include losses from the manufacture of DINP, the compounding of plasticizers and PVC resins to make flexible PVC, the fabrication of flexible PVC into products, and the production of construction materials, plastisols, coatings, and other products containing the PVC product. Losses could also occur during transportation activities, such as during the cleaning of holding containers and truck tanks. Releases of DINP from use and disposal activities include losses from products during service life, as well as during the final disposal of the products in landfills and by incineration. (pg. 19/150)
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	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 Canada, an OECD country.
	Metric 3: Applicability	High	Data are for various commercial uses, like plasticizers, automotive care products, adhesives and sealants, personal care products, electronic products, furniture and furnishings, and fabric, textile and leather products
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (emission factors, percentages, 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 by describing the estimates that went into each calculation in the report. Variability is addressed by comparing the results of other studies to one another.

**Overall Quality Determination****High**



**Study Citation:** ECC/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	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.
	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****Low**

<b>Study Citation:</b>	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.
<b>HERO ID:</b>	7349020
<b>Conditions of Use:</b>	Plastics 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. Emissions from plastic products manufacturing may be generally classified as follows: Volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions resulting from the volatilization of free monomer or solvent in the primary polymer blend during processing; & VOC and HAP emissions that result from secondary process materials, such as blowing agents, additives, and lubricants (mold release compounds); & VOC, HAP, and particulate matter (PM) emissions that result from byproducts formed by chemical reactions or formed during heating of resins; and & PM emissions generated during raw material handling and finishing operations. (Section 2.2). Additional description of specific pollutants (e.g., solvents, particulates) 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	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 within the scope of the risk evaluation; however, the data are general and not chemical specific.
	Metric 4: Temporal Representativeness	Low	The report is from 1998, which is more than 20 years old.
	Metric 5: Sample Size	Medium	The emission factor is provided as a single data point with unclear statistical representativeness.
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	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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<b>Study Citation:</b> ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
<b>HERO ID:</b> 7349020			
<b>Conditions of Use:</b> Plastics Product Manufacturing			
Domain	Metric	EVALUATION Rating	Comments
<b>Overall Quality Determination</b>		<b>Medium</b>	

**Study Citation:** ExxonMobil, (2022). EM BRCP DINP/DIDP facility – virtual tour (sanitized).  
**HERO ID:** 10633678  
**Conditions of Use:** Manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	Crude Filtration #1, Final Filtration #2, Cleaning of Delivery Vessels, Reactor Cleaning
Release quantity:	Crude Filtration #1: 397 kg/dayFiltration #2: 472 kg/dayCleaning Delivery Vessels: 35 kg/dayReactor Cleaning: 189 kg/reactor
Release or emission factors:	Release or emission factors
Release frequency:	Filtration cleaning ~ 90 days/yearCleaning Delivery Vessels ~ Once per weekReactor Cleaning ~ Once/year
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	High	Environmental release data less than 10 years old.
	Metric 5: Sample Size	N/A	Sample size is not applicable to environmental release estimates from manufacturing process.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata, but the technique used to estimate releases from each step is not clear.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.

**Overall Quality Determination****High**

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4168432			
<b>Conditions of Use:</b>	Disposal of plastics			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Migration from the plastics (plasticizers are not bound to the polymer) to air or contact material, disposal of waste plastics to landfill, energy recovery, incineration, or recycling. In general, VOCs could be emitted from polymers and additive pyrolysis at recycling operating temperatures, and the types and concentrations of VOCs emitted mainly depended on the plastic composition during the extrusion process [182].			
Release quantity:	Although the precise amount of plastics entering the marine environment is yet unknown, by linking worldwide data on solid waste, and using population density, a rough estimate within the range of 4.8–12.7 Mt per year on the mass of land-based plastic waste entering the ocean has been calculated [34,35].			
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	Low	Data are global values
	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 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	Low	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.
Overall Quality Determination		Medium		

**Study Citation:** HSDB, (2015). Diisononyl phthalate (CASRN: 28553-12-0).  
**HERO ID:** 2356022  
**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

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

Medium

The release data are for accidental releases which is similar to 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

N/A

This metric is not applicable to the data being extracted

Domain 3: Accessibility/ Clarity

Metric 6:

Metadata Completeness

Low

Release data includes suggested release media but not other metadata

Domain 4: Variability and Uncertainty

Metric 7:

Metadata Completeness

N/A

This metric is not applicable to the data being extracted

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.
<b>HERO ID:</b>	10293367
<b>Conditions of Use:</b>	Processing: Plasticizers

**EXTRACTION**

Parameter	Data
Description of release source:	Air emissions from high efficiency air filter (HEAF), air emissions from the regenerative thermal oxidizer (RTO), air emissions from the dust collectors serving the dry blend day silos exhaust outside the building, fugitive air emissions leave the building through rooftop exhaust fans, stormwater discharge, production scrap, plastisol production debris, waste oil, oily solids waste stream, granulator “fluff” fines consisting of scrim and felt containing residual PVC from the scrap regrinding operation, edge trim from “peel and stick” layer application on plastisol coated membrane, spent HEAF roll filters, spent Smog Hog filters, spent RTO thermal exchange media.
Release quantity:	The estimated amount of DINP that could potentially be released from the Facility per year is approximately 1,700 pounds per year of air releases, and approximately 26,000 pounds through off-site transfers for recycling or disposal.
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 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 an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	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	Uncertainty is addressed by discussing limitations. Variability is addressed by including different points of releases.

**Overall Quality Determination****High**

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7978640			
<b>Conditions of Use:</b>	Building/construction materials			
EXTRACTION				
<b>Parameter</b>		<b>Data</b>		
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	High	Data are for building and constructions materials, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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	



<b>Study Citation:</b>	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.
<b>HERO ID:</b>	6825427
<b>Conditions of Use:</b>	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)"
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
	Metric 3:	Applicability	High
	Metric 4:	Temporal Representativeness	High
	Metric 5:	Sample Size	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, but missing emission factors and release days.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium
			Variability is addressed by including factors that could cause increases of phthalate pollution and including world data. Uncertainty isn't addressed.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	6959335
<b>Conditions of Use:</b>	Disposal

**EXTRACTION**

Parameter	Data
Description of release source:	Sludge from wastewater treatment plants in Korea
Release quantity:	DINP sludge and effluent emissions: Domestic WWTPs: 805.3 kg/day/WWTP Mixed WWTPs: 369.2 kg/day/WWTP Industrial WWTPs: 362.8 kg/day/WWTP
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 Korea, an OECD country.
	Metric 3: Applicability	High	Data are for the disposal of phthalate-containing wastes, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (ranges, means, number of samples) 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 the sampling method and detection ranges. Variability is addressed by sampling at residential and industrial WWTPs.

**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:** Textile dyeing

**EXTRACTION****Parameter****Data**

Description of release source: Textile dyeing wastewater

Waste treatment methods and pollution control: Waste treatment methods and pollution control

Comments: Also contains distributions of phthalates in textile dyeing wastewater before, during, and after treatment (0.21 ug/L in TDP 4).

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

Domain 1: Reliability

Metric 1:

Methodology

Medium

The release data methodology is known or expected to be accurate but only covers wastewater releases.

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. Data are from China.

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 are generally no more than 10 years old (data are from 2017).

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, treatment methods but does not include release quantities or factors.

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**

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3072211			
<b>Conditions of Use:</b>	Use of Building/construction materials			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	High	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.
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	2346023			
<b>Conditions of Use:</b>	Use of PVC Flooring			
EXTRACTION				
Parameter	Data			
Description of release source:	Because phthalate additives are not chemically bound to the polymer matrix, slow emission from the products to air or other media usually occurs.			
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	High	The data are from the United States and are 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, 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	Low	Distribution of samples is qualitative or characterized by no statistics.
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			Medium	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3867109			
<b>Conditions of Use:</b>	emission			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Vehicles and traffic-related activities. DINP can be present in road-side dust particles, road runoff, sediment. DINP can come from tyre materials, integrated vehicle components, car care products, lubricants, bitumen/asphalt, and road paint. (Table 1, pg. 5)			
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 cover all release sources at site.
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 release data are for an 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	Low	Distribution of samples is 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		

<b>Study Citation:</b>	Mersiowsky, N. (2002). Long-term fate of PVC products and their additives in landfills. Progress in Polymer Science 27(10):2227-2277.
<b>HERO ID:</b>	6826007
<b>Conditions of Use:</b>	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.
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	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics, article provides general phthalate info only.
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 uncertainty in the release results.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7978775
<b>Conditions of Use:</b>	Plasticizers

**EXTRACTION**

Parameter	Data
Description of release source:	The primary source of phthalates to native soil is atmospheric deposition. Sources of phthalates to the aquatic environment include industrial and domestic wastewater effluents as well as non-point source inputs such as urban runoff and atmospheric deposition. (20/33)
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 is from the U.S. and multiple EU countries.
	Metric 3: Applicability	Medium	Data are for the use of plasticizers, an in-scope occupational scenario, but general and not specific to DINP.
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5: Sample Size	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and waste treatment provided but missing release quantities and emission factors.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability in waste treatment methods and release sources is described. Uncertainty is not addressed.

**Overall Quality Determination****Medium**



<b>Study Citation:</b>	Radian Corp, (1989). Environmental analysis for the Shell Martinez RM-17 incinerator, with cover letter dated 3/15/1991 (sanitized).				
<b>HERO ID:</b>	1335691				
<b>Conditions of Use:</b>	Waste treatment - Incineration				
EXTRACTION					
Parameter		Data			
Release quantity:		1.4E-4 g/sec for phthalates			
Comments:		Emission rates available for all phthalates and DEHP.			
EVALUATION					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	Low	The release data methodology is not specified. Source just says "Emission rate based on published research 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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Emission factors are given for phthalates but are not DINP specific
		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	

<b>Study Citation:</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.
<b>HERO ID:</b>	10472417
<b>Conditions of Use:</b>	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 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	Medium	The report is for an occupational scenario within the scope of the risk evaluation but information is not chemical specific.
	Metric 4: Temporal Representativeness	High	Report is from last 10 years.
	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	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**

<b>Study Citation:</b>	Stark, T. D., Choi, H., Diebel, P. W. (2005). Influence of plasticizer molecular weight on plasticizer retention in PVC geomembranes. Geosynthetics International 12(2):99-110.
<b>HERO ID:</b>	10218052
<b>Conditions of Use:</b>	Plasticizer

**EXTRACTION**

Parameter	Data
Description of release source:	Pg. 3/12 describes plasticizer migration to air and liquid
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. Release data is for a material.
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 not specific to chemical.
	Metric 4: Temporal Representativeness	Low	The report provides emission factors from "Stepek and Daooust 1983", which is over 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	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	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****Medium**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	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 emissions <sup>7</sup> 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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation although not DINP specific.
	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**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation although not DINP specific
	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**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation although not DINP specific
	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**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation although not DINP specific
	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**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation although not specific to DINP
	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**



<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	synthetic rubber manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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 butldiene 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			
<b>EVALUATION</b>				
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	Medium	The release data are for an occupational scenario within the scope of the risk evaluation although not specific to DINP.
	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.
<b>Overall Quality Determination</b>			<b>Low</b>	

<b>Study Citation:</b>	U.S. EPA, (1995). Chapter 6.4: Paint and varnish. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
<b>HERO ID:</b>	7315881
<b>Conditions of Use:</b>	Process regulators in paint and coating manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	"The primary factors affecting emissions from paint manufacture are care in handling dry pigments, types of solvents used, and mixing temperature. Varnish cooking emissions, 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 airpollution controls used.(1/2)"
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	Methodology is known (engineering site visits) and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for process regulators in paint and coating manufacturing, an in-scope occupational scenario; however data is general, not chemical specific
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (emission factors) 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	Limited discussion of variability, by range in emission rates, and uncertainty, by the emission rating.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.
<b>HERO ID:</b>	9102566
<b>Conditions of Use:</b>	Processing into a formulation, mixture, or reaction product- Not known or reasonably ascertainable (e.g., petroleum refineries)

**EXTRACTION**

Parameter	Data
Description of release source:	5.1 Petroleum Refineries The following process emission sources are discussed:1. Vacuum distillation; 2. Catalytic cracking; 3. Thermal cracking processes; 4. Utility boilers; 5. Catalytic reforming; 6. Hydrogen Production; 7. Sulfur recovery; 8. Blowdown systems; 9. Heaters10. Compressor engines; 11. Sweetening; 12. Asphalt Blowing5.3 Natural Gas Processing; The major emission sources in the natural gas processing industry are compressor engines, acid gas wastes, fugitive emissions from leaking process equipment and if present, glycol dehydrator vent streams. Compressor engine emissions are discussed in Section 3.3.2.5.2 Transportation And Marketing Of Petroleum LiquidsEvaporative emissions from the transportation and marketing of petroleum liquids may beconsidered, by storage equipment and mode of transportation used, in four categories:1. Rail tank cars, tank trucks, and marine vessels: loading, transit, and ballasting losses.2. Service stations: bulk fuel drop losses and underground tank breathing losses.3. Motor vehicle tanks: refueling losses.4. Large storage tanks: breathing, working, and standing storage losses. (See Chapter 7, "LiquidStorage Tanks".)
Release or emission factors:	nan
Comments:	Not specific to DINP.

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is expected to be accurate but may not cover all release sources at the site(only covers air releases).
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 information is not specific to the chemical.
	Metric 4: Temporal Representativeness	Medium	More than 10 years but less than 20 years old.
	Metric 5: Sample Size	Medium	Characterized by uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, oractivity 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****Medium**

<b>Study Citation:</b>	Björklund, K. (2010). Substance flow analyses of phthalates and nonylphenols in stormwater. Water Science and Technology 62(5):1154-1160.		
<b>HERO ID:</b>	6813724		
<b>Conditions of Use:</b>	Articles (Service life releases)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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		
<b>EVALUATION</b>			
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:	Articles (Service life releases)		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

**Study Citation:** CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).  
**HERO ID:** 1987625  
**Conditions of Use:** Disposal - Hazardous waste incineration

**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 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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Unclear at this time how the data will be applied to the engineering assessment
	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**

<b>Study Citation:</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
<b>HERO ID:</b>	5353181			
<b>Conditions of Use:</b>	Waste handling, treatment and disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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)			
<b>EVALUATION</b>				
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 waste handling, treatment, and disposal, 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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Distribution		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	Almost all DINP consumed in the EU is distributed via road tankers or by ship (Cadogan et al., 1994). In the estimate it was considered that 15% of the consumed phthalates are transported by ship and 85% by tank movement, the majority of which are supplied with sophisticated tank cleaning facilities		
Release or emission factors:	nan		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Use of rubbers (leaching release)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	nan			
<b>EVALUATION</b>				
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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Use of applied sealings (leaching release)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	nan			
<b>EVALUATION</b>				
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	Uninformative	The assessment 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	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.	
<b>Overall Quality Determination</b>		<b>Uninformative</b>		

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Disposal: Recycling of paper containing inks with DINP		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	nan		
Release frequency:	250 d/y		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Use of applied paints (leaching release)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	nan			
<b>EVALUATION</b>				
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	Uninformative	The assessment 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	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.	
<b>Overall Quality Determination</b>		<b>Uninformative</b>		

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Disposal of end products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Release quantity:	1.5 t/a released to wastewater from disposal in landfills // 5.7 t/a to air from incineration of waste		
Release or emission factors:	nan		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.
<b>HERO ID:</b>	3687865
<b>Conditions of Use:</b>	Wastewater treatment (POTWs)

**EXTRACTION**

Parameter	Data
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Waste treatment methods and pollution control:	nan
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**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	Medium	The assessment 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	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**

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Use of outdoor PVC applications (roofing, wire and cable, coated fabric, hoses and profiles, car under coating, shoe soles, sealings, paints and laquers)		
EXTRACTION			
Parameter	Data		
Release quantity:	See Table 3.13 (release to surface water: 109 t/a from car undercoating, 1.3 t/a from roofing material, 32.1 t/a from coil coating, 27.1 t/a from fabric coating, 24.3 t/a from wires and cables, 1.9 t/a from hoses and profiles, 3.8 t/a from shoe soles // See Table 3.20 (emission to air): 0.54 t/a from car undercoating, 0.02 t/a from roofing material, 0.58 t/a from coil coating, 0.49 t/a from fabric coating, 0.44 t/a from wires and cables, 0.03 t/a from hoses and profiles, 0.03 t/a from shoe soles		
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	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		Medium	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Use of indoor PVC applications (coated products, film and sheet, wires and cables, hoses and profiles, floor)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release quantity:	To cover both leaching and abrasion the result from Method 2 (14.36 t/a) is added to the amount released by abrasion: 14.3 + 222=236.3 t/a. Release is to wastewater. // Assuming that hose and profile (DINP consumption 5,379 t/a, technical lifetime 10 years) has a similar surface to volume ratio and conditions of use to flooring (DINP consumption 14,201 t/a), the DINP emissions from these products are estimated to be 1 t/a.			
<b>EVALUATION</b>				
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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Formulation and application of paints			
EXTRACTION				
Parameter		Data		
Release or emission factors:		nan		
Release frequency:		300 d/y for formulation, 92 d/y for application		
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	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Formulation and use of inks		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	nan		
Release frequency:	300 d/y formulation; 64 d/y for application		
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	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Formulation and application of adhesives, glues, and sealants		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	nan		
Release frequency:	300 d/y (formulation), 29 d/y (application)		
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	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Processing into rubber		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	nan		
Release frequency:	300 d/y		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	PVC production		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	nan		
Release frequency:	300 d/y		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release quantity:	See page 52: Producers report releases of 0.3 t/a and 0.06 t/a to surface water			
Release or emission factors:	nan			
Release frequency:	300 d/y			
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		

<b>Study Citation:</b>		ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.		
<b>HERO ID:</b>		679967		
<b>Conditions of Use:</b>		Manufacturing		
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Release or emission factors:		Release or emission factors		
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation The emission factor is attributed to phthalates and is not DINP specific
	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.		
<b>HERO ID:</b>	679967		
<b>Conditions of Use:</b>	Distribution		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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		
<b>EVALUATION</b>			
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Factors are for phthalates and are not DINP specific
	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>Medium</b>	



<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
<b>HERO ID:</b>	679967			
<b>Conditions of Use:</b>	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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Factors are for phthalates and are not DINP specific
	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
<b>HERO ID:</b>	679967			
<b>Conditions of Use:</b>	Use of plasticized products			
		<b>EXTRACTION</b>		
<b>Parameter</b>		<b>Data</b>		
Release or emission factors:		Release or emission factors		
		<b>EVALUATION</b>		
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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.		
<b>HERO ID:</b>	679967		
<b>Conditions of Use:</b>	Disposal of plasticized products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	Release or emission factors		
<b>EVALUATION</b>			
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Factors are generic phthalate factors and are not specific to DINP
	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Transportation			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation, although information is not specific to DINP.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Waste treatment methods and pollution control:	nan			
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation although not specific to DINP
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	FOrmulation			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation although not specific to DINP
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Processing into plastics, application of paints/adhesives/etc. to produce articles			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation although not specific to DINP.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	End-product uses (of articles such as plastics, flooring, coated materials)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	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).
<b>HERO ID:</b>	1588746
<b>Conditions of Use:</b>	Automotive care products (Releases during car washing)

EXTRACTION	
Parameter	Data
Release quantity:	Vikelsøe et al. (1998) measured the releases of DINP from cars to washwater in car wash centres. Phthalate concentrations were determined in wash water from two car wash stations in Denmark in 1996 and 1997. The samples were taken at the car wash station in the well collecting the washing water in the washing room. 26 Samples were taken, each from the wash water of a different car. Di-n-nonyl phthalate (DnNP) as well as DINP were determined. DnNP was analysed in all 25 samples. The concentrations varied from <1 to 55 µg/l (mean: 11.1 µg/l). The corresponding emissions per single wash varied from <0.1 to 8 mg/wash (mean 1.5 mg/wash). DINP was analysed in 13 samples. The concentrations varied from <50 to 510 µg/l (mean: 284 µg/l). The corresponding emissions per single wash varied from <7 to 71 mg/wash (mean: 38 mg/wash). (Pg. 57/234)

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 automotive care products, an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The cited data is over 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.

<b>Overall Quality Determination</b>	<b>High</b>
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<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).
<b>HERO ID:</b>	679933
<b>Conditions of Use:</b>	Car washing

EXTRACTION	
Parameter	Data
Release quantity:	Phthalate concentrations were determined in wash water from two car wash stations in Denmark in 1996 and 1997 (Vikelsøe et al., 1998). The samples were taken at the car wash station in the well collecting the washing water in the washing room. 26 Samples were taken, each from the wash water of a different car. DINP was analysed in 13 samples. The concentrations varied from <50 to 510 µg/l (mean: 284 µg/l). The corresponding emissions per single wash varied from <7 to 71 mg/wash (mean: 40 mg/wash).

		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	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

**Medium**

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Disposal of end products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	Four emission sources are identified for the disposal life cycle step: car shredding sites, municipal incineration stations, municipal landfills, waste remaining in the environment. // Car shredding: Release to water is not expected from the dry processing. However, some processing sites separate metals by water flotation. The frequency is however, assumed to be low. Uncontrolled releases of particles is also expected to occur to the surroundings, however, this will be included under “waste remaining in the environment” (see Section below). // Landfill: Landfills are identified to emit phthalates mainly through the leakage water (ECPI, 1996). // Waste remaining in the environment: As well as volatilisation and leaching losses of DINP from products/articles, DINP may also enter into the environment as a result of “waste” from the products themselves during their useful lifetime and disposal. Such waste could include erosion/particulate losses of polymeric products, paints and sealants as a result of exposure to wind and rain or may occur as a result of their mode of use (e.g. wear on conveyor belts, flooring etc.). Similarly, when products/articles are dismantled or disposed of at the end of their useful life there is again a potential for this type of particulate release. In either case the end result is that polymeric particles containing DINP could enter into the environment. As these releases of DINP are essentially bound within a polymer matrix, the actual bioavailability and environmental behaviour of DINP is unknown.		
Release or emission factors:	Release or emission factors		
Release frequency:	250 days/yr assumed		
<b>EVALUATION</b>			
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.
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<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Disposal of end products		
Domain	Metric	EVALUATION Rating	Comments
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Use of products with sealants, inks, paints			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Release or emission factors:		Release or emission factors		
Release frequency:		250 days/yr assumed		
<b>EVALUATION</b>				
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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Use of outdoor PVC products (car undercoating, roofing, coil coating, fabric coating, cables and wires, hoses and profiles, and shoe soles)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	Emissions can be divided into two periods. Firstly during the technical lifetime of the product and secondly during the waste lifetime period.		
Release or emission factors:	Release or emission factors		
Release frequency:	250 days/yr assumed		
<b>EVALUATION</b>			
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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Use of PVC Flooring		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	DINP may be lost through extraction by soapy water during cleaning of flooring, evaporation, and abrasion.		
Release or emission factors:	Release or emission factors		
Release frequency:	250 days/yr assumed		
<b>EVALUATION</b>			
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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Use as additive in paints		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	Release or emission factors		
Release frequency:	300 days/yr assumed for formulation and 92 days/yr assumed for application		
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	



<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Use as additive in inks for paper			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
Release frequency:	300 days/yr assumed for formulation and 64 days/yr assumed for application			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Use as additive in adhesives, glue, and sealing compounds			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
Release frequency:	300 days/yr assumed			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Formulation of polymer additives for non-plastics (adhesives, inks, etc.)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
Release frequency:	300 days/yr assumed			
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		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Production of PVC compounds		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	The initial losses will be to air inside the processing facilities; however subsequent condensation will result in losses to liquid waste. // Raw material handling - Minimal loss can therefore be assumed, this being most likely during transfer (e.g. splashing or accidental spillage). //		
Release or emission factors:	Release or emission factors		
Release frequency:	300 days/yr assumed		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>		ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).		
<b>HERO ID:</b>		679933		
<b>Conditions of Use:</b>		Distribution		
Parameter		EXTRACTION		
Release or emission factors:		Release or emission factors		
Release frequency:		250 days/yr assumed		
Domain		EVALUATION		
		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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release quantity:	Data from two companies on page 52 = 0.3 and 0.06 t/a to surface water;			
Release or emission factors:	Release or emission factors			
Release frequency:	300 days/yr assumed			
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:** ESIG, (2020). SPERC Factsheet – Use in rubber production and processing.  
**HERO ID:** 11360390  
**Conditions of Use:** Non-PVC Plastics Compounding

**EXTRACTION**

Parameter	Data
Description of release source:	Manufacture of tires and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanising, cooling and finishing.
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	Medium	Data is from the European Solvents Industry Group, which is made up of OECD countries.
	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	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 is addressed by provided emission factors for different levels of water solubility. Uncertainty isn't addressed.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	Marx, J. L. (1972). Phthalic acid esters: Biological impact uncertain. Science 46(4056):46-47.
<b>HERO ID:</b>	1335811
<b>Conditions of Use:</b>	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	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Low	Data are for the disposal of phthalates, an in-scope occupational scenario. Environmental concentration data will be most applicable to assessment of environmental exposures not for the assessment of OES
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by discussing differences between studies. Variability isn't addressed.

