

FS Section	Content field	Explanation of content	CSR	eSDS
1. Title	1.1 Title of SPERC	Use in explosives manufacturing (industrial): solvent-borne	Y	Y
	1.2 SPERC code	ESVOC SPERC 2.18a.v3	Y	Y
2. Scope	<b>2.1 Substance/Product Domain</b>			
	Substance types / functions / properties included or excluded	Applicable to petroleum substances and petrochemicals.	Y	N
	Additional specification of product types covered:	Includes a variety of aliphatic and aromatic hydrocarbons, ketones, alcohols, acetates, glycols, glycol ethers, and glycol ether acetates.	Y	N
	Inclusion of sub-SPERCs	Yes	N	N
	<b>2.2 Process domain</b>			
	Description of activities/processes:	Manufacture of slurry explosives (including materials transfer, mixing and charging) and equipment cleaning.	Y	Y
	<b>2.3 List of applicable Use Descriptors</b>			
	LCS	IS – Use at industrial sites	Y	Y
	SU	SU0 - Other	Y	Y
PC	PC11 - Explosives	Y	Y	
3. Operational conditions	<b>3.1 Conditions of use</b>			
	Location of use	Indoor	Y	Y
	Water contact during use	Yes	Y	Y
	Connected to a standard municipal biological STP	Yes	Y	Y
	Rigorously contained system with minimisation of release to the environment	No	Y	N
	Further operational conditions impacting on releases to the environment	Volatile compounds subject to air emission controls. Wastewater emissions generated from equipment cleaning with water.	Y	Y
	<b>3.2 Waste Handling and Disposal</b>			
	Waste Handling and Disposal:	Residual raw materials and are in some cases recycled and fed back into the process reactor to improve efficiencies. In other cases, residues and by-products are used as raw materials for other downstream applications (EU, 2016). Wastewater generated during cleaning and maintenance operations is directed to a waste water treatment plant for biological degradation. Atmospheric release of waste vapor may be ameliorated using wet scrubbers, thermal oxidizers, solid adsorbents, membrane separators, biofilters, and/or cold oxidizers for trapping residual vapours. Solvent-containing liquid cleaning wastes are handled as hazardous waste and disposed of via thermal or catalytic incineration capable of efficiently converting volatile organic compounds to carbon dioxide and water. Hazardous waste handling conforms with the requirements of the Waste Framework Directive and includes procedures that minimize release during production, collection, storage, transportation, and treatment. These measures include a ban on the mixing of waste types, suitable	Y	N

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		<p>packaging and labelling, and detailed documentation on the sources, quantities, and characteristics of the waste.</p> <p>EU (2016). Best Available Techniques (BAT) Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector. Report EUR 28112 EN. European IPPC Bureau. Seville, Spain. <a href="http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf">http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf</a></p> <p>EU (2008). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. Official Journal of the European Union 22.11.2008. <a href="https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&amp;from=EN">https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&amp;from=EN</a></p>		
4. Obligatory RMMs onsite	RMM limiting release to air:	No obligatory RMMs.	Y	Y
	RMM Efficiency (air):	Optional RMMs have been assigned a nominal removal efficiency value that is