**Overall Quality Determination****Medium**



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

**EXTRACTION**

Parameter	Data
Description of release source:	Container cleaning, equipment cleaning, coating application (overspray). Releases to air, 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	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 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 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, 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**

<b>Study Citation:</b>	OECD, (2004). Emission scenario document on lubricants and lubricant additives.			
<b>HERO ID:</b>	3827416			
<b>Conditions of Use:</b>	Lubricants and Lubricant Additives			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	provides general explanations of expected release sources for each lifecycle stage.			
Release or emission factors:	Release or emission factors			
Release frequency:	provides some release frequencies based on expected changeouts, etc.			
<b>EVALUATION</b>				
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 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 and different lubricant types.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.
<b>HERO ID:</b>	3840003
<b>Conditions of Use:</b>	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**

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on plastic additives.			
<b>HERO ID:</b>	5079084			
<b>Conditions of Use:</b>	Processing - Plastics Compounding and Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Raw material handling, compounding, converting, service life, disposal. Release to air, water.			
Release or emission factors:	nan			
<b>EVALUATION</b>				
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/addtive types but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2019). Complementing document to the emission scenario document on plastic additives: Plastic additives during the use of end products.			
<b>HERO ID:</b>	6306751			
<b>Conditions of Use:</b>	Use of plastic products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Release during product use. Releases to air.			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	High	Data is for an in-scope occupational scenario and contain chemical-specific emission factors	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Variability addressed by presenting emission factors for multiple additive types. Uncertainty is addressed in methodology for measuring emissions.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on the chemical industry.			
<b>HERO ID:</b>	6306753			
<b>Conditions of Use:</b>	Manufacture, Formulation of processing aids, processing as a reactant, use of processing aids			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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, water.			
Release or emission factors:	nan			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2020). Emission scenario document on chemical additives used in automotive lubricants.
<b>HERO ID:</b>	6385735
<b>Conditions of Use:</b>	Functional Fluids

**EXTRACTION**

Parameter	Data
Description of release source:	PROC: unloading, container cleaning, blending, sampling, equipment cleaning, loadingUSE: unloading, container cleaning, disposal of spent lube oil
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	nan
Release frequency:	Processing: 203-360Use: 253
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 multiple in-scope occupational scenarios; 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 multiple additive types.

**Overall Quality Determination****High**



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

**EXTRACTION**

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

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data 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**

<b>Study Citation:</b>	OECD, (2011). Resource compendium of PRTR release estimation techniques, part 4: Summary of techniques for releases from products, version 1.0.			
<b>HERO ID:</b>	7348917			
<b>Conditions of Use:</b>	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	Medium	Data are for various consumer and commercial uses which are in scope of the risk evaluation, but DINP is not mentioned specifically.	
	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		Low		

**Study Citation:** Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.  
**HERO ID:** 6311222  
**Conditions of Use:** Automotive Coating Application

**EXTRACTION**

Parameter	Data
Description of release source:	Auto OEM: blowdown, sludge processing, generated sludge, stack air releases. Autorefinish: 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/yr. Autorefinish: 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**

<b>Study Citation:</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
<b>HERO ID:</b>	10480466			
<b>Conditions of Use:</b>	Use - Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Container unloading, container cleaning, labware equipment cleaning, during laboratory analyses, waste disposal; Release media: Air, water, landfill			
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			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>High</b>		

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

<b>Study Citation:</b>	U.S. EPA, (2020). Generic model to estimate dust releases from transfer/unloading/loading operations of solid powders.
<b>HERO ID:</b>	11373483
<b>Conditions of Use:</b>	All COUs

**EXTRACTION**

Parameter	Data
Description of release source:	Transferring of solid powders.
Release quantity:	Provides equations to calculate quantity of solid released.
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 information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Release estimation is based on US 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	High	Discrete data is provided, and statistical distribution is 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	Variability is addressed by providing different methods of dust control and capture. Uncertainty and limitations are described in detail in a paragraph in the methodology.

**Overall Quality Determination****High**

<b>Study Citation:</b>	U.S. EPA, (2023). Methodology for estimating environmental releases from sampling waste (revised draft).			
<b>HERO ID:</b>	11373484			
<b>Conditions of Use:</b>	All COUs			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Sampling of products or raw materials.			
Release or emission factors:	Release or emission factors			
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	The methodology 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	High	Discrete data is provided and statistical distribution is 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	Variability is addressed by breaking down emissions by facility throughput. Uncertainty is addressed via media of release being unknown in various situations and via flowcharts on when to use which assessment method.	
Overall Quality Determination		High		

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

**Overall Quality Determination****High**



<b>Study Citation:</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.
<b>HERO ID:</b>	3827195
<b>Conditions of Use:</b>	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 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**

<b>Study Citation:</b>	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.			
<b>HERO ID:</b>	6304171			
<b>Conditions of Use:</b>	Flexible and Rigid Polyurethane Foam Manufacture			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Container residues, equipment residues, release of auxiliary blowing agents (ABAs), scrap or off-spec product disposal			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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 foam types.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.
<b>HERO ID:</b>	6311218
<b>Conditions of Use:</b>	Incorporating into formulation, mixture or reaction product as a plasticizer; Incorporating into articles as a plasticizer in plastics product manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	Container residue from additive transport container released to water, incineration, or landfill; Dust generation from transferring/compounding released to water or landfill; Fugitive air emissions from compounding/shaping released to water or air; Equipment cleaning and cooling water from compounding released to water (page 10 of 18)
Release quantity:	Provides models for estimating releases for each of the four release types listed in "description of release source" (page 12-14 of 18)
Release or emission factors:	Release or emission factors
Release frequency:	250 days/yr (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 are for multiple in-scope occupational scenarios; 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**

<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	6311221			
<b>Conditions of Use:</b>	Formulation of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Packaging disposal, material transfer, ink processing, equipment cleaning (page 33 of 54)			
Release quantity:	PROC: estimated release equations to water, air, incineration, and land on pages 33-36 of 54			
Release or emission factors:	Release or emission factors			
Release frequency:	250 days/yr (page 31 of 54)			
<b>EVALUATION</b>				
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	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	6311221			
<b>Conditions of Use:</b>	Use of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	disposal/cleaning of ink container, cleaning printing equipment, ink drying (page 40 of 54)			
Release quantity:	estimated release equations for water, air, incineration, and land on pages 40- 44 of 54			
Release or emission factors:	Release or emission factors			
Release frequency:	250 days/yr (page 38 of 54)			
<b>EVALUATION</b>				
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
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).
<b>HERO ID:</b>	6385708
<b>Conditions of Use:</b>	Manufacturing; import; Processing as a reactant; processing – incorporating into formulation, mixture, or reaction product; processing – incorporation into articles; repackaging; distribution in commerce;

**EXTRACTION**

Parameter	Data
Description of release source:	Any water soluble heels that are compatible with the facility's treatment system and the conditions of the facility's wastewater discharge permit are usually combined with other wastewaters for treatment and discharge at the facility. Incompatible heels are segregated into drums or tanks for disposal by alternative means, which may include sale to a reclamation facility, landfill, or incineration. The TEC facility may reuse heels comprised of soaps, detergents, solvents, acids, or alkalis as tank cleaning solutions, as neutralizers for future heels, and for wastewater treatment.
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	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 multiple in-scope occupational scenarios; 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	Medium	Sample distributions characterized by ranges/estimations with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple container types and cleaning methods.

**Overall Quality Determination****Medium**

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

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

**EXTRACTION**

Parameter	Data
Description of release source:	Releases from solid particulate during unloading; Fugitive air releases from volatile liquids during unloading; Container Residue; Fugitive air releases from dispersion tank; Fugitive air releases from milling; Equipment cleaning residue; Fugitive air releases from volatile components during loading of ink (page 9 of 23)
Release quantity:	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.
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**



<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.
<b>HERO ID:</b>	6385710
<b>Conditions of Use:</b>	Use of Printing Inks

**EXTRACTION**

Parameter	Data
Description of release source:	Container residue; Fugitive air releases during unloading from volatile components; Fugitive air releases from volatile components in ink reservoir; Fugitive air releases from ink mist generated by printing press; Equipment cleaning residuals; Fugitive air releases of volatile components during drying (page 15 of 23)
Release quantity:	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**

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

**EXTRACTION**

Parameter	Data
Description of release source:	Container residue cleaning/disposal losses to landfill or incineration; Spillage from compounded resin handling to water, landfill, or incineration; Dust emissions from container transfers to air, water, landfill or incineration; Dust emissions from forming and molding processes to air, water, or landfill; Fugitive air emissions from forming and molding processes to air or water; Equipment cleaning and direct contact cooling water from forming/molding processes to water, landfill, or incineration; Solid waste from trimming operations to landfill or incineration (page 25 of 96) Page 25-27 contains a narrative of the process where possible releases are explained in context.
Release quantity:	Provides models for estimating each release listed above (page 44-51 of 96)
Release or emission factors:	Release or emission factors
Release frequency:	137-254 days/yr (page 30 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**

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

<b>Study Citation:</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385741			
<b>Conditions of Use:</b>	Incorporation into articles for textiles, apparel, and leather manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	dumping finishing bath, drum residues			
Release quantity:	Provides method for estimating release to water based on bath size, and on-weight-bath percentage			
<b>EVALUATION</b>				
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 finishing agent types	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.
<b>HERO ID:</b>	6385748
<b>Conditions of Use:</b>	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 air, water, 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**

<b>Study Citation:</b>	Canada,, G.o. (2020). Phthalate substance grouping – Information sheet.			
<b>HERO ID:</b>	7349060			
<b>Conditions of Use:</b>	All			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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	Medium	The data sources, used in the assessment or report are not specified but presumed to be listed in the screening assessment. Report is the summary of findings from the screening assessment.
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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Canada,, G.o. (2019). Page 5 - Fifth report on human biomonitoring of environmental chemicals in Canada.			
<b>HERO ID:</b>	9641570			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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).”			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
<b>HERO ID:</b>	664488			
<b>Conditions of Use:</b>	Use of plastic articles			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Because they are not chemically bound to the plastics to which they are added, phthalates can be released into the environment during use or disposal of the 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 (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 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	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	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 report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	



<b>Study Citation:</b>	ESIG, (2012). SPERC fact sheet – Manufacture of substance – Industrial (Solvent-borne).			
<b>HERO ID:</b>	11373487			
<b>Conditions of Use:</b>	Domestic Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The ESIG fact sheet uses high quality data and/or techniques or sound methods that are from frequently used sources (European Solvents Industry Group) 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 a European industry group. Most of the members are OECD countries.	
	Metric 3: Applicability	High	Fact sheet is applicable to domestic manufacturing, an in scope scenario.	
	Metric 4: Temporal Representativeness	Medium	Source is from 2012, 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	Medium	Source provides citation for the emission factors, but doesn’t elaborate on how they were obtained	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by providing a range of potential emission factors for differing vapor pressures. Uncertainty not addressed.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	8338316			
<b>Conditions of Use:</b>	Multiple			
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	Most of the writers are from Italy - an OECD country.
		Metric 3: Applicability	High	The information is for occupational scenarios within the scope of the risk evaluation.
		Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
		Metric 5: Sample Size	N/A	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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7978491			
<b>Conditions of Use:</b>	Recycling			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
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 DINP, 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 using different solvents and ball sizes for separation. Uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3015875			
<b>Conditions of Use:</b>	Vinyl flooring			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4728432			
<b>Conditions of Use:</b>	Use of plastic products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Being not covalently bound with polyvinyl chloride, phthalates can leach, migrate, and volatilize over time into environmental media such as indoor air, atmosphere, and foodstuff (Ait Bamai et al. 2014).			
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, 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 (China), 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	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	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	N/A	N/A
Overall Quality Determination			Medium	

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:	Disposal: E-waste sites			
EXTRACTION				
Parameter	Data			
Description of release source:	The concentration range of total phthalates in the ambient environment of e-waste dismantling areas were 0.31–2.39 mg/kg in soil and 1.81–5.77 mg/kg in plants (dry weight/DW) (Ma et al. 2013). Other data from soils at three e-waste sites, Fengjiang, Nanshan, and Meishu in Taizhou city in China, showed that total phthalate concentrations ranged from 12.57 to 46.67 mg/kg (Liu et al. 2009). Environmental pollutants from informal e-waste recycling area present a high exposure risk to local populations via direct and indirect contact (Awasthi et al. 2016).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data and/or techniques or sound methods that are from frequently used sources, 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 (China), 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	Low	The report is for an non-occupational data (soil samples) but is related to environmental releases of e-waste which is occupational data.
	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	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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	6966484			
<b>Conditions of Use:</b>	Stormwater runoff from consumer use of articles (tires, building materials, etc.)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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).			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Uninformative</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	11360398			
<b>Conditions of Use:</b>	Plastics Compounding and Converting			
EXTRACTION				
Parameter	Data			
Description of release source:	Plastic waste from bottles, containers, carpet, bags, toys, pipes, siding, shoes, tile, wrap, film, coatings, food packaging, diapers, CDs, etc.			
Release quantity:	Table 2 presents the total plastic waste by plastic type, and by waste treatment method.			
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 from primary sources (peer reviewed articles) and there are no quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	The report is for recycling (of plastics), an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Report is from 2022, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Samples are characterized by uncertain statistics, such as percentages and totals.
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	Medium	Variability is addressed by comparing releases of various plastic types and disposal methods. Uncertainty isn't addressed.
Overall Quality Determination			High	



<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.			
<b>HERO ID:</b>	4565597			
<b>Conditions of Use:</b>	General industrial manufacturing, processing, or use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.				
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
<b>HERO ID:</b>	5547263			
<b>Conditions of Use:</b>	Use in commercial products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	In most commercial products, DEHP, DiNP, and BzBP are used as additives, and they easily migrate from those products into the environment through evaporation, leaching, and abrasion [9].			
Comments:	The "use in commercial products" for the COU was how it was described in the article, it is not clear exactly what products/categories they are referring.			
<b>EVALUATION</b>				
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 appears to be sourced from European article	
	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	Medium	Source of data is over 10 years old (2005)	
	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.	
<b>Overall Quality Determination</b>		<b>Low</b>		

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	680214
<b>Conditions of Use:</b>	Consumer use

EXTRACTION	
Parameter	Data
Production, import, or use volume:	DINP and DIDP made up more than 75% of the total European phthalate consumption of more than 1 million tons in 2003. // 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: 417,850 mg/kg in gloves; 3,000 mg/kg (mean) in paints; 39,200 mg/kg (mean) in adhesives; 0 mg/kg (mean) in deodorant; 0 mg/kg (mean) in perfumes; 0 mg/kg (mean) in aftershaves; 0 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	Low	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are more appropriate for consumer or general population exposure.
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

**Medium**

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	675060			
<b>Conditions of Use:</b>	Use (general use, not differentiated)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Swedish use volume was ~12,000 tonnes in 2005			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).
<b>HERO ID:</b>	1987625
<b>Conditions of Use:</b>	Use of household PVC products

EXTRACTION	
Parameter	Data
Chemical concentration:	Section 108 of the CPSIA permanently prohibits the sale of any “children’s toy or child care article” containing concentrations of more than 0.1 percent of DEHP, DBP, or BBP (Table 1-1). // Table 10-5 includes DINP concentrations in household products: 80% in bath mat, 27% in carpet tile backing, 22% in food jar gasket, 58.5% in lightweight glove, 27.7% in pet toys, 11% in shoulder bag, 8.6% in shower curtain, 0.55% in soft vinyl vibrator, 12% in vinyl floor, 24.5% vinyl wallpaper // Table 10-6 contains DINP concentrations in children’s pacifiers, teething, and toys: 3.9-58.3% in pacifiers, 0.05-0.16% in pacifier shields, 19.3-54.4% in teething, 0.00051-58.3% in toys // Table 10-6 contains DINP concentrations in other children’s products: 80% in bath mat, 1-31% in body wash/bubble bath bottle, 32-70% in eraser, 7.8-8.6% in mitten label/reflector, 0.38-22% in nursing pillow, 9.8% in polymer clay

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	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.

<b>Overall Quality Determination</b>	<b>Medium</b>
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<b>Study Citation:</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).
<b>HERO ID:</b>	1987625
<b>Conditions of Use:</b>	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	See Table 2-1: DINP-1 (CAS 68515-48-0) production is >10,000 lbs/yr, DINP-2 (CAS 28553-12-0) production is >10,000 lbs/yr, DINP-A (CAS 71549-78-5) is not commercially produced, a final form of DINP (CAS 14103-61-8) is produced at <10,000 lbs/yr.
Process description:	DINP (68515-48-0; 28553-12-0) is a mixture of C9-rich, di-C8 to C10, branched chain dialkyl esters of ortho-phthalic acid (Hellwig et al. 1997; NLM 2009; ECB 2003). Different processes are used to produce the isononyl alcohols used as feedstock in manufacturing DINP. This results in DINP's with different isomeric compositions and multiple CAS numbers. Two commercial processes are currently in use. DINP-1 (68515-48-0) contains alcohol groups made from octane, by the "polygas" process (ECB 2003). At least 95 percent of these alcohol groups comprise roughly equal amounts of 3,4-, 3,5-, 3,6-, 4,5-, 4,6-, and 5,6-dimethyl heptan-1-ol (Hellwig et al. 1997) (Table 2-1). DINP-1 is also known by the tradename Jayflex®. DINP-2 (28553-12-0) contains alcohol groups made from nbutene, which results mainly in methyl octanols and dimethyl heptanols. DINP-2 is also known by the tradenames Palatinol N® and Palatinol DN® (NLM 2009a). DINP-3 (also 28553-12-0) contains alcohol groups made from n-butene and i-butene, resulting in 60 percent methylethyl hexanols. DINP's generally contain 70% or more nonyl alcohol moieties, with the remainder being octyl or decyl (Madison et al. 2000). According to the American Chemistry Council, the composition of each type of DINP is stable (CERHR 2003). However, data on the composition of DINP-1 and DINP-2 suggest that there may be some variability (Table 2-2.). Although their isomeric composition differs, the different types of DINP are considered commercially interchangeable. DINP-3 is no longer produced. Some manufacturers add small amounts of diisodecyl phthalate (DIDP) to their DINP. Manufacturers also add small amounts of bisphenol A as a stabilizer at the request of the customer.
Number of sites:	DINP-1 is manufactured in the U.S. by four companies: ExxonMobil Company, Baton Rouge, LA; Ferro Corporation, Bridgeport, NJ; Sunoco, Inc., Pittsburgh, PA; and Teknor Apex, Brownsville, TN (EPA 2006). Sunoco also reports manufacturing DINP-2 at the Pittsburgh site.
Chemical concentration:	>/= 95%

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	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			

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<b>Study Citation:</b>		CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).		
<b>HERO ID:</b>		1987625		
<b>Conditions of Use:</b>		Manufacturing		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	CPSC, (2010). Toxicity review of Diisononyl Phthalate (DINP).		
<b>HERO ID:</b>	1987625		
<b>Conditions of Use:</b>	Domestic uses - lifecycle and demand		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Domestic consumption of DINP was estimated to be 178,000 metric tons (392 million pounds) in 1998.		
Life cycle description:	Over 90% of DINP is used as a plasticizer for PVC. DINP is used as a plasticizer in a variety of products manufactured from PVC, including vinyl flooring, wire and cable insulation, stationery, coated fabrics, gloves, toys, tubing, garden hoses, artificial leather, footwear, automobile undercoating, and roofing (CERHR 2003; ECB 2003; ExxonMobil 2009). The use of DINP in toys represents less than 1% of total DINP consumption. Most of the DINP in toys imported into the U.S. is manufactured by Asian companies (ExxonMobil 2009). DINP has limited use in food packaging in the U.S. and is not used in medical devices (CERHR 2003). Non-PVC uses of DINP account for less than 10% of DINP production (ECB 2003; ExxonMobil 2009). Non-PVC uses include rubbers, inks, paints, lacquers, adhesives, and sealants (ECB 2003).		
<b>EVALUATION</b>			
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	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.
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.
<b>HERO ID:</b>	5155508
<b>Conditions of Use:</b>	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	U.S. production of DINP has been estimated at 356,000,000 pounds (178,000 tons) per year (CPSC, 2010). National production volume from CDAT was reported at 100,000,000–250,000,000 lb/yr with at least six companies listed as using or producing DINP (U.S. EPA, 2015). (pg 88/180)
Life cycle description:	DINP has a wide range of applications as a plasticizer in PVC products, including: toys, construction, and additional consumer products. (pg. 89/180)
Process description:	DINP is made through esterification of phthalic anhydride and alcohol (either an octene- or n-butene-based alcohol) in a closed system. The reaction is catalyzed with the presence of an acid or through high temperature (specific catalyst or temperature not specified). (pg. 84/180)
Number of sites:	DINP is manufactured by two companies in Germany, and one each in The Netherlands, France, and Italy (Danish EPA, 2011). A Chem Sources Online search identified at least 12 U.S. manufacturers and one each in China, Germany, Hong Kong, Mexico, and Switzerland (Chem Sources Online, 2015). HSDB (2015) lists two U.S. manufacturers. (pg. 88/180)

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	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 (source is dated 2015).
	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	The assessment provides only limited discussion of the variability and uncertainty in the results.

## Overall Quality Determination

**High**

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<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.		
<b>HERO ID:</b>	5155508		
<b>Conditions of Use:</b>	Manufacturing		
		EVALUATION	
Domain	Metric	Rating	Comments

<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.		
<b>HERO ID:</b>	5155508		
<b>Conditions of Use:</b>	Incorporation into articles (plastic products)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	Average DINP in toys measures in the range of 20–40% (range <0.1 - 73%); up to 22% in PVC flooring; up to 21% in food packaging; 18-77% in sex toysTable 6-3 (pg 91-100/180) contains concentrations in childrens toysTable 6-4 has other consumer products (Pgs. 101-102/180)		
<b>EVALUATION</b>			
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	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 (source is dated 2015).
	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	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.			
<b>HERO ID:</b>	5155508			
<b>Conditions of Use:</b>	Incorporation in formulation, mixture, or reaction product (Paints)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	4-5.5% in consumer paints			
<b>EVALUATION</b>				
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	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 (source is dated 2015).	
	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 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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.			
<b>HERO ID:</b>	5155508			
<b>Conditions of Use:</b>	Incorporation in formulation, mixture, or reaction product (Adhesives)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	5.46% in consumer adhesives (Table 6-4)			
<b>EVALUATION</b>				
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	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 (source is dated 2015).	
	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	The assessment provides only limited discussion of the variability and uncertainty in the results.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Potential for the presence of phthalates in selected plastics.		
<b>HERO ID:</b>	5155510		
<b>Conditions of Use:</b>	Incorporation in formulation, mixture, or reaction product (Plastics)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Process description:	DINP was not found in most polypropylene, polyethylene, HIPS, or ABS. Polymer manufacturing consists of polymerization, after treatment (to remove catalyst and solvent residue), and granulation (which involves melting and kneading additives and fillers, followed by pelletizing). Additives may be blended into the polymer during manufacturing and/or during processing into finished parts. The investigated plastics (polypropylene, polyethylene, high impact polystyrene, and acrylonitrile butadiene styrene) are processed mostly through melt processing (compression molding, injection molding, blow molding, or extrusion molding).		
Chemical concentration:	0.2% in polypropylene food packaging (pg. 27/104)		
<b>EVALUATION</b>			
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	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 (source is dated 2015).
	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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).			
<b>HERO ID:</b>	679920			
<b>Conditions of Use:</b>	Production of plastic products, including consumer products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	DINP accounts for ~10-15% of total DAP production. // Table IV-1 has volume of DINP by end use: 13,000 mton for film and sheet; 48 mton for flooring; 3 mton for artificial leather; 21 mton for coated fabrics; 30 mton for dip coating/slush molded; 7 mton for tubings and profiles; 32 mton for wires and cables; 9 mton for shoes/shoe soles; 7 mton for underbody coatings; 8 mton for sealants (carpet backing).			
Life cycle description:	Used as a general-purpose plasticizer that renders polyvinyl chloride (PVC) flexible. DINP has limited use in food packaging and is not currently used in medical products. DINP is used in vinyl upholstery, wire and cable, coated fabrics, footwear, and children’s products.			
Process description:	At the request of CPSC, U.S. toy manufacturers and importers voluntarily stopped using DINP and other phthalates in teethers, rattles, and bottle nipples (see Section I). The voluntary action, which became effective in March 1999, applies to products intended to be mouthed; it does not apply to other children’s products, such as squeeze toys and rainwear.			
Chemical concentration:	DINP content in plastic toys has been measured to be typically ~20 to 40%, but in some items more than 50%, of the dry weight. Table IV-2 contains concentrations from different studies: 15.1-54.4% in teethers and toys; 3.99-44% in teethers, toys, and pacifiers; 36% in teethers; 21-46.6% in toys and teethers; 36% in teethers			
<b>EVALUATION</b>				
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.
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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<b>Study Citation:</b>	CPSC, (2001). Report to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on diisononyl phthalate (DINP).		
<b>HERO ID:</b>	679920		
<b>Conditions of Use:</b>	Production of plastic products, including consumer products		
Domain	Metric	<b>EVALUATION</b> Rating	Comments
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
<b>HERO ID:</b>	5353181			
<b>Conditions of Use:</b>	Domestic Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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. Manufacture and import quantities forBBP, DBP, DCHP, and DIBP were in the range of 10 000 to 1 000 000 kg/year. (4/228)”			
<b>EVALUATION</b>				
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 domestic 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	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 is addressed in estimation method of total production data. Variability is addressed by compiling different studies in the report.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.
<b>HERO ID:</b>	3687865
<b>Conditions of Use:</b>	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	According to the data provided by the producers (ECPI, 1997a), the total production volume in the EU was 185,200 t/a as of 1994. An estimated import volume of 5,400 t/a was obtained from existing inventories from the previous year and approximately 83,400 t/a were exported outside the EU. Consequently, the estimated consumption volume in 1994 is ca. 107,200 t/a. This value is in reasonable agreement with the estimated mean consumption of DINP in Western Europe from 1990-1995 of ca. 121,000 t/a (Legrand, 1996). Based on estimations by the producers, the evolution of the consumption volumes of DINP (t/a) in Western Europe over the last decades is (Exxon Chemical Europe, 1999): 30,000 t/a (1964), 40,000 t/a (1970), 50,000 t/a (1975), 70,000 t/a (1980), 80,000 t/a (1985), 100,000 t/a (1990), 107,000 t/a (1994).
Life cycle description:	According to ECPI (1997a), approximately 95% of DINP is used in PVC applications. The remaining 5% is used in non-PVC applications. More than half of the DINP used in non-PVC applications involves polymer related-uses (e.g. rubbers). The remaining DINP is used in nonpolymer applications including inks and pigments, adhesives, sealants, paints and lacquers and lubricants. See Table 2.2 and 2.3 for volumetric breakdown between uses: 101,500 t/a for PVC end uses, 5,500 t/a for Non-PVC end uses (2,750 t/a polymer related, 915 t/a for adhesives, 915 t/a for inks, 915 t/a for paints)
Process description:	DINP is produced by esterification of phthalic anhydride with isononyl alcohol in a closed system. Isononyl alcohol used in the synthesis of DINP is produced via either the dimerization of butene or the oligomerization of propylene/butene (cf. Figure 1.1). The reaction rate is accelerated by elevated temperatures (140-250°C) and catalyst. Following virtually complete esterification, excess alcohol is removed under reduced pressure and the product is then typically neutralised, water washed and filtered.
Number of sites:	See Table 2.1. Five total producers / importers.
Chemical concentration:	An analysis by BASF (1992a) of a DINP sample (named “di(isononyl) phthalate 3”; Proben-Nr. 18620, probably DINP 3) gave a purity of > 99.5%, but gas chromatography revealed “at least 24 components” (visual inspection of the chromatogram reveals some 38 to 40 peaks). Five components may be considered as main constituents (perhaps between 10 and 20% each). The CAS number is indicated. Another good quality chromatogram has been furnished (BASF, 1987a). In this report, up to 40 peaks are attributed to DINP 2 (37 after partial distillation). Here again, 5 constituents may be considered as principal (from ca. 6 to ca. 20%).

EVALUATION			
Domain	Metric		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
			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			

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<b>Study Citation:</b>		ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>		3687865		
<b>Conditions of Use:</b>		Manufacturing		
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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	PVC production		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	101,500 t/a; See Table 2.3 for breakdown by type of converting process: 19,488 t/a calendering, 41,524 t/a extrusion, 8,313 t/a injection molding, 22,230 t/a plastisol spread coating, 9,643 t/a other plastisol applications		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.			
<b>HERO ID:</b>	3687865			
<b>Conditions of Use:</b>	Processing into rubber			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	2,750 t/a			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>		ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>		3687865		
<b>Conditions of Use:</b>		Formulation and application of adhesives, glues, and sealants		
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Production, import, or use volume:		915 t/a DINP used for adhesives, glues, and sealants		
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Formulation and use of inks		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	915 t/a DINP used for inks		
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	

<b>Study Citation:</b>		ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>		3687865		
<b>Conditions of Use:</b>		Formulation and application of paints		
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Production, import, or use volume:		915 t/a DINP used for paints		
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Use of indoor PVC applications (coated products, film and sheet, wires and cables, hoses and profiles, floor)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	See Table 2.4: 25,168 t/a DINP used in these products		
<b>EVALUATION</b>			
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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECB, (2003). European union risk assessment report: DINP.		
<b>HERO ID:</b>	3687865		
<b>Conditions of Use:</b>	Use of outdoor PVC applications (roofing, wire and cable, coated fabric, hoses and profiles, car under coating, shoe soles, sealings, paints and laquers)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	See Table 2.4: 39,977 t/a DINP used in these products		
Life cycle description:	For PVC in cars the lifetime was estimated to be 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.		
<b>EVALUATION</b>			
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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.		
<b>HERO ID:</b>	679967		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume: About 2.7 x 10^6 tonnes/year of total phthalates are produced. DINP accounts for 1-10% of the tonnage.			
<b>EVALUATION</b>			
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 PV data is for total phthalates and not DINP specific
	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	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).
<b>HERO ID:</b>	3687875
<b>Conditions of Use:</b>	Use in plastics

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).
Life cycle description:	About 95% of DINP is used in PVC applications. 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 (so-called "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).
Chemical concentration:	DINP could be found in concentrations higher than 0.1%, like in some baby changing mats/cushions (in concentrations of ca. 15 % and potentially more, according to a study from 2008), in plasticine (ca. 10 % according to a study from 2002), and in so-called "mucous toys" found in day-care centres (in maximum concentration of 0.18 % according to a study from 2006). // A survey conducted for the Danish EPA (Force Technology, 2007) showed that 10 out of 26 (38.5%) tested erasers were containing phthalates; among the nine (9) erasers which were further analysed, six (6) were containing DINP (67%) in concentrations between 32 and 70% w/w, and an additional one at the level of traces. // It appears that DINP has been found in the label of two (2) mittens (label with product name on the back of the hands) in concentrations of 7.8% and 8.6%, in one (1) PVC-containing soap packaging in a concentration of 8.8% and one (1) shower mat in a concentration of 14.6%; DINP was also found in the coverage of a pacifier, but at a low concentration (i.e. around 0.1 %). // it is reported that DINP was found in some (children) clothes, in concentrations of up to 32% (Greenpeace – Toxic textiles by Disney, 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 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.

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<b>Study Citation:</b>	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).
<b>HERO ID:</b>	3687875
<b>Conditions of Use:</b>	Use in plastics

Domain	Metric	EVALUATION Rating	Comments
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**

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Life cycle			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Tab 3-14: Used for floor coverings as an alternative to DBP			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Formulation			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation although not specific to DINP
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.		
<b>HERO ID:</b>	6316858		
<b>Conditions of Use:</b>	Processing into plastics, application of paints/adhesives/etc. to produce articles		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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.		
<b>EVALUATION</b>			
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	Medium	The assessment is for an occupational scenario within scope although not specific to DINP
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	



<b>Study Citation:</b>	ECHA, (2016). Committee for Risk Assessment RAC - Annex 1 - Background document to the Opinion proposing harmonised classification and labelling at EU level of 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkylesters, C9- rich; [1] di-“isononyl” phthalate; [2] [DINP] EC Number: 271-090-9 [1] 249-079-5 [2] CAS Number: 68515-48-0 [1] 28553-12-0 [2].		
<b>HERO ID:</b>	7325002		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	The substance is registered under REACH with the following volumes: CAS 68515-48-0: 100,000-1,000,000 tonnes/year, CAS 28553-12-0: 100,000-1,000,000 tonnes/year. (p. 8).		
Life cycle description:	DINP is a high molecular weight general purpose plasticiser added to PVC to impart flexibility. Plasticized PVC with DINP is used in construction, industrial applications and durable goods. DINP is also used in non PVC polymer applications. According to the Plasticisers and Flexible PVC Information Centre (by the European Council for Plasticisers and Intermediates, ECPI), 95% of DINP is used in PVC applications. The remaining DINP is used in rubbers, adhesives, sealants, paints and lacquers and lubricants (ECPI 2014). The high molecular weight orthophthalates currently represent approximately 70% of the European plasticisers market (ECPI 2014). (see Section 2.2).		
Process description:	1,2-benzenedicarboxylic acid, di-C8-10-branched alkylesters, C9-rich (CAS 68515-48-0) is manufactured by the “Polygas” process whereas di-“isononyl” phthalate (CAS 28553-12-0) is nbutene based. Isononyl alcohol, used in the synthesis of DINP, is produced via either the dimerization of butene or the oligomerization of propylene/butene. DINP is produced by esterification of phthalic anhydride with isononyl alcohol in a closed system. Following esterification, excess alcohol is removed under reduced pressure and the product is then typically neutralised, water washed and filtered (ECPI 2014). (see Section 2.1). Additional process description on page 113-114.		
Chemical concentration:	Typical concentration as manufactured is >99.5% (see Table 5). Purity is 99.9 wt% (page 113-114).		
<b>EVALUATION</b>			
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	Report is from ECHA, which is comprised of OECD countries 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	High	Report is from 2018, which is less than 10 years old.
	Metric 5: Sample Size	Medium	Production volume is provided as a range with uncertain statistics. Lifecycle volume provided as single value with uncertain representiveness.
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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<b>Study Citation:</b> ECHA, (2016). Committee for Risk Assessment RAC - Annex 1 - Background document to the Opinion proposing harmonised classification and labelling at EU level of 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkylesters, C9- rich; [1] di-“isononyl” phthalate; [2] [DINP] EC Number: 271-090-9 [1] 249-079-5 [2] CAS Number: 68515-48-0 [1] 28553-12-0 [2].				
<b>HERO ID:</b> 7325002				
<b>Conditions of Use:</b> Manufacturing				
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty of engineering information.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Use as additive in paints			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Table 2.2: 915 tonne/yr in paints (this is the use rate in Western Europe)			
<b>EVALUATION</b>				
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	Uninformative	The use rate is for Western Europe and is not applicable for U.S.
	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.
<b>Overall Quality Determination</b>		<b>Uninformative</b>		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Use as additive in inks for paper			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Table 2.2: 915 tonne/yr in inks			
<b>EVALUATION</b>				
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	Uninformative	The use rate is for Western Europe and is not applicable for U.S.	
	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.	
<b>Overall Quality Determination</b>		<b>Uninformative</b>		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).			
<b>HERO ID:</b>	679933			
<b>Conditions of Use:</b>	Use as additive in adhesives, glue, and sealing compounds			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Table 2.2: 915 tonne/yr in adhesives, glues, and sealing compounds			
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	Uninformative	The use rate is for Western Europe and is not applicable for U.S.
	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		Uninformative		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Distribution		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Process description:	Almost all DINP consumed in the EU is distributed via road tankers or by ship (Cadogan et al., 1994). In the estimate it was considered that 15% of the consumed phthalates are transported by ship and 85% by tank movement, the majority of which are supplied with sophisticated tank cleaning facilities.		
Throughput:	Every roadload transports around 20 tonnes		
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	

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-”isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Production of PVC compounds		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Table 2.2: 101,500 tonne/yr (broken down by type of process [calendering, extrusion, injection molding, other] in Table 2.3)		
Life cycle description:	For PVC in cars the lifetime was estimated to be 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.		
Process description:	Two general methods are used to prepare for the convenient processing of PVC. Dryblending, a process unique to PVC technology is used to prepare blends for extrusion, injection moulding and sometimes calendering. Plastisol blending is used to prepare plastisols, (approximately 30-35% of all plasticisers in PVC is applied in plastisol applications). A third route, rather obsolete but occasionally associated is Banbury mixing. Description of dryblending, plastisol blending, and banbury mixing on page 54. // PVC is processed in many ways: 1. calendering, 2. extrusion, 3. injection moulding, 4. several plastisol applications including spread coating (with oven fusion / gelation), rotational moulding, spray coating (with closed tunnel ovens) and miscellaneous small to very small applications. See page 55 for more detail.		
Chemical concentration:	In PVC formulations, the typical amount of DINP is about 20-40% but may go up to 55%. In end products, the amount varies greatly from less than 1% to more than 50% (INRS, 1998).		
Comments:	note that the volumes in table 2.2 are for Western Europe. they are not relevant for our assessment.		
<b>EVALUATION</b>			
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: 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 compounds		
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	



<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-“isononyl” phthalate (DINP).		
<b>HERO ID:</b>	679933		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	According to the data provided by the producers (ECPI, 1997a), the total production volume in the EU was 185,200 t/a as of 1994. An estimated import volume of 5,400 t/a was obtained from existing inventories from the previous year and approximately 83,400 t/a were exported outside the EU. Consequently, the estimated consumption volume in 1994 is ca. 107,200 t/a. This value is in reasonable agreement with the estimated mean consumption of DINP in Western Europe from 1990-1995 of ca. 121,000 t/a (Legrand, 1996).		
Life cycle description:	According to ECPI (1997a), approximately 95% of DINP is used in PVC applications. The remaining 5% is used in non-PVC applications. More than half of the DINP used in non-PVC applications involves polymer related-uses (e.g. rubbers). The remaining DINP is used in nonpolymer applications including inks and pigments, adhesives, sealants, paints and lacquers and lubricants.		
Process description:	DINPs are oily, viscous liquids at normal temperature and pressure. DINP is produced by esterification of phthalic anhydride with isononyl alcohol in a closed system. Isononyl alcohol used in the synthesis of DINP is produced via either the dimerization of butene or the oligomerization of propylene/butene (cf. Figure 1.1). The reaction rate is accelerated by elevated temperatures (140-250°C) and catalyst. Following virtually complete esterification, excess alcohol is removed under reduced pressure and the product is then typically neutralised, water washed and filtered.		
Number of sites:	5 European manufacturers identified in Table 2.1		
Chemical concentration:	>99.5% to 99.8% purity		
<b>EVALUATION</b>			
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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<b>Study Citation:</b>		ECJRC, (2003). European Union risk assessment report: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich - and di-"isononyl" phthalate (DINP).		
<b>HERO ID:</b>		679933		
<b>Conditions of Use:</b>		Manufacturing		
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	

<b>Study Citation:</b>	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).			
<b>HERO ID:</b>	7265437			
<b>Conditions of Use:</b>	Plastics			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Table 41: 101,500 t/y for PVC uses, 2,750 t/y for polymer uses			
Life cycle description:	DINP is used in a variety of plastic products, including flooring, wall covers, wires and cables, electrical equipment, bags, curtains, oilcloth, dinner mats, table cloth, shower curtains, carpet tile backing, air mattresses, foot ware, bathing equipment, balls / sporting equipment, rubber erasers. 95 % of DINP is used as aplasticiser for flexible PVC used for construction and industrial applications, and durable goods (wire and cable, film and sheet, flooring, industrial hoses and tubing, footwear, toys, food contact plastics). The other five per cent is used in non-PVC applications (e.g., rubbers, adhesives, sealants, paints and lacquers, lubricants) (DINP-facts, 2011).			
Chemical concentration:	Concentration in flooring <= 22%. One of bag contained a mix of DINP and DIDP at 11%. One of the curtains also contained DINP and DIDP, the total concentration was 8.6%. Transparent tablecloth (PVC film) 3.2% DINP. Two wall papers had a content of DINP and DIDP between 23 and 26%, Foot ware up to 3.2%DINP, bathing equipment 20-30% DINP, The investigation has revealed the content of 32 % DINP/DIDP in onesample of erasing rubber.			
<b>EVALUATION</b>				
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.
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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:	Plastics		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	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).		
<b>HERO ID:</b>	7265437		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	30,000 t/y (1964) to 107,000 t/y (1994). Table 41 has use volumes for each use sector. Table 42 and 43 has breakdown by type of PVC operation (calendering, extruction, injection molding, plastisol spread coating, and other plastisol applications) and type of products (wires, flooring, etc.)		
Life cycle description:	According to ECPI (1997a), approximately 95% of DINP is used in PVC applications. The remaining 5% is used in non-PVC applications. More than half of the DINP used in non-PVC applications involves polymer related uses (e.g. rubbers). The remaining DINP is used in nonpolymer applications including inks and pigments, adhesives, sealants, paints and lacquers and lubricants.		
Process description:	DINP is produced by esterification of phthalic anhydride with isononyl alcohol in a closed system. Isononyl alcohol used in the synthesis of DINP is produced via either the dimerization of butene or the oligomerization of propylene/butene. The reaction rate is accelerated by elevated temperatures (140-250°C) and catalyst. Following virtually complete esterification, excess alcohol is removed under reduced pressure and the product is then typically neutralised, water washed and filtered.		
Number of sites:	5 sites identified on page 140		
<b>EVALUATION</b>			
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 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. Some of the data cited is from sources before 2000.
	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.
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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:	Manufacturing		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	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).			
<b>HERO ID:</b>	7265437			
<b>Conditions of Use:</b>	Adhesives, inks, paints			
EXTRACTION				
<b>Parameter</b>		<b>Data</b>		
Production, import, or use volume:		Table 41: 915 t/y for each adhesives, inks, and paints		
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	

<b>Study Citation:</b>	ESIG, (2020). SPERC Factsheet – Use in rubber production and processing.			
<b>HERO ID:</b>	11360390			
<b>Conditions of Use:</b>	Non-PVC Plastics Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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 substance/day			
<b>EVALUATION</b>				
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	Data is from the European Solvents Industry Group, which is made up of OECD countries.
	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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	4730751		
<b>Conditions of Use:</b>	Use of deodorizing products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Throughput:	the median range of amount used per application of deodorizing agents is 0.55-1.02 g/s during spray use (in general, not chemical specific) (Table 4 on page 6 of 12)		
Chemical concentration:	not detected (or detected as below the limit of quantitation) in 47 products (page 7 of 12)		
<b>EVALUATION</b>			
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	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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Marx, J. L. (1972). Phthalic acid esters: Biological impact uncertain. Science 46(4056):46-47.			
<b>HERO ID:</b>	1335811			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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	Data are from the U.S.	
	Metric 3: Applicability	Medium	Data are for the production of phthalates, an in-scope occupational scenario but are not DINP specific	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by discussing differences between studies. Variability isn’t addressed.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	NICNAS, (2008). Existing chemical hazard assessment report: Diisononyl phthalate.
<b>HERO ID:</b>	1987648
<b>Conditions of Use:</b>	Import and life cycle

EXTRACTION	
Parameter	Data
Production, import, or use volume:	In Australia, DINP is imported as finished products or mixtures and as a raw chemical for local manufacture. The chemical is used industrially as plasticiser for PVC applications including cable and wire jacketing, automotive products, flooring, sheets, films, carpet backing, laminations, and adhesive tape. It is also used in non vinyl applications such as adhesives, surfactants, and printing inks. Imported finished articles containing DINP include toys, play and exercise balls.
Life cycle description:	According to the European Council of Plasticisers and Intermediates, approximately 95% of DINP is used in polyvinyl chloride (PVC) applications. The remaining 5% is used in non- PVC applications. More than half of the DINP used in non-PVC applications involves polymer related uses (e.g. rubbers) and the remaining DINP is used in non-polymer applications such as inks, adhesives, sealants, paints and lubricants. The chemical is used industrially as plasticiser for PVC applications including cable jacketing, automotive products, flooring, sheets, films, carpet backing, laminations, and adhesive tape. It is also used in non-vinyl applications such as adhesives, surfactants, and printing inks.
Chemical concentration:	DINP is not a single compound, but a complex mixture containing mainly C8, C9- branched isomers. The composition of CAS 68515-48-0 is represented as mixed phthalates with side chains made up of 5-10% methyl ethyl hexanol, 45-55% dimethyl heptanol, 5-20% methyl octanol, 0-1% n-nonanol, and 15-25% isodecanol; and the composition of CAS 28553-12-0 is represented as mixed phthalates with side chains made up of 5-10% methyl ethyl hexanol, 40-45% dimethyl heptanol, 35-40% methyl octanol, and 0-10% n-nonanol. Thus, diisononyl phthalate [side chains of dimethyl heptanol (i.e. isononanol)] makes up about 50% of the two 'DINP' mixtures which appear to be available on the market.

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.
	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.
Domain 2: Representativeness	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	Low	The assessment does not address variability or uncertainty.

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Study Citation:	NICNAS, (2008). Existing chemical hazard assessment report: Diisononyl phthalate.		
HERO ID:	1987648		
Conditions of Use:	Import and life cycle		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

<b>Study Citation:</b>	NICNAS, (2015). Priority existing chemical assessment report no. 40: Butyl benzyl phthalate.		
<b>HERO ID:</b>	3664467		
<b>Conditions of Use:</b>	Use as plasticizer		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Process description:	BBP might be used as a secondary plasticiser (in conjunction with another plasticiser) or occur as a minor contaminant of other phthalates, including diethylhexyl phthalate (DEHP) or diisononyl phthalate (DINP). (p. 9). Among the phthalate plasticisers, DINP is largely used in PVC and PVC/polyvinyl acetate co-polymers due to its high binding affinity, good solvation and the ability to maintain low temperature flexibility (p. 21). BBP is likely to substitute for DBP in any of its applications, but is not likely to substitute for DINP, which is a HMW phthalate commonly used in PVC toys and childcare articles (p. 21).		
Chemical concentration:	Total plasticiser concentration (DINP+BBP) in the PVC of 43 % - 0.5 % BBP and 42.5 % DINP (p. 9-10). Some phthalates such as DEHP and DINP can be present in high concentrations (up to approximately 40–50 % w/w) in polymer materials (p. 16).		
<b>EVALUATION</b>			
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 are from Australia, an OECD country.
	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 2015, which 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	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	NICNAS, (2012). Priority existing chemical assessment report no. 35: Diisononyl phthalate.
<b>HERO ID:</b>	3687905
<b>Conditions of Use:</b>	Manufacture/Import

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Data collected through calls for information specific to the assessment of DINP suggest that the total volume of DINP imported for industrial uses was in the range of 1,000 to 9,999 tonnes in 2002 and approximately 600 tonnes in 2004. Manufacture of DINP as a raw material in Australia was not reported. The current market consumption volume of DINP in Australia is between 1,600 and 2,000 tonnes per annum. (pg. 9/98)// The estimated consumption volume of DINP in Western Europe in 1994 was 107,000 tonnes per annum (ECB, 2003). (pg. 25/98) // Consumption of DINP in the US was estimated to be 178,000 tonnes in 1998, and DINP production currently exceeds that of DEHP (CPSC, 2010). (pg. 25/98)
Life cycle description:	The assessment undertaken by the European Chemicals Bureau (ECB, 2003) and the DINP Information Centre ( <a href="http://www.dinp-facts.com/">http://www.dinp-facts.com/</a> ) indicates that 95% of DINP is used as a plasticiser in PVC applications. The remaining 5% is used in non-PVC applications. More than half of the DINP used in non-PVC applications involves polymer-related uses (e.g. rubbers) and the remainder is used in inks and pigments, adhesives, sealants, paints and lacquers and lubricants. // The information collected by NICNAS indicated that in Australia DINP is used mainly as a plasticiser (plastic softener) for polyvinyl chloride (PVC) products but also in other applications such as adhesives, laminations, resins, surfactants and screen printing inks, with a small proportion in children's toys. DINP is used in a diverse range of industrial products such as electrical wire and cables, flexible PVC sheet, coated fabrics, automotive parts (synthetic leather for car interiors, car underbody coatings, cables), building and construction (waterproofing), vinyl flooring, footwear, sealings, lamination film and PVC-containing school supplies (scented erasers, pencil cases). DINP can be blended into a paste (plastisol) for coating (tarpaulins, synthetic leather and wall covering) and rotomoulding (toys, play and exercise balls, hoppers) applications. In addition, DINP is also used in applications such as adhesives, paints, surfactants and printing inks for T-shirts. DINP can also be found in plasticine, in several categories of toys (plastic books, balls, dolls and cartoon characters) and in baby products (changing mats/cushions) that could be placed in the mouth, although this was not the purpose for which they were designed. DINP was also found in other articles for / in contact with children (clothes, mittens, coverage of pacifiers, PVC-containing soap packaging and shower mats).
Process description:	DINP is imported as a raw material or mixtures for local formulation and in finished (ready-to-use) products.
Chemical concentration:	Purity is >99.5% // Note: DINP is not a single compound but a complex mixture containing mainly C9-branched isomers. The composition of CAS No. 68515-48-0 is represented as mixed phthalates with side-chains made up of 5–10% methyl ethyl hexanols, 45–55% dimethyl heptanols, 5–20% methyl octanols, 0–1% n-nonanol, and 15–25% isodecanol; and the composition of CAS No. 28553-12-0 is represented as mixed phthalates with side-chains made up of 5–10% methyl ethyl hexanols, 40–45% dimethyl heptanols, 35–40% methyl octanols, and 0–10% n-nonanol. Thus, diisononyl phthalate [side-chains of dimethyl heptanols (i.e. iso-nonanol)] makes up about 50% of the two 'DINP' mixtures that appear to be available on the market. (pg 23/98)

		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.

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<b>Study Citation:</b>		NICNAS, (2012). Priority existing chemical assessment report no. 35: Diisononyl phthalate.		
<b>HERO ID:</b>		3687905		
<b>Conditions of Use:</b>		Manufacture/Import		
Domain		Metric	EVALUATION	
			Rating	Comments
	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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	NICNAS, (2012). Priority existing chemical assessment report no. 35: Diisononyl phthalate.		
<b>HERO ID:</b>	3687905		
<b>Conditions of Use:</b>	Incorporation into Articles (plastics)		
EXTRACTION			
Parameter	Data		
Chemical concentration:	As a plasticiser, DINP can be present in high concentrations (up to approximately 50%) in polymer materials. DINP was found in baby changing mats / cushions at concentrations of 15%, in plasticine at 10%, in mittens at 8.6%, in soap packaging at 8.8%, in the cover of pacifiers at 0.1% and in shower mats at 14.6% (Danish EPA, 2009*; ECHA, 2010). DINP was also found in toy erasers at 70% and in PVC pencil cases at trace levels (Force Technology, 2007*; ECHA, 2010). (pg. 19/98)DINP was the phthalate most frequently found in the toy samples (64%) and tended to be present at the highest concentration (up to 51% w/w). (pg. 28/98)		
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	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	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		Medium	



<b>Study Citation:</b>	NICNAS, (2012). Priority existing chemical assessment report no. 35: Diisononyl phthalate.			
<b>HERO ID:</b>	3687905			
<b>Conditions of Use:</b>	Commercial use of personal care products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	In a report on the use of phthalates in perfumes, a trace amount of DINP (up to 26 mg/kg or 0.0026%) was found in one of 36 perfumery products tested in the EU (Peters, 2005). A subsequent report on phthalates in consumer products suggested that this trace amount of DINP could be due to leaching during early stages of formulation from plastic manufacturing equipment (containers, pipes, pumps) or from plastic tubing during product packaging (SCCP, 2007). (pg. 25/98)			
<b>EVALUATION</b>				
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	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario, commercial use of personal care products, within the scope of the risk evaluation, in terms of the type of industry, operations, and workactivities.
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	NICNAS, (2015). Priority existing chemical draft assessment report: Diisodecyl Phthalate & Di-n-octyl Phthalate.			
<b>HERO ID:</b>	6836808			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	In 2010, the total global market for phthalates was estimated at six million tonnes, with 1.4 million tonnes in the EU, the Middle East and Africa; 1.1 million tonnes in the Americas and 3.5 million tonnes in Asia. (20/65) DIDP and DINP (and other C9/C10 phthalates) represent approximately 30% of the global consumption of plasticizers.			
Chemical concentration:	PVC products made with DIDP include inflatable water products, hoppers, and play and exercise balls, with a maximum concentration of 40% (possibly in combination with other phthalates). (9/65)			
<b>EVALUATION</b>				
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 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	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 (ranges, production values) 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 by listing critiques of the studies and data used in the assessment. Variability is addressed by using data from many studies.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	NTP-CERHR, (2000). NTP-CERHR expert panel report on di-isononyl phthalate. GRA and I(GRA and I):47.		
<b>HERO ID:</b>	679849		
<b>Conditions of Use:</b>	Plastics products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Total of 178k mt in annual demand (see table 2)		
Life cycle description:	1998 US consumption by end-use listed in Table 2 - 13k mt for film and sheet, 48k mt for flooring, 3k mt for artificial leather, 21k mt for coated fabrics, 30k mt for dip coating/slush molded, 7k mt for tubing and profiles, 32k mt for wire and cables, 9k mt for shoes/soles, 7k mt for under body coatings, and 8k mt for sealants (carpet backing)		
Chemical concentration:	Concentration in children’s toys ranging from 3.9-54.4% dry weight.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	NTP-CERHR, (2000). NTP-CERHR expert panel report on di-isononyl phthalate. GRA and I(GRA and I):47.			
<b>HERO ID:</b>	679849			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	CAS RN 68515-48-0 (designated DINP-1 in this document) is manufactured from octene that is converted to alcohol moieties consisting mainly of 3,4-, 4,6-, 3,6-, 3,5, 4,5-, and 5,6-dimethyl-heptanol-1. CAS RN 28553-12-0 (DINP-2) is produced from n-butene that is converted primarily to methyloctanols and dimethylheptanols. The 28553-12-0 CAS RN also represents DINP-3 which is produced from n-butene and isobutene that are converted to alcohols, with 60% consisting of methylethyl hexanols. DINP, like other phthalate esters, is manufactured within a closed system under negative pressure.			
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	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.		
<b>HERO ID:</b>	3808976		
<b>Conditions of Use:</b>	Use		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on adhesive formulation.		
<b>HERO ID:</b>	3827299		
<b>Conditions of Use:</b>	Processing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	15.8-4,990 million kg adhesive/yr		
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 & Batches per 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. Wt fraction of plasticizer: 0.01 (p31 hot-melt); 0.05-0.2 (p33 moisture curable RTV silicone)		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.		
<b>HERO ID:</b>	3840003		
<b>Conditions of Use:</b>	Processing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on plastic additives.		
<b>HERO ID:</b>	5079084		
<b>Conditions of Use:</b>	Processing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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 compoundind 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.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	



<b>Study Citation:</b>	OECD, (2011). Emission scenario document on the chemical industry.			
<b>HERO ID:</b>	6306753			
<b>Conditions of Use:</b>	Manufacture, processing, use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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			
<b>EVALUATION</b>				
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)
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2020). Emission scenario document on chemical additives used in automotive lubricants.			
<b>HERO ID:</b>	6385735			
<b>Conditions of Use:</b>	Functional Fluids			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Production, import, or use volume:		6.3 billion kg lubricants/yr		
Life cycle description:		Formulation and Use of Automotive Lubricants		
Process description:		”Processing: Unloading raw materials, blending, intermediate storageUse: Unloading lube oil, removing spend oil and replacing with new oil, disposing/recycling of used oil”		
Throughput:		Provides methodology for estimating throughput based on the amount of lubricant produced, and the concentration of the chemical in the lube oil		
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 lubricant		
Chemical concentration:		Provides conc. estimates based on chemical function, not chemical specific.		
<b>EVALUATION</b>				
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	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 multiple additive types.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on transport and storage of chemicals.		
<b>HERO ID:</b>	6393282		
<b>Conditions of Use:</b>	Processing-Transportation and Storage		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.			
<b>HERO ID:</b>	6311222			
<b>Conditions of Use:</b>	Automotive Coating Application			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Auto OEM: 166,00 cars painted/yr. Autorefinish: 70-2,000 L paints/yr.			
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:	Auto OEM: 250 days/yr. Autorefinish: 170 days/yr; 8 L of paints used per car, 400 L per site			
Number of sites:	Auto OEM: 61 sites. Autorefinish: 1000's of sites.			
Chemical concentration:	default for solids 0.25; High solids paints can have a solids content of up to 45-50 percent for top coats			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources (EPA).
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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	5155511			
<b>Conditions of Use:</b>	Textile article production			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	After production of fibers, they may then undergo processing, dyeing and finishing. DINP is not generally found in undyed polyester, nylon, acrylic, spandex, rayon, or natural latex rubber, or the colorants used to dye these fibers. DINP is more typically used in the textile finishing process (which comes after dyeing).			
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	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 (source is dated 2015).
	Metric 5:	Sample Size	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents 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	

<b>Study Citation:</b>	Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates in specified materials at concentrations above 0.1 percent.
<b>HERO ID:</b>	5155525
<b>Conditions of Use:</b>	Plastics

EXTRACTION	
Parameter	Data
Chemical concentration:	DINP was not found above the limit (0.1% in children's articles) in the following investigated plastics: polymethylmethacrylate (PMMA), Polyacrylonitrile (PAN), Butadiene-ethylene resins (EBR), Ethylene-butene copolymers (EBC), Ethylene vinyl acetate (EVA), Ethylene vinyl alcohol (EVOH), Ethylene-propylene monomer (EPM), Ethylene-propylene-diene monomer (EPDM), Ionomers (Surlyn), Polycarbonate (PC), Polystyrene (crystal and general-purpose [GPS]), medium-impact (MIPS), and super-high-impact (SHIPS) grades, Styrene-butadiene copolymers (SBC), Silicone rubber (SR), Styrene-acrylonitrile copolymers (SAN), Styrene-butadiene-styrene rubber (SBS), and styrene-butadiene rubber (SBR)

		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 an occupational scenario within the scope of the risk evaluation. The data provides some helpful information on the concentrations in plastic articles
	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 (source is dated 2015).
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics (source just indicates DINP was not found in studied products).
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**

<b>Study Citation:</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).		
<b>HERO ID:</b>	10480466		
<b>Conditions of Use:</b>	Use - Laboratory Chemicals		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Provides methodology to estimate annual use rate.		
Life cycle description:	Laboratory Chemicals		
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:	260 days/yr; 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.		
<b>EVALUATION</b>			
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
<b>Overall Quality Determination</b>		<b>High</b>	

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

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	11373493			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.			
<b>HERO ID:</b>	3827195			
<b>Conditions of Use:</b>	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. 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		

<b>Study Citation:</b>	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.			
<b>HERO ID:</b>	6304171			
<b>Conditions of Use:</b>	Flexible and Rigid Polyurethane Foam Manufacture			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	2,365 million lbs polurethan foam/yr. 6,442 million lbs polysytrene/yr.			
Process description:	Converters mix plastic resins with additives, shaping/molding			
Number of sites:	566 total polystyrene sites, 610 total polyurethane foam sites			
<b>EVALUATION</b>				
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	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 multiple foam types.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.		
<b>HERO ID:</b>	6311218		
<b>Conditions of Use:</b>	Incorporating into formulation, mixture or reaction product as a plasticizer; Incorporating into articles as a plasticizer in plastics product manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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 8-9 of 18 for detailed description of methods for this step), extrusion/shaping (page 4 of 18)		
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). In 2001 there were 715 plastic compounding sites (page 11 of 18).		
Chemical concentration:	'Provides conc. estimates based on additive function in various plastics, not chemical specific (page 5-6 of 18)		
<b>EVALUATION</b>			
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 are for multiple in-scope occupational scenarios; 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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).		
<b>HERO ID:</b>	6311221		
<b>Conditions of Use:</b>	Formulation of Printing Inks		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	11.9-373.8 million kg ink/yr (depending on printing application) (Table 4 and Table 7, page 28 and 37 of 54)		
Process description:	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 22 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 (page 37-38 of 54)		
Number of sites:	13-239 (depending on printing application, Table 4 on page 28 of 54)		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific. (Table 5 on page 29 of 54)		
<b>EVALUATION</b>			
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
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	6311221			
<b>Conditions of Use:</b>	Use of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	11.9-373.8 million kg ink/yr (depending on printing application) (Table 4 and Table 7, page 28 and 37 of 54)			
Process description:	Provides descriptions for lithography, gravure, flexography, letterpress, digital printing, and screen printing. (page 22-26 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 (page 37-38 of 54)			
Number of sites:	454-18,622 (depending on printing application, Table 7 on page 37 of 54)			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific. (Table 5 on page 29 of 54)			
<b>EVALUATION</b>				
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	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).
<b>HERO ID:</b>	6385708
<b>Conditions of Use:</b>	Manufacturing; import; Processing as a reactant; processing – incorporating into formulation, mixture, or reaction product; processing – incorporation into articles; repackaging; distribution in commerce;

EXTRACTION	
Parameter	Data
Production, import, or use volume:	EPA estimates 500,000 IBCs are cleaned annually in the United States. Of this amount, EPA believes 225,000 IBCs are cleaned by Transportation Equipment Cleaning facilities. The remaining 275,000 IBCs are cleaned by drum reconditioning facilities.
Process description:	Cleaning process generally include reviewing manifests, draining the tank heel, rinsing, washing or using material-specific cleaning methods, rinsing a second time, and drying. Cleaning processes vary between facilities depending on the available cleaning equipment and the commodities last transported in the tanks to be cleaned.
Throughput:	IBCs are portable plastic and metal containers with 450 liters (199 gallons) to 3,000 liters (793 gallons) capacity. Cleaning time for tank barges typically ranges from four to eight hours. On average, tank trucks, IBCs, or intermodal tank containers requires two hours for cleaning.

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 multiple in-scope occupational scenarios; 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	Medium	Sample distributions characterized by ranges/estimations with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple container types and cleaning methods.

## Overall Quality Determination

**Medium**



<b>Study Citation:</b>	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385709			
<b>Conditions of Use:</b>	Flexographic Printing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	ink received in drums, charged to ink chamber, flexographic press, ink in substrate product.			
Throughput:	1,800 kg ink/site-day.			
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.			
<b>EVALUATION</b>				
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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385710			
<b>Conditions of Use:</b>	Formulation of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	The manufacturing of printing inks consists of two major processes: vehicle preparation and dispersion. Vehicle preparation consists of creating and mixing all other components of the ink except the dye or pigment. The process can consist of polymerization of resins, solvent mixing, and dissolving of other solid and liquid components. These processes are conducted in various types of autoclaves, reactors and high speed mixers. The dispersion stage is where dyes and pigments are added to the ink vehicle to form the final product. Dispersion is done in ball or media mills. The type of media used in the mills depends on the color, texture and final use of the ink product (page 7 of 23)			
Number of sites:	See Table 2-2 on page 7 of 23: An average 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 16 of 23)			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385710			
<b>Conditions of Use:</b>	Use of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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:	Provides descriptions for lithography, gravure, flexography, letterpress, digital printing, and screen printing. (pages 10-13 of 23)			
Number of sites:	See Table 2-2 on page 7 of 23: 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 16 of 23)			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.			
<b>HERO ID:</b>	6385711			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Plastics converters receive the masterbatch of plastic resin from compounders and convert the plastic resin into a finished plastic product. The plastic resins, which contain the chemical additives, are received at the converting site as solid pellets, sheets, or films. They are then heated and are formed into the desired shape through a variety of converting methods, including extrusion, injection molding, and thermoforming (BPF, no date b). The converted plastics may then undergo finishing operations, where secondary modifications yield the final, finished plastic product. Finishing operations include filing, grinding, sanding, polishing, painting, bonding, coating, engraving, etc. (page 24 of 96)			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic (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 of 96)			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific. (page 15-18 of 96).			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385719			
<b>Conditions of Use:</b>	Furniture Coating Application			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.		
<b>HERO ID:</b>	6385741		
<b>Conditions of Use:</b>	Incorporation into articles for textiles, apparel, and leather manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	73 million kg finishing agents/yr		
Process description:	Fabric immersed in an aqueous finishing formulation then squeezed between metal rolls to remove excess pagging solution and to aid in the even distribution of the finishing agent, fabric dried by passing over a series of heated metal rolls, fabric cured by passing through a long oven.		
Throughput:	3,520-50,000 kg cloth/site-day		
Number of sites:	1,100 total finishing plants		
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 multiple finishing agent types
Overall Quality Determination		Medium	

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385748			
<b>Conditions of Use:</b>	Processing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	3M, (2005). Material safety data sheet: 3M (TM) Nomad (TM) Scraper Matting 9100, Gypsy Red.			
<b>HERO ID:</b>	6984695			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.5-3%			
<b>EVALUATION</b>				
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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>		3M, (2019). Safety data sheet: 3M™ Polyurethane Sealant 540 (Various Colors).			
<b>HERO ID:</b>		6984702			
<b>Conditions of Use:</b>		Adhesive/Sealant			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		<5%			
		<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>			

<b>Study Citation:</b>	3M, (2019). Article information sheet: Scotch® Vinyl Electrical Color Coding Tape 35 (Blue, Brown, Gray, Green, Orange, Pink, Red, Violet, White, Yellow).			
<b>HERO ID:</b>	6984703			
<b>Conditions of Use:</b>	Plastics Converting			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<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	The report is for 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		

<b>Study Citation:</b>	ACC, (2020). ACC Presentation to EPA: DIDP and DINP–Conditions of use and proposed approach for addressing exposure data gaps.			
<b>HERO ID:</b>	11360394			
<b>Conditions of Use:</b>	Various			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	DINP is used in the following sectors:Film and Sheet: 38%Wire and cable insulation and jacketing: 42%Other: 20%			
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 various 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 - life cycle 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 - life cycle description.	
Overall Quality Determination		High		

<b>Study Citation:</b>	Adams, R. C., Pretzer, W. R., Yokelson, H. B., Wilhelmi, M. A. (2004). Heat Aging Performance of Decorative Lighting Products. :31-35.		
<b>HERO ID:</b>	7978865		
<b>Conditions of Use:</b>	Industrial Use: Plasticizer		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	Table 1 provides overall plasticizer and relative DINP concentration in Decorative Lights (2002 – 2003 products). Relative concentration ranged from not reported (blank) to 22.9%. Table 2 provides relative DINP concentration in Decorative Lights (2003 – 2004 products). Relative concentration ranged from not reported (blank) to 100%.		
<b>EVALUATION</b>			
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.
	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	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 discussed by including products from different years but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ADFORS, (2017). Glasgrid.			
<b>HERO ID:</b>	6984607			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<20%			
<b>EVALUATION</b>				
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	Medium	Product is from France, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	America,, T.T. (2016). Chemical data reporting: 1,2-Benzenedicarboxylic acid, 1,2-diisononyl ester.			
<b>HERO ID:</b>	7330234			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Toyota Tsusho America, Inc had a national aggregate production of between 100,000,000-250,000,000 lbs of DINP from 2012-2015. In 2012, the company produced 175,466 lbs DINP. In 2013, the company produced 174,762 lbs DINP. In 2014 and 2015, the company did not produce any DINP.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources. (CDR data)
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from the U.S.
	Metric 3:	Applicability	High	Data are for domestic manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (production volume) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Anonymous (2001). Toy safety: European Commission extends ban on phthalates. Europe Environment (12 June 2001):415.			
<b>HERO ID:</b>	7978472			
<b>Conditions of Use:</b>	Toys, playgrounds, and sporting equipment			
EXTRACTION				
Parameter	Data			
Life cycle description:	On December 7, 1999, the European Commission imposed an emergency ban on toys intended to be placed in the mouths of children under 3, manufactured in soft PVC, and containing one or more of the substances DINP, DEHP, DBP, DIDP, DNOP, and BBP.			
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 the European Commission.
	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	N/A - Life cycle 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 - Life cycle description.
Overall Quality Determination			High	

<b>Study Citation:</b>	APR, (2020). U.S. post-consumer plastic recycling data.			
<b>HERO ID:</b>	11360400			
<b>Conditions of Use:</b>	Recycling			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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%			
<b>EVALUATION</b>				
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	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 describing amounts of recycled products for several categories but uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	APR, (2023). Model Bale Specifications: 1-7 ALL Rigid Plastics.			
<b>HERO ID:</b>	11374516			
<b>Conditions of Use:</b>	Recycling			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	Description of standard industry plastic bale sizing:Bale Size: Approximately 30"x42"x 48" or 30"x48"x 60", For example, bale sizes should allow a minimum of 35,000 pounds to be shipped on 48 foot trailer, which is an industry standard. Individual companies may apply price deductions for shipments that do not meet their minimum weight requirements.Bale Density: 15-20 lbs/ft3			
Comments:	No environmental release data identified from document.			
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 Industrial/Commercial Use: Recycling, an in-scope 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	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 the explanation of different supplier parameters for plastic bales but uncertainty is not addressed.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	4198524
<b>Conditions of Use:</b>	Plastics

EXTRACTION	
Parameter	Data
Process description:	Phthalates are chemical additives to plastics and polymers to increase physical flexibility. They are commonly used in polyvinyl chloride (PVC) plastics, which occur in a range of materials and objects found in the home, including children's toys. Phthalates are associated with the materials they are added to, and not bonded chemically to them, allowing them to migrate from the source materials into the environment over time. A study is referenced indicating the migration rate of DINP in PVC (with 43% DINP) is 6.14 to 57.93 ug/cm2/h (mean = 26.03 ug/cm2/h).
Chemical concentration:	Concentration within children toys- Median conc.: 0.78%, mean conc.: 6.20%, max. conc.: 32.3% (Table 3, pg. 6) There is a regulatory limit of 0.1% for children's toys in the EU and US.

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 ( US Consumer Product Safety Advisory Panel) 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. (New Zealand), 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 may be useful to an occupational scenario within the scope of the risk evaluation, such as the manufacturing of these plastic and rubber products.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old (report is dated 2018).
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by median and maximum 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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.

## Overall Quality Determination

**High**

Continued on next page ...

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<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	4198524		
<b>Conditions of Use:</b>	Plastics		
		<b>EVALUATION</b>	
Domain	Metric	Rating	Comments

<b>Study Citation:</b>	Babich, M. A., Chen, S. B., Greene, M. A., Kiss, C. T., Porter, W. K., Smith, T. P., Wind, M. L., Zamula, W. W. (2004). Risk assessment of oral exposure to diisononyl phthalate from children’s products. Regulatory Toxicology and Pharmacology 40(2):151-167.		
<b>HERO ID:</b>	679870		
<b>Conditions of Use:</b>	Plasticizers (e.g., toys, playground, and sporting equipment manufacturing)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Life cycle description:	DINP is also used in vinyl flooring, wire and cable, stationery, wood veneer, coated fabrics, gloves, tubing, artificial leather, shoes, sealants, and carpet backing		
Chemical concentration:	Table 3 on page 9 shows the DINP content in children’s products ranged from 12.9 to 39.4% by weight, with a mean of 30%The Dutch Consensus Group obtained DINP migration data from a study with adult volunteers, who mouthed a standard PVC disk containing 40% DINP, a teether, or a disk cut from the teether (Rijksinstituut voor Volksgezondheid en Milieu; RIVM, 1998).		
<b>EVALUATION</b>			
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	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	High	Variability is addressed by including concentrations for different products. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	1335313		
<b>Conditions of Use:</b>	Use of Polyvinyl Chloride		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	49.7 million tons of plastic were produced by the US in 2005		
Chemical concentration:	phthalates may be up to 50% of the total PVC weight		
<b>EVALUATION</b>			
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	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
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Björklund, K. (2010). Substance flow analyses of phthalates and nonylphenols in stormwater. Water Science and Technology 62(5):1154-1160.		
<b>HERO ID:</b>	6813724		
<b>Conditions of Use:</b>	Processing: Incorporation in formulation, mixture, or reaction product (use in PVC)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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. (pg. 4/7)		
Chemical concentration:	the phthalates make up 35% of the PVC material (pg 3/7)		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Bond,, Seal (2018). SB 150HV - Natural.			
<b>HERO ID:</b>	6984608			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-5%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	BondCote Corporation, (2014). Material safety data sheet: PVC Laminated Polyester.			
<b>HERO ID:</b>	6984707			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	16%			
<b>EVALUATION</b>				
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 April 2014, 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.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.			
<b>HERO ID:</b>	6311430			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	These primary plasticizers are produced by esterification of oxo alcohols of carbon chain length nine and ten. The oxo alcohols are produced through the carbonylation of alkenes (olefins). The carbonylation process (eq. 3) adds a carbon unit to an alkene chain by reaction with carbon monoxide and hydrogen with heat, pressure, and catalyst. In this way a C8 alkene is carbonylated to yield a C9 alcohol; a C9 alkene is carbonylated to produce a C10 alcohol (p. 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, 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. (most data is European).
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Process description information is applicable but not specific to DINP
	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	This metric is not applicable to qualitative information.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.			
<b>HERO ID:</b>	6311430			
<b>Conditions of Use:</b>	Use as plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Well over 90% of plasticizer sales by volume are into the PVC industry (p. 10). // Worldwide consumption of plasticizers is estimated at $3.5 \times 106$ t (31), and is of the order of 1 million tons in Western Europe (Fig. 7; Table 4). The distribution of plasticizers into various applications is as follows: 27%, wire and cable covering; 23%, extrusion/profile; 17%, film and sheet; 13%, coated fabrics; 12%, wall covering; and 8%, undersealing/coating. (p. 20).			
Process description:	The steps involved in the incorporation of a plasticizer into a PVC product can be divided into five distinct stages: (1) Plasticizer is mixed with PVC resin. (2) Plasticizer penetrates and swells the resin particles. (3) Polar groups in the PVC resin are freed from each other. (4) Plasticizer polar groups interact with the polar groups on the resin. (5) The structure of the resin is re-established, with full retention of plasticizer (p. 6).			
Chemical concentration:	Flexible PVC is typically 30wt% plasticizer (Tab 2). 10wt% in acrylic (Sec 4.1). 2wt% in polyolefins (Sec 4.4). Up to 25wt% in fluoroplastics (Sec 4.6).			
<b>EVALUATION</b>				
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. (most data is European).	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Information is applicable but not specific to DINP.	
	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	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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

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:	Plasticizers			
EXTRACTION				
Parameter	Data			
Chemical concentration:	In PVC gaskets, DiNP was detected at 24.5% to 52.1%, DiDP was detected from 0.3% to 40.7%, and DCHP was detected at 0.1% to 10.5%. PVC gloves used in the preparation of the foods contained up to 74.8% of DiNP, and 27.9% of BBP. (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	Medium	Data are for consumer use of plastic products, which is similar to commercial use of plastic products, an in-scope occupational scenario. Data could be applied to assessment of OES that produces these articles
	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		

<b>Study Citation:</b>	Carboline, (2015). Safety data sheet: Phenoline 380 Part A.			
<b>HERO ID:</b>	6984711			
<b>Conditions of Use:</b>	Paint/Coating			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1-1.0%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>		CDC, (2009). Fourth national report on human exposure to environmental chemicals.		
<b>HERO ID:</b>		664488		
<b>Conditions of Use:</b>		Manufacturing		
EXTRACTION				
Parameter		Data		
Life cycle description:		DiNP is primarily used to produce flexible plastics and has replaced di-2-ethylhexyl phthalate (DEHP) in some plastics, though not in medical products. DiNP is widely used in such products as toys, flooring, gloves, drinking straws, garden hoses, and in sealants used for food packaging.		
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 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	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 report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

<b>Study Citation:</b>	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.			
<b>HERO ID:</b>	10442901			
<b>Conditions of Use:</b>	Paint and Coatings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Throughput:	Typical maximum daily usage, based on sector knowledge,1000 kg product/day at any one locationPigment/extender/filler - 100 kg/dayBinder - 100 kg/dayOrganic solvent/coalescent - 450 kg/dayAdditives - 5 kg/day			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is general and not chemical specific.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a maximum 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	Medium	Variability is addressed by including throughput for different substance functions but uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.			
<b>HERO ID:</b>	10442902			
<b>Conditions of Use:</b>	Paint and coatings, Ink, toner, and colorant products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Throughput:	Typical maximum daily usage, based on sector knowledge,100 kg product/day at any one locationPigment/extender/filler - 10 kg/dayBinder - 10 kg/dayOrganic solvent/coalescent - 45 kg/dayAdditives - 0.50 kg/day			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is general and not specific to the chemical.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a maximum 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	Medium	Variability is addressed by including throughput for different substance functions but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	CertiPrep., SPEX (2017). Safety data sheet: Phthalates in polyethylene standard w/BPA.			
<b>HERO ID:</b>	6301542			
<b>Conditions of Use:</b>	Lab Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Phthalates in Polyethylene Standard w/BPA contains 3.0% DINP.			
<b>EVALUATION</b>				
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 lab chemicals, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no 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 is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	CertiPrep., SPEX (2021). Safety Data Sheet (SDS): Phthalates in poly(vinyl chloride).			
<b>HERO ID:</b>	6301562			
<b>Conditions of Use:</b>	PVC Plastics Compounding			
EXTRACTION				
Parameter		Data		
Chemical concentration:		PVC Plastic contains 3.0% DINP.		
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 PVC plastics 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.
		Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no 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 or uncertainty is not addressed.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	CertiPrep., SPEX (2017). Safety data sheet: Phthalate standard.			
<b>HERO ID:</b>	6302569			
<b>Conditions of Use:</b>	Lab Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Phthalate standard contains 0.1% DINP.			
<b>EVALUATION</b>				
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 lab chems, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative 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	Variability or uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	CertiPrep., SPEX (2017). Safety data sheet: Diisononyl phthalate in PE.			
<b>HERO ID:</b>	6984559			
<b>Conditions of Use:</b>	Lab Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1%			
Physical form:	Solid			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	CertiPrep., SPEX (2017). Safety data sheet: Phthalates in Poly(vinyl chloride).			
<b>HERO ID:</b>	6984560			
<b>Conditions of Use:</b>	Lab Chemicals			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	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 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	

<b>Study Citation:</b>	Chem., HB (2014). Safety data sheet: DINP.			
<b>HERO ID:</b>	6984538			
<b>Conditions of Use:</b>	Plastics compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	100%			
		<b>EVALUATION</b>		
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 November 2014, 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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Chem., LG (2013). Safety data sheet: LG Premium PVC High Glossy Deco Sheet (G200).			
<b>HERO ID:</b>	6984566			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Chemical concentration:		0-2%		
<b>EVALUATION</b>				
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	Medium	Product is from Korea, an OECD country.
	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 2013, 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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Composites,, A.E. (2018). Safety data sheet: Alpha Style 3478-VS-2.			
<b>HERO ID:</b>	6984696			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	9.4-10.2%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Cordeiro, C. F., Petrocelli, F. P. (2005). Vinyl acetate polymers.			
<b>HERO ID:</b>	10186827			
<b>Conditions of Use:</b>	Processing: Adhesives and sealants chemicals (e.g., adhesive and sealant manufacturing)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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. Plasticizers are usually highboiling esters, eg, phthalates.			
<b>EVALUATION</b>				
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 phthalates and not specific to DINP.
	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.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	CPSC, (2009). U.S Consumer Product Safety Commission Log of Meeting: Phthalates, July 16, 2009.			
<b>HERO ID:</b>	11360391			
<b>Conditions of Use:</b>	Several			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	ExxonMobil manufactures DIDP and DINP. Laura Winks,ExxonMobil said that 90% of all plasticizers are used in PVC and that 90% of all plasticizers produced are phthalates. (pg. 1)			
Throughput:	However, many of the toys manufactured in Asia contain phthalates made by Asian chemical companies. Overall, more than half of phthalate production goes into building materials, roofing, automobiles, wire and cable, and flooring. Less than 1% of phthalate production is used in toys. More DINP than DEHP is produced in the U.S., although more DEHP is still produced globally. (pg. 1)			
Number of sites:	In response to a question from the CPSC, theysaid that ExxonMobil and BASF are the largest plasticizer producers. (pg. 1)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is an industry representative.
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	Medium	The report captures industry data 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	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	N/A	This metric is not applicable to the data being extracted
Overall Quality Determination		High		

<b>Study Citation:</b>	Daniels, P. H., Brofman, C. M., Harvey, G. D. (1986). Meaningful evaluation of plastisol gelation and fusion temperatures by dynamic mechanical analysis. Journal of Vinyl and Additive Technology 8(4):160-163.			
<b>HERO ID:</b>	7976924			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	When a plastisol is heated from room temperature, viscosity decreases (as a result of thermal expansion) until plasticizer begins to diffuse into the resin particles. The gelation process continues until the dispersion becomes a solid mass (with little cohesive strength). Here, the melting of the crystalline portion of the PVC occurs. These crystallites melt and reform in different locations when the plastisol cools and, together with the physical entanglements of the polymer chains, impart tensile strength to the processed compound. The melting of PVC crystallites in a plastisol occurs gradually over a temperature range beyond the final gel temperature but appears to occur much more rapidly over a narrow temperature range near 190°C regardless of plasticizer type and level. (2/4)			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for the incorporation of plasticizers into plastic and resin, an in-scope occupational scenario. However, no mention of DINP specifically.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	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	This metric is not applicable to the data being extracted
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Denka Company Limited, (2016). Safety data sheet: Vini-tape.			
<b>HERO ID:</b>	6984721			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25-30%			
Physical form:	Solid (Film-type molding product)			
<b>EVALUATION</b>				
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	Medium	Product is from Japan, an OECD country.
	Metric 3:	Applicability	Low	SDS is for a non-occupational scenario (consumer product) but is similar to an occupational scenario.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Depot,, Home (2018). Gardner 8 oz. Flex 'n Fill Premium Patching Paste.			
<b>HERO ID:</b>	6984556			
<b>Conditions of Use:</b>	Adhesive/Sealant			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	2%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The information is from a primary 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 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	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		

<b>Study Citation:</b>	DOE., WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.
<b>HERO ID:</b>	10454465
<b>Conditions of Use:</b>	Floor coverings

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). In 2016, the California Office of Environmental Health Hazard Assessment estimated that DINP was present in vinyl floors at up to 18.9% in their safe use determination statement (California Office of Environmental Health Hazard Assessment, 2016).

		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	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 uncertainty is not addressed.

<b>Overall Quality Determination</b>	<b>High</b>
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<b>Study Citation:</b>	Dow Chemical, (2018). Safety data sheet: BETASEAL Xpress 30 Urethane Adhesive.			
<b>HERO ID:</b>	6984571			
<b>Conditions of Use:</b>	Adhesive/Sealant			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	> 15.0 - < 25.0 %			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Duro-Last Inc, (2017). Safety data sheet: Duro-last® pitch-pan filler.			
<b>HERO ID:</b>	6984722			
<b>Conditions of Use:</b>	Adhesive/Sealant			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1-1%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping 1,2-Benzenedicarboxylic acid, diisononyl ester; 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich (Diisononyl Phthalate; DINP). Chemical Abstracts Service Registry Numbers: 28553-12-0 and 68515-48-0.			
<b>HERO ID:</b>	3688004			
<b>Conditions of Use:</b>	Manufacture/Import			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	”Based on information collected through a survey issued pursuant to section 71 of the Canadian Environmental Protection Act, DINP was imported, manufactured, and exported at quantities of over 10,000,000 kg, 1,000,000 to 10,000,000 kg, and 1,000,000 to 10,000,000 kg, respectively.In the U.S., DINP production volume ranged between greater than 4.540,000 to 226,796,000 kg in 2002. In 2006, the reported range was between 45,359,000 and less than 226,796,000 kg”. (pg. 16/150)			
Life cycle description:	Plasticizer, automotive care products, adhesives and sealants, personal care products, electronic products, furniture and furnishings, fabric, textile and leather products. (See Table 5-1, pg 17/150 for more info)			
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 various commercial uses, like plasticizers, automotive care products, adhesives and sealants, personal care products, electronic products, furniture and furnishings, and fabric, textile and leather products
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (emission factors, percentages, 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	High	Uncertainty is addressed by describing the estimates that went into each calculation in the report. Variability is addressed by comparing the results of other studies to one another.
Overall Quality Determination			High	



<b>Study Citation:</b>	ECHA, (2013). Evaluation of new scientific evidence concerning DINP and DIDP in relation to entry 52 of Annex XVII to REACH Regulation (EC) No 1907/2006.		
<b>HERO ID:</b>	2441673		
<b>Conditions of Use:</b>	manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	According to ECPI, about one million tonnes of phthalates are manufactured each year in Europe, of which approximately 93% are used to make PVC soft and flexible. ECPI indicated that the total consumption of plasticizers in Western Europe is approximately one million tonnes. Calvin (2011) indicated that non-phthalate plasticizers accounted for approximately 16% of the plasticizer market in Western Europe in 2010, and on this basis the consumption of phthalates would be approximately 840,000 tonnes. The difference between manufacturing and EU consumption is quite well in accordance with the data on external trade indicating a net export of C8 (mainly DEHP) and C9/C10 phthalates of approximately 230,000 t/year. The three phthalates DINP, DIDP and DPHP account for the majority of the C9/C10 phthalates both at global and at an EU level. According to ECPI, the consumption of DINP, DIDP and DPHP has increased from representing about 50% of total phthalate sales in Europe in 2001 to approximately 83% of the total sales in 2010. If 83% of the manufacturing of phthalates (as is the case for consumption) is C9/C10 phthalates, the total manufacture of these phthalates corresponds to approximately 830,000 t/year. The total global market for phthalates was estimated at 6 million tonnes, with 1.4 million tonnes in Europe, the Middle East and Africa; 1.1 million tonnes in the Americas and 3.5 million tonnes in Asia. Phthalates represent 84% of the global plasticiser market.		
Life cycle description:	Breakdown of the use of DINP by application area in 2015 (as tonnes): Film, sheet and coated products - 57,018; Flooring, roofing, wall covering - 7,739; Hose and profile – 25,006; Wire and cable - 85,761; Clear, medical, film - 39,901; Footwear and miscellaneous - 48,249; Flooring - 68,299; General (coated fabric, wall covering, etc.) - 76,933; Car undercoating and sealants - 50,498; Slush/rotational molding etc. - 10,845; Non-PVC applications - 24,750; Total – 495,000. About 95% of DINP is used in PVC applications. The other 5% is used in non-PVC applications such as rubbers, adhesives, sealants, paints and lacquers and lubricants.		
Process description:	Two different types of DINP are currently on the market: DINP-1 is manufactured by the “Polygas” process, DINP-2 is n-butene based. DINP is composed of different alcohol chains depending on the production method. It is a manufactured substance made by esterifying phthalic anhydride and isononanol. Isononanol is composed of different branched C9 alcohol isomers. The two branches on the molecule R1 and R2 are not necessary identical, and are either mainly C8H17 to C10H21 (DINP-1) or C9H19 isomers (DINP-2).		
Chemical concentration:	DINP and DIDP shall not be used as substances or in mixtures, in concentrations greater than 0.1 % by weight of the plasticised material, in toys and childcare articles which can be placed in the mouth by children (entry 52 of Annex XVII to REACH).		
<b>EVALUATION</b>			
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 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	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.
Continued on next page ...			

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Study Citation:	ECHA, (2013). Evaluation of new scientific evidence concerning DINP and DIDP in relation to entry 52 of Annex XVII to REACH Regulation (EC) No 1907/2006.		
HERO ID:	2441673		
Conditions of Use:	manufacturing		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	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).			
<b>HERO ID:</b>	5353093			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	DINP and DIDP represent 30% of the global use of plasticizers in 2009. The use of phthalates other than DEHP, in particular DINP, has constantly increased since 1994, whilst the manufacture of DEHP has decreased. (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	High	The report is for an occupational scenario within the scope of the risk evaluation (processing, plasticizer)	
	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		High		

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	7325004		
<b>Conditions of Use:</b>	Use as Plasticizer (replacement for DEHP)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Sweden used around 750 tons of DINP in 1994 and 1999, 9500 tons in 2002, and 12000 tons in 2005. (46/106)		
Life cycle description:	Table 3-23, pg. 84/106, provides applications that DINP is used as a replacement for DEHP, these applications include flooring and wall covering, film/sheet and coated products, wire and cable, automotive, sealants (glass insulation, construction). Also provided in the footnote is a link to an ExxonMobil site (access denied by admin so I couldn't look at it) that appears to have product(s), Jayflex, that contain DINP.		
Comments:	Provides data regarding the use of DINP and DIDP as a replacement for DEHP beginning in 1999 - 2002; pg. 45/106, see also pg. 46/106, "DEHP has to a large extent been replaced by DINP or DIDP (Chistensen et al. 2008).".Provides economical data for phthalates in general, see Table 3-24 pg. 85/106.		
<b>EVALUATION</b>			
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 Sweden, an OECD country.
	Metric 3: Applicability	Medium	Data are for of DINP [as a replacement for DEHP] as a plasticizer in various plastic products.
	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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2021). Substance infocard: 1,2-Benzenedicarboxylic acid, di-C8-10-branched alkyl esters, C9-rich.			
<b>HERO ID:</b>	7325409			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	DINP is manufactured and/or imported to the European Economic Area at 100,000-1,000,000 tons per year. (1/1)			
Life cycle description:	DINP is used in articles, by professional workers, in formulation or re-packaging, and at industrial sites. Releases may occur from outdoor use in long-life materials with low release rate (metal, wooden, and plastic construction materials), indoor use in long-life materials with low release rate (flooring, furniture, toys, paper products, electronic equipment), adhesives and sealants, cooling liquids, and lubricants. (1/1)			
<b>EVALUATION</b>				
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 the European Chemicals Agency, which is based in Finland, an OECD country.
	Metric 3:	Applicability	High	Data lists multiple in-scope occupational scenarios as a part of the life cycle description, and also includes manufacturing.
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ECPI, (2011). Endocrine data evaluation report. For selected high molecular weight (HMW) phthalates (DINP, DIDP) and a low molecular weight (LMW) phthalate (DBP), using the OECD conceptual framework. Volume I. Mammalian data.		
<b>HERO ID:</b>	2079182		
<b>Conditions of Use:</b>	Production of plastics		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Global annual market: 34 mTon of PVC (65% is rigid, 35% flexible); 6 MTon plasticizers (87% is phthalates)		
Life cycle description:	DINP and DIDP are used principally as PVC plasticisers. // Per Figure 1, 4% of phthalates are used for sensitive applications (medical, food, toys) and the remaining 96% are used for durable goods (wires, film, roofing, flooring, wall coverings, etc.). // PVC use in Europe is broken down in Figure 2: 25% for wires and cables, 22% for film and sheet, 14% for floor covering, 11% for extrusions, 10% for coated fabric, 9% for plastisol, and 9% for other.		
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 (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	

<b>Study Citation:</b>	EFSA, (2005). Opinion of the scientific panel on food additives, flavourings, processing aids and materials in contact with food (AFC) on a request from the commission related to di-isononylphthalate (DINP) for use in food contact materials. Question N° EFSA-q-2003-194. 244:1-18.			
<b>HERO ID:</b>	3688079			
<b>Conditions of Use:</b>	Manufacturing and Use			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Di-isononylphthalate is mainly (approximately 95%) used as a plasticiser in PVC applications. The remaining 5% is used in non-PVC applications (ECPI, 1997). More than half of the DINP used in non-PVC applications involves polymer related-uses (e.g. rubbers). The remaining DINP is used in other applications including inks and pigments, adhesives, sealants, paints and lacquers and lubricants (Legrand, 1996).			
Chemical concentration:	>99.5% with trace impurities			
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	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Emulsions,, E.A. (2019). Safety data sheet: HawkFlash LiquiCap - Component A.			
<b>HERO ID:</b>	6984723			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<5%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	ENF, (2024). Plastic recycling plants in the United States.			
<b>HERO ID:</b>	11360395			
<b>Conditions of Use:</b>	Recycling			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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		

<b>Study Citation:</b>	Enterprises,, BJB (2019). Safety data sheet: TC-889 PART B.			
<b>HERO ID:</b>	6984698			
<b>Conditions of Use:</b>	Non-PVC Material Converting			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	15-40%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>		Enterprises,, BJB (2019). Safety data sheet: TC-890 Part A.			
<b>HERO ID:</b>		6984699			
<b>Conditions of Use:</b>		Adhesive/Sealant			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		10-30%			
		<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>			

<b>Study Citation:</b>	ExxonMobil, (2022). EM BRCP DINP/DIDP facility – virtual tour (sanitized).
<b>HERO ID:</b>	10633678
<b>Conditions of Use:</b>	Manufacturing

EXTRACTION	
Parameter	Data
Life cycle description:	Provides information about chemical manufacturing BRCP unit operation process, as well as points of chemical exposure and release within the manufacturing process.
Process description:	BRCP Unit Operation Step 1: Reactor, Step 2: Neutralization & Hydrolysis, Step 3: Crude Filtration #1, Step 4: Water Wash, Step 5: Flash Distillation/Steam Stripping/N2 Stripping, Step 6: Filtration #2, Step 7: Anti-oxidant Addition.
Chemical concentration:	Crude filtration #1 leads to waste discharge of 50:50 solid:adsorbed oil, where adsorbed oil is 80% diester and 20% alcohol. Final filtration #2 leads to waste discharge of 50:50 solid:adsorbed oil, where adsorbed oil is 100% diester. Sampling is performed post reactor (liquid/~80% diester/alcohol) and at unit back-end & rundown tanks (liquid/100% diester).

EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Data comes directly from the manufacturing facility and general engineering information is expected to be accurate.
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	N/A	Sample size is not applicable to the general engineering information 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 with respect to diester concentration at various stages of BRCP unit process.

## Overall Quality Determination

**High**

<b>Study Citation:</b>	Fastenings,, Macsim (2017). Technical data sheet: Fireseal 6.			
<b>HERO ID:</b>	6984570			
<b>Conditions of Use:</b>	Adhesives and Sealants			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0-5%			
Physical form:	Grey paste that is partially soluble in water by mixing.			
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	Medium	Product is from Australia, an OECD country.
	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			Medium	

<b>Study Citation:</b>	FCW, (2017). Statistical Report 2016.			
<b>HERO ID:</b>	10472414			
<b>Conditions of Use:</b>	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, DINP 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		

<b>Study Citation:</b>	Firestone Building Products Company, (2018). Safety data sheet: EPDM solvent-free bonding adhesive.			
<b>HERO ID:</b>	6984725			
<b>Conditions of Use:</b>	Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	30-31%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Form., Pro (2016). PF 225 Urethane Windshield Adhesive Black.			
<b>HERO ID:</b>	6984602			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-10%			
<b>EVALUATION</b>				
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	Medium	Product is from Canada, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	Freeman Manufacturing and Supply Company, (2018). Safety data sheet: Freeman 90-1 burnt orange pattern coating.			
<b>HERO ID:</b>	6984728			
<b>Conditions of Use:</b>	Paint/Coating			
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 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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7978498			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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	Low	Data are global
	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	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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Fulbright,, N.R. (2014). Safe Use Determination (SUD) application for Tandus Centiva Modular Vinyl Carpet Tile.			
<b>HERO ID:</b>	10177754			
<b>Conditions of Use:</b>	Floor coverings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	Tiles with pre-applied adhesive have an easily removed protective film covering the adhesive on the entire back of the tile. For a tile with adhesive, installers remove the backing and then place it into position. After placing all of the tiles, the installer then rolls the tiles with a 75 to 100 lb roller. For a tile without adhesive, installers first apply adhesive to the sub-floor and then place the tile once the adhesive has dried. The tiles are packed front-to-back, with 15 tiles per shipping package. (5/28)			
Chemical concentration:	Figure 1 shows a composition breakdown of the carpet tiles. (5/28)			
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 commercial use of floor coverings, 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 (average values) 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	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

<b>Study Citation:</b>	Gardiner, N. (2008). Disposable decisions. Cleanroom Technology 15(2):27-28.			
<b>HERO ID:</b>	7978842			
<b>Conditions of Use:</b>	Plastic and rubber products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	The most frequently encountered plasticizers are phthalates and in PVC products thefollowing phthalates seen to be most frequently employed: DEHP, DIDP, DINP, DBP, and BBP.For many years, there have been concerns regarding the risk of plasticizers leaching out of the PVC materials. (1/2) When vinyl gloves are disposed of by landfill, phthalates may be released, especially when in contact with non-aqueous solvents. (2/2)			
Chemical concentration:	DEHP and DINP combined may represent between 22% and 44% of total PVC glove composition. (1/2)			
<b>EVALUATION</b>				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	Report does not specify the data used.
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	8338316			
<b>Conditions of Use:</b>	Industrial/Commercial Use: Plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Plasticizer, remaining in rubbers, inks, adhesives and sealants, paints, and lacquers			
<b>EVALUATION</b>				
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	Most of the writers are from Italy - 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	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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7978731			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	The Organization for Economic Co-operation and Development (OECD) reported in 2018 that global production volumes of phthalate plasticizers could reach approximately 5.5 million metric tonnes per year. (2/13)			
<b>EVALUATION</b>				
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 Norway, 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	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	This metric is not applicable to the data being extracted	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Godwin, A. D., Krauskopf, L. G. (2008). Monomeric plasticizers. :173-238.			
<b>HERO ID:</b>	7324538			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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:	DINP is present in PVC resin at 53 parts per hundred rubber (phr) as a plasticizer, or 50%. (8/66) Formulations based on end-product are given throughout the article.			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Green Mountain International, (2008). Material safety data sheet: Mountain Grout Pump Flush.			
<b>HERO ID:</b>	6836844			
<b>Conditions of Use:</b>	Use of Lubricants and Functional Fluids			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	95-100%			
Comments:	Mountain Grout Pump Flush is a non-flammable maintenance fluid for use before and after each pump use to ensure a moisture free pumping system. Mountain Grout Pump Flush contains no volatile solvents, is non-hazardous, non-corrosive and compatible with all Mountain Grout Polyurethane Systems. It may be left in the pump and hoses during storage until their next use.			
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	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		



<b>Study Citation:</b>	Group., R.W. (2004). B101-G804 B104-G202 White Gloss Jet Spray.			
<b>HERO ID:</b>	6984604			
<b>Conditions of Use:</b>	Paints and Coatings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-10%			
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 2004, 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	

<b>Study Citation:</b>	Group,, R.W. (2004). B101-G826 Black Gloss Jet Spray.			
<b>HERO ID:</b>	6984605			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-10%			
<b>EVALUATION</b>				
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 2004, 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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Group,, R.W. (2004). B610-01006 Flattenner.			
<b>HERO ID:</b>	6984606			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-10%			
<b>EVALUATION</b>				
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 2004, 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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Guo, Y., Wang, L., Kannan, K. (2014). Phthalates and parabens in personal care products from China: Concentrations and human exposure. Archives of Environmental Contamination and Toxicology 66(1):113-119.			
<b>HERO ID:</b>	1987638			
<b>Conditions of Use:</b>	Use of Personal Care Products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report cites the data from a Consumer Product Safety Commission (CPSC) report.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from China, a non-OECD country.	
	Metric 3: Applicability	Low	The data 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 (2014).	
	Metric 5: Sample Size	N/A	This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents results, methods, and assumptions. Datasources 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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	4168432
<b>Conditions of Use:</b>	Disposal of plastics

## EXTRACTION

Parameter	Data
Life cycle description:	See graphical abstract and Fig 1: Plasticizers and other additives are added at plastics processing and manufacturing sites -> plastic products used -> plastic products disposed of -> plastic waste collection -> sent to landfill, open burning, energy from waste, or material recovery facilities -> from material recovery facilities, material is reprocessed through mechanical/ chemical means -> sent back to plastics processing and manufacturing sites for integration into plastic articles
Process description:	Large volumes of plastic wastes are generated, mainly due to the short lifespan of many plastic products (it is estimated that approximately 40% of plastic products have a service life of less than 1 month). In Europe, which arguably with Japan has the most technically advanced and environmentally conscious waste and resource recovery systems deployed on the ground, approximately 50% of plastic waste is still directed to controlled landfill disposal [2]. Resource recovery alternatives to landfill are mechanical recycling (primary recycling substituting virgin materials and secondary recycling), chemical recovery (tertiary recycling) or energy recovery (quaternary recycling) [9,10]. In industrial countries a large share of plastic waste is used for energy recovery. In Europe, more plastics waste is destined for energy recovery (39.5%) (in EfW or via solid recovered fuels (SRF) recovered in cement kilns) than for recycling (29.7%) [27]. Primary recycling substituting virgin polymers in the same application is possible for some plastic types and fractions (e.g. for PET plastic bottles or car bumpers) [10]. Moulding and extrusion are key stages in the mechanical material recycling process of plastic waste that usually is operated at 200–300°C. However, among else, the great variability in plastics polymers and post-use contamination obstructs closed-loop recycling or makes it difficult [10,11]. For the vast majority of plastic waste fractions (e.g. most packaging, plastic from electronics, plastic and polymers from the transport and construction sectors) labour or technology intensive sorting is needed in order to get a high quality recyclate which can be used for substituting virgin materials [12]. Often, plastics are in most cases secondary recycling applies, in which used plastics are cascaded into material applications different than the original, and often of less demanding material specifications (e.g. PET bottles into fleece). Plastic waste for recycling could be transported overlong distances, for instance exported from the Global North to the developing countries, particularly to Asia [13]. It was shown that 46% wt. of the plastics collected for recycling in Europe were eventually exported, with 90% wt. of it directly or indirectly ending up in China [14,15]. Chemical recovery (tertiary recycling), involves chemicals, e.g., raw materials such as monomers, being recovered and/or converted from the plastic material [9]. This can potentially be done by catalytic depolymerisation or by controlled thermal degradation, such as thermolysis, which is a non-catalytic cracking process [16]. Pyrolysis is also considered to be a sustainable and efficient treatment that can produce a range of useful hydrocarbons, potentially used as a chemical feedstock or as energy, thereby minimizing the dependency on non-renewable fossil fuels, while solving the landfilling problem [17,18].

## 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.

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<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4168432			
<b>Conditions of Use:</b>	Disposal of plastics			
Domain		Metric	EVALUATION	
			Rating	Comments
	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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4168432			
<b>Conditions of Use:</b>	Production of plastics			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	During the last 15 years, the global annual production of plastics has doubled, reaching approximately 299 million tonnes in 2013 [1,2]. Global plastic demand is dominated by thermoplastic types of polypropylene(PP) (21%), low -and linear low- density polyethylene (LDPE and LLDPE) (18%), polyvinyl chloride (PVC) (17%), and high-density polyethylene, (HDPE) (15%). Other plastic types with high demand are polystyrene (PS), and expandable PS (8%), polyethylene terephthalate (PET) (7%, excluding PET fibre) and the thermosetting plastic polyurethane [3].			
Life cycle description:	Plastic polymers are not only used for consumer products but also to make synthetic fibres, foams, coatings, adhesives and sealants, which are used in numerous applications [4]. In Europe, the use of plastics is mostly dominated by packaging (38%),followed by building and construction (21%), automotive (7%), electrical and electronic (6%), and other sectors (28%), such as medical and leisure [2]. // About 80% of plasticizers are used in PVC with the remaining 20% used in cellulose plastic.			
Process description:	Plasticizers are most commonly used for improving the flexibility, durability and stretchability of polymeric films, reducing, at the same time, melt flow [87,88]. Plasticizers reduce shear during the mixing steps of polymer production and improve impact resistance in the final plastic film. They, also, provide the material with limp and tacky properties [88–90].			
Chemical concentration:	Plasticizers are typically 10-70 wt% in plastics			
<b>EVALUATION</b>				
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.	
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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:	Production of plastics		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	



<b>Study Citation:</b>	Hallstar, (2015). Safety data sheet: Plasthall DINP.			
<b>HERO ID:</b>	6984572			
<b>Conditions of Use:</b>	Plastics compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	100%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Hanwha Chemical, (2018). Safety data sheet: DINP.			
<b>HERO ID:</b>	6984537			
<b>Conditions of Use:</b>	Plastics compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	100%			
		<b>EVALUATION</b>		
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	Medium	Product is from Korea, an OECD country.
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
<b>HERO ID:</b>	6558535			
<b>Conditions of Use:</b>	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.			
Comments:	There is sampling data but not for DINP or any phthalates. Marked for potential useful COU data in spray painting.			
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 evalu-ated.
	Metric 3:	Applicability	Medium	Occupational scenario falls under a condition of use but DINP or phthalates are not mentioned.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	No samples for DINP.
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	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Hilti, (2012). Safety data sheet: CP 606 Flexible Firestop Sealant.			
<b>HERO ID:</b>	6984542			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10-15%			
<b>EVALUATION</b>				
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	Medium	Product is from Canada, an OECD country.
	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 2012, 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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.				
<b>HERO ID:</b>	11328016				
<b>Conditions of Use:</b>	Processing				
<b>EXTRACTION</b>					
<b>Parameter</b>	<b>Data</b>				
Process description:	”We clarify that DINP is not used as a processing aid, but just as an intermediate within industrial production like the production of articles listed in the table above””We clarify that neither DINP nor DIDP are used as reactants. The terminology “processing as a reactant” was chosen based on the descriptions provided in the official code descriptions for DINP/DIDP end use as a plasticizer (industrial functional category for CDR reporting). In this regard it functions to provide flexibility to PVC. There is no use where DINP or DIDP is used as a chemical reactant in and of itself.”				
<b>EVALUATION</b>					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Methodology	High	Information was requested by EPA.	
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	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	
<b>Overall Quality Determination</b>			<b>High</b>		

Study Citation:	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.			
HERO ID:	11328016			
Conditions of Use:	Fabric, textiles, and leather			
EXTRACTION				
Parameter	Data			
Process description:	Integrated cushions: Plastisol technology, several layers including foam layer and base coat.Coted textiles and ”vegan” leather: Plastisol technology or Film calendaring technology			
Chemical concentration:	Integrated cushions in chairs or banquettes, (artificial leather with foam layer) to wrap the cushion: 30-35 wt%Coated textiles especially for outdoor applications, e.g. roofs for sports arenas, truck awnings: 30-40 wt%“vegan” leather: 25-35 wt%			
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 Textiles, apparel and leather, 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	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 is addressed by describing concentrations of multiple products, uncertainty is not addressed.
Overall Quality Determination		High		

<b>Study Citation:</b>	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.			
<b>HERO ID:</b>	11328016			
<b>Conditions of Use:</b>	Furniture and furnishings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Film calendered and afterwards applied with glue on body of furniture.			
Chemical concentration:	(multi-layer) sheet for decoration of furniture: 4-5 wt %			
<b>EVALUATION</b>				
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 furniture and furnishings, 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	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.			
<b>HERO ID:</b>	11328016			
<b>Conditions of Use:</b>	Building and construction materials			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Homogenous flooring: DINP mixed with PVC and other additives to dry powderRoofing Membrane: Processing at temperatures of 180-200 °C for final arti- cleLuxury Vinyl Tile (LVT): Multi layer product, different layers have different concentration of plasticizer.			
Chemical concentration:	Homogenous Flooring: 15-20 wt%Roofing membrane: 30-40 wt%Luxury vinyl tile (LVT): up to 20 wt%			
<b>EVALUATION</b>				
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 building and construction materials, 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	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 is addressed by giving concentrations for multiple products, uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	HPP,, ACC (2023). ACC High Phthalates Panel response to the US EPA information request dated September 5, 2023 relevant to the DINP and DIDP risk evaluations.			
<b>HERO ID:</b>	11328016			
<b>Conditions of Use:</b>	Ink, toner, and colorant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Formulation, simple mixture			
Chemical concentration:	In theory DINP may be used in some PVC plastisol inks for some textile printing, however, given the wt% limit (next column), it is not used in practice: limit of DINP in textiles to <0.1 wt% (Oeko-Text standard)			
<b>EVALUATION</b>				
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 ink, toner, and colorant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative 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	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	HSDB, (2015). Diisononyl phthalate (CASRN: 28553-12-0).
<b>HERO ID:</b>	2356022
<b>Conditions of Use:</b>	manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Production volumes for DINP reported under the Inventory Update Rule: 1986 - >1 million - 10 million; 1990 - >10 million - 50 million; 1994 - >10 million - 50 million; 1998 - >10 million - 50 million; 2002 - >10 million - 50 million
Life cycle description:	Majority (eg 95%) of DINP is used in PVC applications. More than half of the DINP used in non-PVC applications involves polymer-related-uses (eg rubbers). The non-PVC uses are: adhesives and glues (mainly for the industry for transport equipment as well as the industry for wood and wood products), dyestuffs and pigments, paints and varnishes (printing industry and metal coating industry) as well as sealing compounds (industry of transport equipment and construction industry). DINP in PVC end use includes: Calendering—film, sheet and coated products & flooring, roofing, wall covering; Extrusion—hose and profile, wire and cable, and clear, medical, film; Injection molding—footwear and miscellaneous; Plastisol spread coating—flooring and general (coated fabric, wall covering, etc); Other plastisol applications—car undercoating and sealants, slush/rotational molding etc. DiNP is primarily used to produce flexible plastics and has replaced DEHP in some plastics, though not in medical products. DiNP is widely used in such products as toys, flooring, gloves, drinking straws, garden hoses, and in sealants used for food packaging.
Process description:	DINP is produced by esterification of phthalic anhydride with isononyl alcohol in a closed system. Isononyl alcohol used in the synthesis of DINP is produced via the dimerization of butene. The reaction rate is accelerated by elevated temperatures (140-250 °C) and catalyst. Following virtually complete esterification, excess alcohol is removed under reduced pressure and the product is then typically neutralized, water washed and filtered. DINP-1 is manufactured from octene that is converted to alcohol moieties consisting mainly of 3,4-, 4,6-, 3,6-, 3,5, 4,5-, and 5,6-dimethyl-heptanol-1. DINP-2 is produced from n-butene that is converted primarily to methyloctanols and dimethylheptanols. The ACC has stated that although DINP is a complex substance, it is not variable due to the stability of the alcohol manufacturing process. The two types of DINP are considered commercially interchangeable. (pg. 3)
Number of sites:	As per 2012 manufacture and production data (non-CBI), 1 company was manufacturing, and 10 companies were importing.
Chemical concentration:	Concentrations of more than 0.1 percent of DINP are not allowed in any children's toy that can be placed in a child's mouth or in childcare articles.

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	Medium	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 and uncertainty in the results.

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Study Citation:	HSDB, (2015). Diisononyl phthalate (CASRN: 28553-12-0).		
HERO ID:	2356022		
Conditions of Use:	manufacturing		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	Illbruck., Tremco (2017). Safety data sheet: Tremco JS443 A.			
<b>HERO ID:</b>	6984638			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10-<20%			
<b>EVALUATION</b>				
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	Medium	Product is from France, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Illbruck,, Tremco (2017). Safety data sheet: Tremco JS443 B.		
<b>HERO ID:</b>	6984642		
<b>Conditions of Use:</b>	Adhesive/Sealant		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	30-<50%		
<b>EVALUATION</b>			
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	Medium	Product is from France, an OECD country.
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Illbruck., Tremco (2015). Safety data sheet: Illbruck SP036.			
<b>HERO ID:</b>	6984652			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	20- <30%			
<b>EVALUATION</b>				
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	Medium	Product is from Germany, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Illbruck., Tremco (2016). Safety data sheet: Illbruck SP523.			
<b>HERO ID:</b>	6984653			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10- <20%			
<b>EVALUATION</b>				
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	Medium	Product is from Germany, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Industries, P.S. (2016). PSI PolyClay Canes and PSI PolyClay Bricks.			
<b>HERO ID:</b>	6302544			
<b>Conditions of Use:</b>	Non-PVC Material Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	PSI PolyClay Canes and PSI PolyClay Bricks contain <= 2.5% DINP			
<b>EVALUATION</b>				
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 Non-PVC Material Converting, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative 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	Medium	The SDS indicates less than or equal to 2.5% DINP, but the uncertainty in the concentration is not described.
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	Industries,, S.P. (2018). Material safety data information: Softsand.			
<b>HERO ID:</b>	6984557			
<b>Conditions of Use:</b>	Non-PVC Material Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	4%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	SDS information is primary data from the supplier; however, it appears to have quality issues (typed without formatting by someone at company).
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.
<b>HERO ID:</b>	10293367
<b>Conditions of Use:</b>	Processing: Plasticizers

### EXTRACTION

Parameter	Data
Life cycle description:	DINP is used as a plasticizer in Sika Corporation's PVC products to provide properties that relate to durable flexibility and workability for the application.
Process description:	<p>PVC Dry Blend Mix PlantsThe Facility has three dry mix plants which prepare compounded PVC materials for use in extrusion on both production lines. Each of the dry mix plants consists of a ribbon mixer where liquid DINP is mixed with dry ingredients and the mixer is then closed and heated to approximately 200°F, followed by gravity transfer to a second ribbon mixer where additional ingredients are added, the unit is closed, and the blend is cooled to approximately 130°F. The cooled blend is then transferred pneumatically to a solid particulate storage silo or dropped by gravity into a day bin that is moved by fork truck for further processing in either the Extrusion and Laminating Line or in the Plastisol Line. Production reports that dry blend products contain a range of 3-24% DINP with a typical average of 18%; however we make the assumption in our calculations that the dry blend particulates contain an average of 24% DINP to develop conservative, high end estimates of release quantities and exposures.</p> <p>Plastisol Mix PlantThe Facility has a wet plastisol mixing station where compounded PVC plastisol is made for use in coating on the plastisol line. The plastisol mix plant consists of a single mixer where liquid DINP is mixed with dry ingredients to form a liquid solution blend. The liquid blend is then mechanically deaerated under vacuum in a Versator to remove trapped air, and transferred by pump into a holding tank for further processing in the Plastisol Line. Production reports that plastisol contains a range of 13-35% DINP with a typical average of 20%; however we make the assumption in our calculations that the dry blend particulates contain an average of 25% DINP to develop conservative, higher end estimates of release quantities and exposures.</p> <p>Extrusion and Laminating LineThis production line is an inline compounding, extrusion lamination line consisting of twin screw extruders, extrusion lamination stations, a post extrusion lamination station, a lacquer coating station, a lacquer drying oven, and an inline windup station. In the extrusion and laminating production line, PVC dry blend containing DINP is transferred into a charge hopper for extrusion, along with recycled PVC roofing pellets with DINP from its original manufacture that are supplied to Sika Corporation from an off-site recycler. Starting with a fabric substrate a back layer of PVC is melt extruded onto the fabric, followed by a top layer applied by a second extruder. A vacuum system is used to remove vapors from the extruder melt at temperatures of approximately 250°F and those vapors are vented to the thermal oxidizer system. The extruders operate at final melt temperatures of approximately 350-400°F. The extruded product is cured by cooling as it passes over temperature-controlled drums prior to lacquer application. Subsequent processing steps include a spread coating system that can be used to apply a protective lacquer finish on the membrane, a high temperature oven which dries the lacquer coating at approximately 240°F, a laminating station where some products are heated to 350°F for fusion of the softened PVC to a felt layer, and mechanical embossing and laser etching devices which apply the brand logo and date stamp to selected products. The product is then further cooled, inspected for quality control, trimmed at the edges, and wound up as finished product.</p> <p>Plastisol LineThe plastisol production line is a cast film extrusion and plastisol-coating line. The cast film portion of this production line consists of two extruders, an extruder station, a lacquer coating station in-line with an infrared drying oven, a high temperature oven, and a wind-up station. This cast film process produces a PVC film that is then used as a substrate for coating with plastisol to build layers fused with felt to create the layered membrane. PVC dry blend containing DINP is transferred to an extruder and a two-layer film of PVC is extruded with a multicavity die onto a fabric substrate. A vacuum system is used to extract vapors from melt in the extruder barrels and those vapors are vented to the thermal oxidizer system. The extruders operate at final melt temperatures of approximately 350-400°F. A spread coating system can be used to apply a protective lacquer finish on the cast film which is then dried in an oven at approximately 240°F. The lacquer coated product is cooled by passing over temperature-controlled drums, wound up on rolls and brought to the next section of the production line for further processing. After lacquer coating, liquid plastisol PVC is spread onto the cast film at ambient temperature in the plastisol coating station and textile reinforcement is integrated into the wet plastisol. The membrane is then heated to about 300°F on a temperature-controlled drum that causes the plastisol to cure. The membrane then cools to approximately 130°F. A second coating of plastisol PVC is spread onto the reinforced side of the membrane to create a back layer, and the membrane then enters a heated curing oven where the product is again heated to about 300°F. An extended zone in the oven allows certain products to be heated to approximately 340°F for melt fusion with an additional felt layer. Alternatively, a "peel and stick" layer might be applied to the back of the membrane. The product is then cooled, inspected for quality control, trimmed at the edges, and wound up as finished product. At the end of a shift, the leading edge of a sheet of scrim fabric is adhered to the end of the membrane feeding into the extruder using a coating of leader paste containing a mixture of plasticizer and plastisol dust collector waste. This paste is prepared in 5-gallon batches once every 2-4 weeks. The scrim fabric is not coated; and, is used to pull the leading edge of membrane through the machine at the start of the next shift. The plastisol coating station is manually cleaned by workers at the end of each production shift. Scrap Regrinding Scrap from off-specification membrane and edge trimming is recycled on-site with processing through a grinding system. Ground PVC chips are separated from lighter fabric fibers by air classification in an enclosed system to recover the heavier fraction for reuse on the extrusion line. The fabric and felt fractions ("fluff") containing some residual PVC is disposed off-site.</p>

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<b>Study Citation:</b>	Irwin, J. A. (2022). Letter from IRWIN Engineers, Inc with information regarding DINP usage by Sika Corporation.
<b>HERO ID:</b>	10293367
<b>Conditions of Use:</b>	Processing: Plasticizers

Domain	Metric	EVALUATION Rating	Comments
Throughput:	Sika Corporation is a manufacturer of PVC roofing membranes with a total facility production capacity of 20.5 million square meters per year (approximately 90% extrusion product and 10%plastisol product).		
Chemical concentration:	Production reports that dry blend products contain a range of 3-24% DINP with a typical average of 18%. Production reports that plastisol contains a range of 13-35% DINP with a typical average of 20%.		

Domain	Metric	EVALUATION 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	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	High	Uncertainty is addressed by discussing limitations and variability is addressed by discussing multiple processes where DINP is used.

## Overall Quality Determination

## High

<b>Study Citation:</b>	ITW Inc., (2018). Safety data sheet: Spotcheck ® SKL-SP2.			
<b>HERO ID:</b>	6984562			
<b>Conditions of Use:</b>	Incorporation into Other Formulations, mixtures, or reaction products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10 - 20%			
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	Medium	Product is from the UK, an OECD country.
	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			Medium	

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:	manufacturing			
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).			
Chemical concentration:	The concentrations of phthalates that provoked a statistical increase in antibodies in response to one booster of ovalbumin include DiNP, 200 $\mu\text{g/mL}$ (IgE) and 200 $\mu\text{g/mL}$ (IgG1). Exposure of mice to 200 $\mu\text{g/mL}$ DiNP following a single booster of ovalbumin produced non-concentration dependent increased levels of IgG1 and IgE. Furthermore, increasing the concentration of DiNP, from 200 to 2,000 $\mu\text{g/mL}$ ) caused a decrease in antibody production.			
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 an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. PV data from another part of the world is not likely to be used
	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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4683362			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	108 million pounds (2012)			
<b>EVALUATION</b>				
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	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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7976686			
<b>Conditions of Use:</b>	Disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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:	DINP was detected in surface sediment at a range of 33.4-19,200 ng/g with a mean of 826+-2510 ng/g. (4/8)			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Uninformative</b>		

<b>Study Citation:</b>	Koch, H. M., Angerer, J. (2011). Phthalates: Biomarkers and human biomonitoring. Issues in Toxicology 9:179-233.			
<b>HERO ID:</b>	5533904			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In 2008, more than 5 million tons of phthalates were used as plasticizers worldwide. Of the phthalates used, 50% are used in Asia, 20% in Western Europe and 16% in North America. Over the previous 10 years (from when the article was written) the total volume of phthalates used in Western Europe remained stable at around 1 million tons. DINP in 2008 had a market share of 38% and its previous 1998 value was 17%. Figure 3A.1 provides consumption data for phthalates in kt/yr. In 2008, DINP worldwide production was 1.3 million tons per year with total market share of 25%. (Pages 3 - 4 of 55)			
Life cycle description:	Typical products containing phthalates 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. (page 1 of 55)			
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 DINP.	
	Metric 4: Temporal Representativeness	Medium	Relevant data 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	Low	Addresses variability by looking at various phthalates consumption over a 20 year period. Does not address uncertainty.	
Overall Quality Determination		Medium		



<b>Study Citation:</b>	Koch, H. M., Angerer, J. (2011). Phthalates: Biomarkers and human biomonitoring. Issues in Toxicology 9:179-233.			
<b>HERO ID:</b>	5533904			
<b>Conditions of Use:</b>	Processing as a plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Within soft PVC, the plasticizing phthalate content can be up to 40%			
<b>EVALUATION</b>				
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 DINP.
	Metric 4:	Temporal Representativeness	Medium	Relevant data 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	Low	Addresses variability by looking at various phthalates consumption over a 20 year period. Does not address uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	787918
<b>Conditions of Use:</b>	Car manufacturing - cold plastisol application

EXTRACTION	
Parameter	Data
Production, import, or use volume:	4.6 million tonnes of DEHP, DINP, DIDP, and DPHP used worldwide in 2008
Process description:	Plastisol is sprayed by robots on the welding seams of the raw car bodies. The refinishing of the pastisol seams was performed by workers with a brush or finger. Cars were then painted and heated to dry and cure the plastisol.
Chemical concentration:	20 to 30 wt% in plastisol

		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.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S. (Germany).
	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 (source is dated 2012).
	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 information is mostly specific to the investigated site but does provide some information that addresses variability in DINP use and uncertainty is well characterized

## Overall Quality Determination

**High**

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	6825427		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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)		
<b>EVALUATION</b>			
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	High	Data are for domestic 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	Sample distribution characterized by limited statistics (production values) but discrete samples not provided and distribution not fully characterized. Not specific to DINP
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

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:	Typically, cables are used in such systems in the form of wire harnesses, whichgenerally 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:	The process involves the simultaneous extraction of a plasticizer and the removal of the PVC coating from Cu wires by the physical impact of balls in the presence of a solvent, constituting a one-pot wet ball-milling method. The process swells the PVC coatingin n-butyl acetate, acetone, or ethyl acetate. (7/9)		
Chemical concentration:	To impart chemical and physical stability and enhance flexibility in the cable coating, the PVC may also contain 20–40 wt % diisononyl phthalate (DINP). (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 DINP, 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 including a range of concentrations. Uncertainty is not addressed.
Overall Quality Determination		High	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	4141956
<b>Conditions of Use:</b>	Plastics Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	About 80% of phthalates consumed in the world are o-phthalates: di(2-ethylhexyl) phthalate (dioctyl phthalate, DOP), diisononyl phthalate (DINP), and diisodecyl phthalate (DIDP) (pg. 3)
Process description:	Plasticizers do not react chemically with macromolecular compounds, but are incorporated into the polymer matrix, making it elastic, decreasing the processing temperature and the melt viscosity, and enhancing the dielectric properties of articles and their resistance to heat, frost, water, and organic media. Ester plasticizers are prepared by esterification of carboxylic acids or their anhydrides with alcohols in the presence of catalysts at elevated temperature (130– 270°C) with simultaneous azeotropic distillation of the released water with alcohol to shift the reaction equilibrium toward ester formation. (pg. 1)

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 (Russia), 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	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 (source is from 2015).
	Metric 5:	Sample Size	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents 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. Uncertainty is not discussed.

## Overall Quality Determination

**Medium**

<b>Study Citation:</b>		LANXESS, (2016). Safety data sheet: Biochek 8064.			
<b>HERO ID:</b>		6984565			
<b>Conditions of Use:</b>		Plastics compounding			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		71 - 77%			
		<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>			

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	4730751		
<b>Conditions of Use:</b>	Laboratory reagent		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	100% in laboratory reagent (page 3 of 12)		
<b>EVALUATION</b>			
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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	6959335			
<b>Conditions of Use:</b>	Disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	DINP mean concentrations: Domestic WWTPs: 22,000 ng/g sludge Mixed WWTPs: 17,000 ng/g sludge Industrial WWTPs: 26,000 ng/g sludge			
<b>EVALUATION</b>				
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 Korea, an OECD country.
	Metric 3:	Applicability	High	Data are for the disposal of phthalate-containing wastes, an in-scope occupational sce- nario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (ranges, means, number of sam- ples) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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 at residential and industrial WWTPs.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	Lerner, I. (2005). European plastics industry moves from 2-EH, DEHP. Chemical Market Reporter 267(26):26-27.			
<b>HERO ID:</b>	7978846			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In 2003, global sales of plasticizers were estimated to be roughly \$4.9 billion, and the global plastic additives industry was worth about \$14.8 billion, representing nearly 18 billion pounds. About 70 percent of the plasticizer market volume is phthalates, (1/2). U.S. accounts for 16% of global plasticizers(2/3) DEHP, dibutyl phthalate (DBP) and benzyl butyl phthalate (BBP) were banned from children’s toys. BASF says it will offer its customers diisononyl phthalate (DINP) and di-propyl heptyl phthalate (DPHP) plasticizers as substitutes. (1/2)			
Life cycle description:				
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 global, but EU and US data are the main focus of the article.
	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	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 limited statistics (percentages, production values) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Lewandowski, K., Skórczewska, K. (2022). A brief review of poly(vinyl chloride) (PVC) recycling. Polymers 14(15):3035.			
<b>HERO ID:</b>	10778266			
<b>Conditions of Use:</b>	Recycling			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Methods of PVC recycling, including mechanical recycling and feedstock recycling, are discussed on PDF Pg. 3-8.			
<b>EVALUATION</b>				
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
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	4259743		
<b>Conditions of Use:</b>	Textile Dyeing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Throughput:	Table 1 (pg. 3) provides textile material, design capacity (m3/d), operating capacity (m3/d), total hydraulic retention (hrs), filling and aeration time (h), settling time (h) for four plants.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	High quality data 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 (China), and locality-specific factors (e.g., potentially greater differences in 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 is generally no more than 10 years old (published in 2017).
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by maximums with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	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 by investigating 4 different plants and discussed uncertainty in the results.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3072211			
<b>Conditions of Use:</b>	Use of Building/construction materials			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In the last decade, the global production of phthalates has increased from 3.5 to 6.0 million tons/yr. (pg. 1/9)			
Chemical concentration:	DINP concentration in 2 out of 6 vinyl flooring samples analyzed were 0.2 and 0.05 mg/mg. The DINP concentration in the remaining samples were below detection level. (Table 3, pg 5/9)			
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	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		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:	Manufacturing		
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. (pg. 1/10)		
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. Data are global.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Sources cited in the article indicate that the info is at least 10 yrs old (2009 and 1996).
	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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	2346023			
<b>Conditions of Use:</b>	Processing: Incorporation into formulation, mixture, or reaction product (PVC Flooring)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	20 ± 3% in the studied PVC flooring (Table 1)			
<b>EVALUATION</b>				
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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3015875			
<b>Conditions of Use:</b>	Vinyl flooring			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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 S3, DINP content from 0.01% to 26.5% for vinyl flooring. Other phthalates (DEHP) are also measured.			
Comments:	Report contains estimation of air diffusivity and mass transfer coefficients(table S4 & S5). .			
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.
	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	

<b>Study Citation:</b>	Limited., C.N. (2017). Safety data sheet: CT1 Colours (Excluding Silver).			
<b>HERO ID:</b>	6984708			
<b>Conditions of Use:</b>	Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10-<30%			
Physical form:	Pasty			
<b>EVALUATION</b>				
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	Medium	Product is from Ireland/UK, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	Limited,, U.A. (2019). Safety data sheet: U-Pol Tiger Seal - Grey.			
<b>HERO ID:</b>	6984664			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	5-23%			
<b>EVALUATION</b>				
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	Medium	Product is from Australia, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Lord Corporation, (2018). Safety data sheet: FUSOR 800DTM.			
<b>HERO ID:</b>	6984568			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25-30%			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Lott, S. (2014). Phthalate-free Plasticizers in PVC.			
<b>HERO ID:</b>	7323639			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	LCD: Plasticizers are added to PVC to make it flexible, but since they are not tightly bound to the PVC molecules, they migrate from PVC products. (4/26)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for the use of plasticizers in building materials, 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	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	This metric is not applicable to the data being extracted
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Lowell Center for Sustainable Production at the University of Massachusetts, (2011). Technical briefing: Phthalates and their alternatives: Health and environmental concerns. :23.		
<b>HERO ID:</b>	5349749		
<b>Conditions of Use:</b>	Use as plasticizer		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Life cycle description:	DINP is primarily used as a plasticizer for PVC. Used in Teethers, rattles, balls, spoons, toys, gloves, drinking straws, rubber, adhesives, ink, sealant, paints and lacquers, food and food related uses, clothes, shoes, car and public transport interior. (Table 1 on p. 5 of 24).		
Chemical concentration:	PVC products may contain up to 50 percent by weight of plasticizers, most commonly phthalates. (p. 4 of 24).		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Ltd., C.&. (2016). Safety data sheet: Brewers Premium Decorators’ Caulk.			
<b>HERO ID:</b>	6984709			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	5 - <10%			
<b>EVALUATION</b>				
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	Medium	Product is from the UK, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Ltd., E.P. (2015). Black 615, Material Safety Data Sheet.		
<b>HERO ID:</b>	6836850		
<b>Conditions of Use:</b>	Non-PVC Material Converting		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	>60% bis(3,5,5-trimethylhexyl) phthalate		
<b>EVALUATION</b>			
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	Medium	Product is from Australia, an OECD country.
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	4728432			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	The global annual production of phthalates is estimated to be 11 billion pounds (Sirivarasai et al. 2013).			
Life cycle description:	PVC, inks, paints, and sealants (instead of DEHP)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	High quality data that are 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 (China), 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	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 (2017).
	Metric 5:	Sample Size	N/A	Mostly qualitative information
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 uncertainty with extracted data, variability is not applicable for global production volume or life cycle description.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	680058			
<b>Conditions of Use:</b>	Manufacture			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	US production (1987): 74.84 kT; Western Europe production: 45 kT; EEC production: 80-100 kT			
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	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 giving production volumes for multiple countries but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b> Mach-Dynamics, (2014). Safety data sheet: A-A-529 Adhesive and Sealing Compound.	
<b>HERO ID:</b> 6984569	
<b>Conditions of Use:</b> Adhesives and Sealants	
<b>EXTRACTION</b>	
<b>Parameter</b>	<b>Data</b>
Chemical concentration:	>3%
Physical form:	Liquid
<b>EVALUATION</b>	
<b>Domain</b>	<b>Metric</b>
<b>Rating</b>	<b>Comments</b>
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 2014, 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.
<b>Overall Quality Determination</b>	<b>High</b>

<b>Study Citation:</b>	Megaloid, (2013). Safety data sheet: Diisononyl phthalate.			
<b>HERO ID:</b>	6984587			
<b>Conditions of Use:</b>	Plastics compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	100%			
		<b>EVALUATION</b>		
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	Medium	Product is from Canada, an OECD country.
	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 2013, 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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	11360398			
<b>Conditions of Use:</b>	Plastics Compounding and Converting			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	44 Mt of plastic waste managed in 2019.			
Life cycle description:	Of the estimated 44 Mt of plastic waste managed in 2019 domestically, approximately 86% was landfilled, 9% was combusted, and 5% was recycled.			
Number of sites:	2904 active landfills and 99 combustion facilities			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from primary sources (peer reviewed articles) and there are no quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	The report is for recycling (of plastics), an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Report is from 2022, which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Samples are characterized by uncertain statistics, such as percentages and totals.	
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	Medium	Variability is addressed by comparing releases of various plastic types and disposal methods. Uncertainty isn't addressed.	
Overall Quality Determination		High		

<b>Study Citation:</b>	Nazdar Company, (2015). Safety data sheet: Avery Dennison 4930 Series Screen Ink.			
<b>HERO ID:</b>	6984692			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<0.5%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	NICNAS, (2015). Diisononyl phthalates and related compounds: Human health tier II assessment.			
<b>HERO ID:</b>	3687925			
<b>Conditions of Use:</b>	Plasticizer in plastic material and resin manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	commercial uses include automotive products, cable insulations, laminations, sheets, film, adhesives, surfactants, printing inks for T-shirts; polyvinyl chloride (PVC) and polymer-related products for indoor use such as gaskets, gumboots, vinyl flooring, and carpetbackings; and children’s PVC toys and childcare articles (in imported articles)			
Chemical concentration:	The average concentration of DINP in PVC is 13-16% by weight. (7/13)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources (NICNAS).
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	High	Assessment is based on current industry conditions and data no more than 10 years old (information cited 2014).
	Metric 5:	Sample Size	Medium	Sample distribution 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	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Nova Scotia Company, (2018). Quick-Cure Primerless HV Urethane U418HV.			
<b>HERO ID:</b>	6984590			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	> 15.0 - < 25.0 %			
<b>EVALUATION</b>				
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	Medium	Product is from Canada, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	680097			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Recent information indicates that approximately 178 million kilograms (392 million pounds) of DINP were used in the United States in 1998. (6/153) Table 2 contains US consumption values for each end use (17/153)			
Life cycle description:	End uses included: film and sheet (stationary and wood veneer, pool liners, other), flooring (tiles, sheets), artificial leather, coated fabrics (tarps, conveyor belts, other), dip coating/slush molded (gloves, toys, traffic cones, other), tubings and profiles (profiles, garden hoses), wire and cables, shoe/shoe soles, under body coating, sealants (carpet backing).			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources (e.g., NTP).
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for the processing of plasticizers, 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 (production value) 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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	680097			
<b>Conditions of Use:</b>	Toys, playground, and sporting equipment			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	DINP content has been measured at 15.1–54.4% dry weight in 31 toys (7), and 3.9–44% dry weight in 27 of 42 toys tested. (36/153)			
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	Low	Data are for consumer use of toys and equipment, which is similar to the in-scope occupational scenario of fabrication of final products from articles.
	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	Uncertainty is addressed by describing the need for more human data and including public comments. Variability is not addressed.
Overall Quality Determination		Medium		



<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	680097			
<b>Conditions of Use:</b>	Domestic Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	DINP-1 is manufactured from octene that is converted to alcohol moieties consisting mainly of 3,4-, 4,6-, 3,6-, 3,5, 4,5-, and 5,6-dimethyl-heptanol-1. DINP-2 is produced from n-butene that is converted primarily to methyloctanols and dimethylheptanols. (16/153)			
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 domestic 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	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	

<b>Study Citation:</b>	O’Sullivan Films Inc. (2016). ”IL” PVC Compact Sheet, [Safety Data Sheet].			
<b>HERO ID:</b>	6847039			
<b>Conditions of Use:</b>	Plastics Converting			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<40%			
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	

<b>Study Citation:</b>	OECD, (2018). Socio-economic assessment of phthalates.			
<b>HERO ID:</b>	7681900			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	The phthalate plasticizer market currently stands at around 5.5 million tonnes per year. (15/90)			
Process description:	Phthalates are esters of phthalic acid, made by reacting phthalic anhydride with alcohols from methanol and ethanol to tridecyl (C13) alcohol. (15/90)			
Chemical concentration:	Phthalates can contribute as much as 50% of the weight of PVC materials. (15/90)			
<b>EVALUATION</b>				
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 is from an OECD report.	
	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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	OEHHA, (2013). Proposition 65, Carcinogen Identification Committee (CIC) transcripts from 12/5/2013 hearing.			
<b>HERO ID:</b>	10217511			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Among the 10 individual phthalates, DINP has the highest production volume with the American Chemistry Council predicting annual world production of DINP to be 1.5 million metric tons in 2013.			
Life cycle description:	DINP is a general purpose plasticizer used in a variety of PVC products, including vinyl flooring, undercoatings for cars, roofing materials, and more. It's also used in non-PVC products like rubbers, inks, and sealants. DINP is used in limited food packaging materials, and it is not used in medical applications.			
Process description:	DINP is produced by multiple processes. And these different production processes yield isomeric mixtures with various CAS numbers, but the general structure is shown here. DINP is an isomeric mixture consisting of a branched alkyl diester of either 8, 9, or 10 carbons, with the bulk of the mixture containing 9 carbons. Isomeric mixtures of DINP produced by different production processes are considered commercially interchangeable and are being considered for listing today.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The report is a transcript, not a published report. Transcript is from OEHHA, which is 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	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	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		

<b>Study Citation:</b>	OEHHA, (2016). Issuance of a safe use determination for exposure to professional installers to diisononyl phthalate in vinyl flooring products.
<b>HERO ID:</b>	10472400
<b>Conditions of Use:</b>	Vinyl flooring installation

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Vinyl flooring products (in sheets or tiles) account for 12.1% market share of US floor covering sales (Catalina Research, 2013). The reported distribution of end-use applications of resilient flooring sales in the US in 2013 are as follows: residential replacement (48%), educational and institutional (17%), new residential (11%), retail (8%), health care (7%), and offices (6%).
Process description:	Vinyl flooring is defined by RFCI as a non-textile flooring material consisting of polyvinyl chloride (PVC), pigments, plasticizers (such as DINP), fillers (e.g., limestone), extenders, and stabilizers to protect against heat and light deterioration. DINP is added intentionally to vinyl flooring materials because it makes the PVC soft and flexible and imparts resiliency and comfort to the flooring products. Vinyl flooring often contains recycled materials, such as older PVC materials that commonly contain DINP or other plasticizers. The recycled content of finished vinyl flooring products ranges from 12% to 50%. Vinyl flooring products often last for over 30 years. Four categories of vinyl flooring products, containing different amounts of DINP, are included in this SUD request by RFCI. Each category of vinyl flooring products may be manufactured by different companies. RFCI describes these categories as follows: 1. Heterogeneous Vinyl Flooring (in sheets): This is typically available in 6- or 12-foot wide rolls, and consists of multiple layers (from bottom to top: backing layer, reinforcement layer, pattern layer, and wear layer/finish). It is manufactured with PVC resin, pigments, plasticizers, fillers, extenders, stabilizers, and backing materials (felt or glass fiber). The total thickness of heterogeneous vinyl flooring ranges from 1.1 to 3.8 millimeters (mm), and the thickness of the wear layer ranges from 0.2 to 0.64 mm. 2. Homogeneous Vinyl Flooring (in sheets): This is typically available in 6- or 12-foot wide rolls, and consists of a single layer, with a uniform structure and composition from top to bottom, with a clear top layer coating. It is manufactured with PVC resin, pigments, plasticizers, fillers, extenders and stabilizers. The thickness of these products is typically 2 mm. 3. Vinyl Tile: This is typically available in 1 foot by 1 foot squares and may be constructed as either a single layer (Solid Vinyl Tile) or multiple layers (Luxury Vinyl Tile). The multiple layers of Luxury Vinyl Tile are, from bottom to top: a backing layer, a pattern layer and a wear layer. Vinyl tile is manufactured primarily from limestone with a smaller amount of PVC resin, plasticizers, pigments, stabilizers, and in some cases, fiberglass. The thickness of the products ranges from 2 to 5 mm. The thickness of the wear layer of luxury vinyl tiles ranges between 0.078 to 1 mm. 4. Vinyl Composition Tile: This is typically available in 1 foot by 1 foot squares consisting of a single layer made primarily from limestone with a smaller amount of PVC, resin, plasticizers, pigments and stabilizers. The thickness of the products ranges between 2.4 to 3.2 mm. Some vinyl flooring products may also have a top coating of either urethane or acrylate. RFCI characterizes the urethane and acrylate coatings as impervious to DINP. RFCI suggests these coatings can prevent or greatly reduce DINP migration out of the top surface of vinyl flooring products.
Chemical concentration:	RFCI reports that the DINP content in heterogeneous vinyl flooring varies from 3.5% – 22.0% by weight of the product, with an average DINP content of 21.2%. RFCI reports that the DINP content in homogeneous vinyl flooring varies from 14% -19% by weight of the product, with an average plasticizer content of 15.6%. RFCI reports that the DINP content in vinyl tile varies from 6% - 21% by weight of the product, with an average plasticizer content of 7.3%. RFCI does not report the range of DINP content in vinyl composition tile, but notes that some products have as little as 0.07% DINP. RFCI reports the average plasticizer content as 3.5% by weight of the product.

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium
			The assessment or report uses high quality data that are not from a frequently used source and associated information does not indicate flaws or quality issues.
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.

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<b>Study Citation:</b>		OEHHA, (2016). Issuance of a safe use determination for exposure to professional installers to diisononyl phthalate in vinyl flooring products.		
<b>HERO ID:</b>		10472400		
<b>Conditions of Use:</b>		Vinyl flooring installation		
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 4:	Temporal Representativeness	High	The report was published in 2016 but data sources and respective year are not fully transparent, assume based on year of report that data 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 of product concentrations is addressed by including an evaluation of various types of vinyl flooring, but measurement uncertainty of product concentrations is not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>		Polygem (2015). Polyfoam SLV, Material Safety Data Sheet.			
<b>HERO ID:</b>		6836845			
<b>Conditions of Use:</b>		Adhesive/Sealant			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		<15%			
		<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>High</b>			

<b>Study Citation:</b>	Polyone (2018). 186CGNSPL PANTONE(R) 186 C SIMULATION [Safety Data Sheet].			
<b>HERO ID:</b>	6847117			
<b>Conditions of Use:</b>	Plastics compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25-50%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	PolySol, (2017). PM600-002.			
<b>HERO ID:</b>	6984596			
<b>Conditions of Use:</b>	Plastics Compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25-40%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Porelon (2007). Porelon Red SP Premix, Material Safety Data Sheet.			
<b>HERO ID:</b>	6836848			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	15-20%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Premier Aerosol Packaging Inc., (2017). Safety data sheet: RAL 9010 White Aerosol.			
<b>HERO ID:</b>	6984600			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1-1%			
<b>EVALUATION</b>				
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	The report is for 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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Prime-Line, (2015). Serrated PVC Spline.			
<b>HERO ID:</b>	6984601			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	14%			
Physical form:	Solid flexible vinyl thermoplastic			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Products,, Castle (2016). Safety data sheet: Castle Cast Iron Gray Paint.			
<b>HERO ID:</b>	6984713			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-5%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Products,, DAP (2019). Safety data sheet: 3.0 Window, Door, Trim & Siding Sealant - Crystal Clear.			
<b>HERO ID:</b>	6836835			
<b>Conditions of Use:</b>	Adhesive/Sealant			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.5-1.5%			
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 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		

<b>Study Citation:</b>		Products,, DAP (2015). Safety data sheet: SIDE Winder Advanced Polymer Sealant – All Colors.			
<b>HERO ID:</b>		6984718			
<b>Conditions of Use:</b>		Adhesive/Sealant			
<b>EXTRACTION</b>					
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		1-2.5%			
<b>EVALUATION</b>					
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.
<b>Overall Quality Determination</b>			<b>High</b>		

<b>Study Citation:</b>	Radian Corp, (1989). Environmental analysis for the Shell Martinez RM-17 incinerator, with cover letter dated 3/15/1991 (sanitized).			
<b>HERO ID:</b>	1335691			
<b>Conditions of Use:</b>	Waste treatment - Incineration			
EXTRACTION				
Parameter	Data			
Process description:	Liquid waste from a refinery is feed into the incinerator at one gallon per minute. The firebox temperature is 1,400 - 1,800 F. Air pollution control equipment includes a quench column to cool hot combustion gases, a venturi scrubber for control of particulate matter, a packed bed wet scrubber for acid gas control, and a mist eliminator. Combustion gases exit the incinerator system through a 100-foot stack.			
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	The report is for an occupational scenario within the scope of the risk evaluation. Includes general process description information but not specific to DINP
	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	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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			Medium	



<b>Study Citation:</b>	Redox, (2019). Diisononyl phthalate (DINP).			
<b>HERO ID:</b>	6984603			
<b>Conditions of Use:</b>	Plastics compounding			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<=100%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.
<b>HERO ID:</b>	10472417
<b>Conditions of Use:</b>	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. In heterogeneous vinyl flooring, DINP comprises 21.2% of the plasticizer mass.

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	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	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**

<b>Study Citation:</b>	Rodgers, B., Tallury, S. S., Klingensmith, W. (2016). Rubber compounding. :1-60.			
<b>HERO ID:</b>	7324725			
<b>Conditions of Use:</b>	Plasticizers in rubber product manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Softeners, extenders, and plasticizers can affect the properties of rubber. The term plasticizer is used to denote the ability to act as an internal lubricant for processing purposes as well as for improving low temperature flexibility in the vulcanized product. The synthetic phthalates are the most effective in meeting low temperature flexibility while also serving as softeners, but cost limits their application. The main benefits of processing aids are (1) improve incorporation of fillers, (2) reducing mixing energies, (3) reducing internal friction for ease of milling, extruding, and calendering, (4) compatibilizing the different rubbers for improved processing as well as for better adhesion of one compound to a different compound in the vulcanized tire (compatibilizers have gained markedly in usage because of polarity differences of blended polymers), and (5) providing improved green tack (tackifiers) for better tire building. There is a definite trend in the industry to develop multifunctional materials with value-added properties. (55/60)			
<b>EVALUATION</b>				
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 plasticizers in rubber product manufacturing, an in-scope occupational scenario. However, document does not specifically mention DINP.
	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	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	This metric is not applicable to the data being extracted
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Salisbury, S. (1984). Health hazard evalution report, No. HETA-79-034-1440, Intex Plastics, Corinth, Mississippi.		
<b>HERO ID:</b>	6558526		
<b>Conditions of Use:</b>	Processing into paints and inks		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Process description:	(1) Calender, (2) Color, (3) Print, (4) Laminating, (5) the oven line, (6) FinishingCalender includes pre-mixing of raw materials then transferred to banbury mixers or farrell continuous mixer. The dough is discharged from the mixer onto a conveyer belt which feeds the dough into a mill at 325-370oF.A 2-3# strip of vinyl is then fed by conveyer to the top of a calender, which apply more heat and pressure to form a thin vinyl sheet. The sheet is threaded over and under a series of water filled cooling drums and wound into rolls 500-700 yards in length.Color department is a mixing area for solvents, pigments, and other color chemicals used for the production of expanded vinyl upholstery materials. Print department contains 5 printing machines for decorative printing. [more process description within source]		
Chemical concentration:	typical formulations contained 10-30 % of "DOP"(which could be DINP, DEHP or DOTP)		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data that are from frequently used sources (NIOSH HHE).
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The 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	Low	The 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	High	Report clearly documents its data sources, assessment methods, results, andassumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Sealants,, Hodgson (2014). Safety data sheet: Aquacaulk.		
<b>HERO ID:</b>	6984544		
<b>Conditions of Use:</b>	Adhesive/Sealant		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	5 - <10%		
<b>EVALUATION</b>			
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	Medium	Product is from the UK, an OECD country.
	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 November 2014, 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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>		Sealants,, Hodgson (2015). Safety data sheet: HS20.			
<b>HERO ID:</b>		6984547			
<b>Conditions of Use:</b>		Adhesive/Sealant			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		<10%			
		<b>EVALUATION</b>			
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	Medium	Product is from the UK, an OECD country.
		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.
<b>Overall Quality Determination</b>		<b>Medium</b>			

<b>Study Citation:</b>	Sealants,, Hodgson (2015). Safety data sheet: HS20 Clear.		
<b>HERO ID:</b>	6984549		
<b>Conditions of Use:</b>	Adhesive/Sealant		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	10-25%		
<b>EVALUATION</b>			
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	Medium	Product is from the UK, an OECD country.
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Sealants,, Hodgson (2015). Safety data sheet: HVAC - Acrylic Duct Sealant.		
<b>HERO ID:</b>	6984553		
<b>Conditions of Use:</b>	Adhesive/Sealant		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	<5%		
<b>EVALUATION</b>			
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	Medium	Product is from the UK, an OECD country.
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>	



<b>Study Citation:</b>	Sealants,, Tremco (n.d.). Safety Data Sheet (SDS): TremPro PU1000 Multipurpose Adhesive-12C.			
<b>HERO ID:</b>	11374517			
<b>Conditions of Use:</b>	Formulation of Adhesives and Sealants; and Application of Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Use and Formulation			
Chemical concentration:	DINP: 0.01 - <1%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Services,, S.P. (2019). Safety data sheet: SRW Vertical Instant Lock Adhesive.			
<b>HERO ID:</b>	6984561			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10 - 25%			
<b>EVALUATION</b>				
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	The report is for 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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>		Shat-R-Proof Corp., (2014). SRP 180 HV.			
<b>HERO ID:</b>		6984612			
<b>Conditions of Use:</b>		Adhesive/Sealant			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		10-30%			
		<b>EVALUATION</b>			
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 December 2014, 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.
<b>Overall Quality Determination</b>		<b>High</b>			

<b>Study Citation:</b>	Sika, (2019). Everbuild EB25 Crystal Clear.			
<b>HERO ID:</b>	6984611			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	>= 20 - < 25%			
<b>EVALUATION</b>				
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	Medium	Product is from the UK, 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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Sika, (2018). ClearSeal Glasklar.			
<b>HERO ID:</b>	6984613			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	>= 25 - < 40%			
<b>EVALUATION</b>				
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	Medium	Product is from Denmark, an OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Siroflex, (2016). DuoSil® Ultra.			
<b>HERO ID:</b>	6984614			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10-15%			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Skudo, (2013). Skudo Glass Advanced.			
<b>HERO ID:</b>	6984615			
<b>Conditions of Use:</b>	Paint/Coating			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10-20%			
<b>EVALUATION</b>				
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	The report is generally no more 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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Smooth-On, (2018). Safety data sheet: Urethane 2718 Part A.			
<b>HERO ID:</b>	6984548			
<b>Conditions of Use:</b>	Non-PVC Material Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<10%			
Physical form:	White liquid			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>		Smooth-On, (2018). Safety data sheet: Part A: PMC-790.			
<b>HERO ID:</b>		6984616			
<b>Conditions of Use:</b>		Non-PVC Material Converting			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		10-20%			
		<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>				<b>High</b>	

<b>Study Citation:</b>	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.			
<b>HERO ID:</b>	675435			
<b>Conditions of Use:</b>	Use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description: used as general purpose plasticizer; minor use as a dielectric fluid in capacitors as a replacement for PCBs				
<b>EVALUATION</b>				
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	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	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 report addresses variability and uncertainty in the results. Uncertainty is well characterized.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.			
<b>HERO ID:</b>	675435			
<b>Conditions of Use:</b>	Import			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		3.3 million pounds imported in US in 1976		
Number of sites:		2 distributors identified		
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	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	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	

<b>Study Citation:</b>	SRC, (1982). Information profiles on potential occupational hazards: Phthalates.			
<b>HERO ID:</b>	675435			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	100 million pounds produced in US in 1974			
Process description:	DINP is made by the esterification reaction of phthalic anhydride with isononyl alcohol			
Number of sites:	2 sites identified for manufacturing			
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	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	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		

<b>Study Citation:</b>	Stark, T. D., Choi, H., Diebel, P. W. (2005). Influence of plasticizer molecular weight on plasticizer retention in PVC geomembranes. Geosynthetics International 12(2):99-110.
<b>HERO ID:</b>	10218052
<b>Conditions of Use:</b>	Plasticizer

EXTRACTION	
Parameter	Data
Life cycle description:	Most PVC geomembranes contain plasticizers as an additive to increase the flexibility, softness, workability, pliability, and distensibility of the material. Examples of phthalate plasticizers are dioctyl phthalate (DOP), diisodecyl phthalate (DIDP) and diisononyl phthalate (DINP).
Process description:	Plasticization is classified into two types: internal plasticization and external plasticization (Mark and Gaylord 1964; Nass and Heiberger 1986; Wilson 1995). In internal plasticization, plasticizer molecules are attached to the polymer resin by primary bonds and incorporated as part of the polymer chain. Thus plasticizer retention is typically not a concern with internal plasticization because of the strong primary bonds. In external plasticization the small monomeric plasticizer molecules absorb into and adsorb onto the porous PVC polymer.
Chemical concentration:	A typical formulation for PVC geomembranes is about 60–65% of PVC resin, 30–35% of plasticizer, and 0–5% of other additives such as fillers and stabilizers (Hammond et al. 1993).

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 Canada.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but not specific to chemical.
	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. 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	The report provides only limited discussion of the variability but not uncertainty in the results.

## Overall Quality Determination

**Medium**

<b>Study Citation:</b>	Stewart, E. (2011). Air and wipe sampling for phthalates in a medical office building. 1:85-90.				
<b>HERO ID:</b>	7978848				
<b>Conditions of Use:</b>	Plastic and rubber products				
<b>EXTRACTION</b>					
<b>Parameter</b>	<b>Data</b>				
Life cycle description:	”They are used as softening agents in plastics, fromteething rings and rubber duckies to vinyl flooring and stain resistant fabrics, as well as perfumes,cosmetics and other personal care products (NTP 2006).” (PG. 2)				
Chemical concentration:	Walk-off mat material- 9.39% diisononyl phthalate (DINP) (pg. 2)				
<b>EVALUATION</b>					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses 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	
	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 yearsbut 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	Assessment or report clearly documents its data sources, assessment methods, results, andassumptions.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.	
<b>Overall Quality Determination</b>			<b>High</b>		

<b>Study Citation:</b>	Supply,, G.I. (2018). Material safety data sheet: Gans Deep Klene.				
<b>HERO ID:</b>	6836851				
<b>Conditions of Use:</b>	Use of Lubricants & Functional Fluids				
		<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>				
Chemical concentration:	40-50%				
		<b>EVALUATION</b>			
Domain	Metric		Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS is from a primary source.	
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	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	Variability is addressed but not uncertainty.	
<b>Overall Quality Determination</b>			<b>High</b>		

<b>Study Citation:</b>	Surfaces,, Acoustical (1999). Material safety data sheet: Vinyl Coated Fabrics and Films.			
<b>HERO ID:</b>	6984704			
<b>Conditions of Use:</b>	Plastics Converting			
EXTRACTION				
Parameter		Data		
Chemical concentration:		20-40%		
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 over 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	



<b>Study Citation:</b>	TCC, (2016). Safety data sheet: Brush on electrical tape black 4 fl oz.			
<b>HERO ID:</b>	6984567			
<b>Conditions of Use:</b>	Paint/Coating			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-10%			
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	Low	SDS is for a non-occupational scenario (consumer product) but is similar to an occupational scenario.
	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			Medium	

<b>Study Citation:</b>	Tomar, R. S., Budroe, J. D., Cendak, R. (2013). Evidence of the carcinogenicity of diisononyl phthalate (DINP).
<b>HERO ID:</b>	2349610
<b>Conditions of Use:</b>	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	At a global level, overall consumption of DINP and DIDP represent approximately 30 percent of the total consumption of plasticizers. The American Chemistry Council estimated annual world production of DINP to be 1.3 million metric tons in 2008, and projected annual world production of DINP to be 1.5 million metric tons in 2013, assuming 2.5 percent annual production growth in that time period. Annual U.S. production volume information is available for DINP-1 and DINP-2, which are considered commercially interchangeable. DINP represented approximately 10-15 percent of total phthalate plasticizer production in 1998. According to the 2006 TSCA Inventory Update Reporting (IUR) database, the annual production volume of DINP-1 (including imports) is in the range of 100 to <500 million pounds. DINP production in the U.S. currently exceeds that of DEHP, and DINP has been cited by U.S. EPA as having the highest production volume among the 10 individual phthalates. (pg. 12/82)
Life cycle description:	DINP is a general purpose plasticizer. Over 90 percent of the DINP produced is used to improve the flexibility, pliability, and elasticity of a variety of PVC products, including vinyl flooring, wire and cable insulation, stationery, coated fabrics, gloves, toys, tubing, garden hoses, artificial leather, footwear, automobile undercoatings, and roofing materials. Less than 10 percent of the DINP produced is used in the production of non-PVC products, such as rubbers, inks, pigments, paints, lacquers, adhesives, and sealants. DINP has limited use in food packaging and is not used in medical applications. (pg 13/82)
Process description:	DINP is a substance comprised of isomeric compounds that are C9 (nine-carbon) rich, branched chain alkyl di-esters of o-phthalic acid. Different DINP production processes may yield isomeric mixtures with differing proportions of nine-, eight-, and ten-carbon alkyl ester chains, containing differing amounts of straight chain impurities. DINP-1 is manufactured from propylene or butene by the “polygas” process and consists of a mixture of isomeric compounds with branched alkyl di-esters of either nine, eight, or ten carbons, with the bulk of the alkyl ester chains containing nine carbons (approximately 70% by weight). (pg. 11/82)
Chemical concentration:	The California phthalates ban, Assembly Bill 1108 prohibits the manufacture, sale or distribution in commerce of toys and child care articles intended for use by a child under three years of age containing DINP, DIDP, or DNOP in concentrations exceeding 0.1%, if the products can be placed in a child’s mouth. In February 2009, the U.S. enacted an interim ban on the uses of DINP in “any children’s toy that can be placed in a child’s mouth” or “child care article” containing concentrations of more than 0.1 percent of DINP. (pg. 13/82)

		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	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.

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Study Citation:	Tomar, R. S., Budroe, J. D., Cendak, R. (2013). Evidence of the carcinogenicity of diisononyl phthalate (DINP).		
HERO ID:	2349610		
Conditions of Use:	Manufacturing		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
<b>HERO ID:</b>	11138808			
<b>Conditions of Use:</b>	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 ( <a href="https://www.bls.gov/oes/current/oes_research_estimates.htm">https://www.bls.gov/oes/current/oes_research_estimates.htm</a> ).
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	

<b>Study Citation:</b>	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
<b>HERO ID:</b>	10366189			
<b>Conditions of Use:</b>	Commercial Use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Provides U.S. commercial use 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.			
Number of workers:	Provides number of workers.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is EPA.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.			
<b>HERO ID:</b>	4565597			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Phthalates are produced in high volume, over 470 million pounds per year (EPA 2006).			
Life cycle description:	DINP is a mixture of phthalates and is a commonly used plasticizer (TURI, 2006). PVC applications account for 95 percent of the volume. 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.			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.			
<b>HERO ID:</b>	4565597			
<b>Conditions of Use:</b>	Production of plastics			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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).			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.			
<b>HERO ID:</b>	46492			
<b>Conditions of Use:</b>	Plasticizer in adhesive and sealant manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	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. The solids portion of the formulations consists of elastomers, tackifying resins, plasticizers (phthalate esters, polybutenes, mineral oil), and fillers. 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. After solvent base coatings have been applied, the web moves into the drying oven where the solvents are evaporated from the web. Two basic types of heating are used in conventional drying ovens, direct and indirect. Direct heating routes the hot combustion gases (blended with ambient air to the proper temperature) directly into the drying zone. With indirect heating, the incoming oven air stream is heated in a heat exchanger with steam or hot combustion gases but does not physically mix with them. After exiting the drying oven, the continuous web is wound on a roll, and the Coating process is complete. (477/2050)			
<b>EVALUATION</b>				
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 plasticizers in adhesive and sealant manufacturing, an in-scope occupational scenario. Applicable though not specific to DINP	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	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	This metric is not applicable to the data being extracted	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	U.S. EPA, (2014). Preliminary Materials for the Integrated Risk Information System (IRIS) Toxicological Review of Diisononyl Phthalate (DINP) (CAS-RNs 28553-12-0, 68515-48-0, 71549-78-5, and 14103-61-8).			
<b>HERO ID:</b>	6547111			
<b>Conditions of Use:</b>	Domestic Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Between 100 and 500 million pounds of DINP was imported or manufactured in US in 2006. (page 10 of 130)			
<b>EVALUATION</b>				
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 domestic 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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2014). Preliminary Materials for the Integrated Risk Information System (IRIS) Toxicological Review of Diisononyl Phthalate (DINP) (CAS-RNs 28553-12-0, 68515-48-0, 71549-78-5, and 14103-61-8).			
<b>HERO ID:</b>	6547111			
<b>Conditions of Use:</b>	Processing Incorporation into articles and formulation			
EXTRACTION				
Parameter	Data			
Life cycle description:	It is used in the production of plastics to increase flexibility and is commonly present in products such as toys, vinyl swimming pools, vinyl containing furniture and clothes, flooring, gloves, drinking straws, garden hoses, sealants used in food packaging, and cosmetics. Most DINP is used in PVC products, with less than 10% used in non PVC products such as different types of rubber, inks, pigments, paints, lacquers, adhesives, and sealants. (page 10 of 130)			
Chemical concentration:	In 2008, the Consumer Product Safety Improvement Act (CPSIA) placed an interim ban on DINP in children’s toys and certain child care articles at concentrations greater than 0.1 percent. The Chronic Hazard Advisory Panel (CHAP) recommended that the interim ban on DINP be made permanent in children’s toys and child care products at level greater than 0.1% (page 10-11 of 130)			
Comments:	The use of di-2-ethylhexyl phthalate (DEHP) has largely been replaced by24 DINP, though not in medical products. (page 10 of 130)			
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 domestic 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	quantitative
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, (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	Medium	The report is for an occupational scenario within the scope of the risk evaluation although not specific to DINP.	
	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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Plastics Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation although not specific to DINP.
	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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Printing ink Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation although not DINP specific
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Soap and Detergent Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation although not DINP specific	
	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	Medium	The report is for an occupational scenario within the scope of the risk evaluation although not DINP specific
	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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Synthetic rubber Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation although not DINP specific
	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7315820
<b>Conditions of Use:</b>	Plasticizer in adhesive and sealant manufacturing

**EXTRACTION**

Parameter	Data
Process description:	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. The solids portion of the formulations consists of elastomers, tackifying resins, plasticizers (phthalate esters, polybutenes, mineral oil), and fillers. 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. After solvent base coatings have been applied, the web moves into the drying oven where the solvents are evaporated from the web. Two basic types of heating are used in conventional drying ovens, direct and indirect. Direct heating routes the hot combustion gases (blended with ambient air to the proper temperature) directly into the drying zone. With indirect heating, the incoming oven air stream is heated in a heat exchanger with steam or hot combustion gases but does not physically mix with them. After exiting the drying oven, the continuous web is wound on a roll, and the Coating process is complete. (4.2.2.9. Page 2/7)

**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 plasticizers in adhesive and sealant manufacturing, an in-scope occupational scenario. However, source does not specifically mention DINP.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	Sample size not applicable to 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	Variability and uncertainty are not applicable to qualitative process description information.

**Overall Quality Determination****High**

<b>Study Citation:</b>	U.S. EPA, (1995). Chapter 6.4: Paint and varnish. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
<b>HERO ID:</b>	7315881
<b>Conditions of Use:</b>	Process regulators in paint and coating manufacturing

EXTRACTION	
Parameter	Data
Process description:	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. These processes take place in large mixing tanks at approximately room temperature. 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 650°F). (pg. 1/2)

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources(EPA).
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for process regulators in paint and coating manufacturing, an in-scope occupational scenario; however information is general, not chemical specific.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	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	This metric is not applicable to the data being extracted

<b>Overall Quality Determination</b>	<b>High</b>
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<b>Study Citation:</b>	U.S. EPA, (2019). Manufacturer request for risk evaluation: Diisononyl phthalate (DINP).			
<b>HERO ID:</b>	7325467			
<b>Conditions of Use:</b>	Domestic Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	According to the 2015 US EPA Chemical Data Reporting (CDR) database, between 100 and 500 million pounds of DINP was imported or manufactured in the United States. Table 1 shows a breakdown of DINP-1 and DINP-2 production from 2012-2015. (20/22)			
Process description:	CASRN 28553-12-0 (DINP-2) is manufactured by esterification of phthalic anhydride with alcohol groups made from n-butene (predominantly C9 methyl octanols and dimethyl heptanols). It predominantly contains C9H19 isomers as alkyl side chains. CASRN 68515-48- 0 (DINP-1) is manufactured by esterification of phthalic anhydride with alcohol groups made from octene (>95% comprise roughly equal amounts of 3,4-, 3,5-, 3,6-, 4,5-, 4,6-, and 5,6- dimethyl heptan1-ols). It contains a distribution of C8H17 to C10H21 isomers, where C9H19 alkyl chains are predominant (>70%). (2/22)			
Chemical concentration:	In 2008, the United States congress passed the Consumer Product Safety Improvement Act (CPSIA) that placed an interim restriction on the use of DINP in childcare articles and in children’s toys that can be placed in a child’s mouth at concentrations no greater than 0.1%.. (21/22)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for domestic 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 limited statistics (concentrations, production values) 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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		High		

<b>Study Citation:</b>	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.		
<b>HERO ID:</b>	9102524		
<b>Conditions of Use:</b>	Toys, playground, and sporting equipment		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	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 (pg. 11) 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). (pg. 11)		
Life cycle description:	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 (pg. 11) In the United States, tires typically are collected at tire dealerships and automobile servicestations and shipped to tire recyclers. Tires of different types (e.g., passenger cars, trucks) and from different manufacturers are mixed together at tire collection stations and tire recyclingplants (pg. 13)		
Process description:	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 turf infill. The ambient process uses granulation or cracker mills to produce tire crumb rubber at room temperature. 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. The cryogenic process uses liquid nitrogen to freeze partially shredded tires, which then are fed into a hammer mill to create tire crumb rubber. Fabric (i.e., polyester, nylon, or other fibers) and steel belt components of the scrap tire are separated in both processes. Fabric is removed from the rubber using air classifiers or vacuums, while the steel is removed using magnetic separators. Gravity separators also can be used to remove contaminant particles, such as rocks, and can aid in the sorting process. Likewise, water can be used for pre-washing to remove gravel and dirt and cooling during the ambient process; otherwise no chemicals are added to the original rubber composition during either process. Following processing, tire crumb rubber typically is placed into one-ton sacks and distributed to fields for spreading. (14/169)		
Number of sites:	Currently, there are between 12,000 and 13,000 synthetic turf recreational fields in the United States, with 1,200 – 1,500 new installations each year. (4/169) There are nine tire crumb rubber producers in the U.S. that produce 95% of the recycled rubber used in synthetic turf. (13/169) There are approximately eight major synthetic field installers in the United States. (15/169)		
<b>EVALUATION</b>			
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 phthalate use in toys, playground, and sporting equipment, which can be both a commercial or consumer use.
	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 (ranges, number of sites) 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.
Continued on next page ...			

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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		
Domain	Metric	EVALUATION Rating	Comments
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Variability is addressed by explaining two turf production processes. Uncertainty isn't addressed in terms of facility information..
Overall Quality Determination		High	

<b>Study Citation:</b>	USA,, Selenia, Inc., (2015). Coat & Seal.			
<b>HERO ID:</b>	6984609			
<b>Conditions of Use:</b>	Adhesive/Sealant			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	20 - 40%			
Physical form:	Liquid, black paste			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Veritas,, Groupe (2015). Material safety data sheet: Diisononyl Phthalate (DINP).			
<b>HERO ID:</b>	6984684			
<b>Conditions of Use:</b>	Lab Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	99.5%			
<b>EVALUATION</b>				
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	Low	Product is from India, a non-OECD country.
	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Vinmar, (2012). Chemical data reporting: 1,2-Benzenedicarboxylic acid, 1,2-diisononyl ester.			
<b>HERO ID:</b>	7330233			
<b>Conditions of Use:</b>	Import			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Vinmar Overseas Ltd had a national aggregate production of 108,497,785 lbs of DINP, all of which was due to imports. In 2011, the company imported 1,266,333 lbs.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources. (CDR data)	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is from the U.S.	
	Metric 3: Applicability	High	Data are for DINP imports, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (production volume) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
<b>HERO ID:</b>	5547263			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		The annual global production of phthalate was 4.7 million metric tons in 2006 [6,7] and ~8 million metric tons in 2015 [8].		
Life cycle description:		The high molecular weight phthalates are used primarily in PVC polymers and plastisol applications, plastics, food packaging, and food processing materials, vinyl toys and vinyl floor coverings, and building products. The low molecular weight phthalates are often used in non-PVC applications, such as personal care products, paints, adhesives, and enteric-coated tablets [44]. BzBP, DEHP, DiNP, DBP, and DiBP are used in toys, bags, gloves, and plastic tubing for improving flexibility and making the polymeric products soft and malleable [4]. DMP and DEP are widely used in cosmetics, such as perfumes, aftershaves, shampoos, makeup, and nail care products [4].		
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	Global values provided
		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 provides only global values, this does not address variability or uncertainty.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
<b>HERO ID:</b>	5547263			
<b>Conditions of Use:</b>	Plasticizer (in PVC and/or food packaging)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	PVC products may contain up to 50% (by weight) phthalates (pg. 1/28). Food packaging plastic film contains phthalates (such as DBP and DEP) at levels of up to 10% by weight (pg. 4/28).(Note: these values are not specific to DINP)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	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	Data source is over 10 years old (2005)	
	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		

<b>Study Citation:</b>		Wedi Corporation, (2018). Safety data sheet: Wedi Joint Sealant.		
<b>HERO ID:</b>		6984685		
<b>Conditions of Use:</b>		Adhesive/Sealant		
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Chemical concentration:		5-20%		
<b>EVALUATION</b>				
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	The report is for 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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Williams,, Sherwin (2020). KEM AQUA® 600T Water Reducible Enamel - White.			
<b>HERO ID:</b>	6984610			
<b>Conditions of Use:</b>	Paint/Coating			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<5%			
		<b>EVALUATION</b>		
Domain	Metric			
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.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Wypych, G. (2015). Health & safety and environmental impact. :413-439.			
<b>HERO ID:</b>	5633778			
<b>Conditions of Use:</b>	Industrial Use - Plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	The scientific evidence supports the continued use of DINP as a plasticizer in children’s products (page 7 of 27)			
<b>EVALUATION</b>				
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	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 is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3045454			
<b>Conditions of Use:</b>	Textile, apparel, and leather manufacture (proc and use)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Backpack WA-b2: 0.63+-0.62 mass% Backpack TM-b: 4.22+-1.91 mass % (Table 1, pg 3/6)			
<b>EVALUATION</b>				
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	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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].			
<b>HERO ID:</b>	5164231			
<b>Conditions of Use:</b>	Consumer use - nail polish			
EXTRACTION				
Parameter	Data			
Chemical concentration:	DINP not detected in nail polish samples. (Table 2 footnote)			
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	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	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		Uninformative		

<b>Study Citation:</b>	Zippertubing, (2018). Safety data sheet: DVH 20 / DVH 40.			
<b>HERO ID:</b>	6984573			
<b>Conditions of Use:</b>	Plastics Converting			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10-20%			
		<b>EVALUATION</b>		
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.
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	Zoller, A., Marcilla, A. (2011). Soft PVC foams: Study of the gelation, fusion, and foaming processes. II. Adipate, citrate and other types of plasticizers. Journal of Applied Polymer Science 122(5):2981-2991.			
<b>HERO ID:</b>	4853590			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
Parameter	Data			
Process description:	In the production of foams, several techniques can be used, such as extrusion or rotational molding. The foaming process generally occurs at elevated temperatures at about 180–200 degrees C and involves the curing of the plastisol (gelation and fusion) and the decomposition of the chemical blowing agent; this generates gases and then bubbles. To obtain good quality foams, all of these dynamic processes have to be adequately synchronized with each other. The development of the melt strength, a property that indicates a compound’s ability to withstand drawing without breaking, also plays a significant role in the foaming because the polymer matrix has to withstand the stresses evolved during the gas generation and bubble growth and stabilizes the foam structure. A high melt strength is fundamental for the production of foamed plastics with low density and good cell structure. (page 2 of 11)It could be observed that foams of the best quality (i.e., smallest average size and distribution) were those prepared with ASE, EHBDC, DINCH, DINP (from a previous work), ATBC, and DHA (page 10 of 11)			
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 Spain, an OECD country.
	Metric 3:	Applicability	High	Data are for plasticizers in foam 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	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	This metric is not applicable to the data being extracted
Overall Quality Determination			High	

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	7976469		
<b>Conditions of Use:</b>	Plasticizer for Plastics		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Life cycle description:	Plasticizers are used as a lubricant as they decrease the stiffness of the polymer via reduction of the cohesive intermolecular friction along the polymer chain (Subramanian, 2013). They are mostly used for polymers which are in a glassy state at room temperatures such as PVC, and their flexibility is improved via strong interaction between the plasticizer and polymer chain units (Stepek, 1983). In addition, they reduce shear during polymer processing and improve the impact resistance of the final material (Bhunia et al., 2013). (p. 13).		
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 (p. 13).		
<b>EVALUATION</b>			
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 Belgium, 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	High	The report was published in 2020.
	Metric 5: Sample Size	Medium	Concentration 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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	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.		
<b>HERO ID:</b>	7976469		
<b>Conditions of Use:</b>	Plastics Recycling - Solvent Extraction of Plastic Additives		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Process description:	The removal of molecules from a solid matrix is a complex process which is very difficult to model in a proper way as there are many factors that are relevant, ranging from pore size to chemical interactions between solute, solvent and solid matrix. Permeability of the solid matrix is the main physical factor which controls the rate mechanism of mass transport. When a solvent is in contact with the solid matrix, it is likely to percolate through the permeable matrix and remove the substances based on their solubility with a specific rate which is controlled by the diffusivity. Therefore, permeability depends on both solubility and diffusivity (p. 15). See Table 3.1 for summary of extraction methods found for phthalates: methanol ethanol, 2-propanol and acetone/CYHA for extraction of phthalates from PVC had a 71-96% efficiency; methanol extraction of phthalates from PVC had 60-95% efficiency; Sc-CO2 with methanol extraction of phthalates from PVC had a 10-90% efficiency; Sc-CO2 extraction of phthalates from PVC had a 30-98% efficiency; CYHA/2-propanol extraction of phthalates from PVC and PP had a ~100% efficiency; and, THF/ethanol extraction of phthalates from PVC had a >90% efficiency.		
<b>EVALUATION</b>			
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 Belgium, 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	High	The report was published in 2020.
	Metric 5: Sample Size	Medium	Process extraction efficiencies are 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.
<b>Overall Quality Determination</b>		<b>High</b>	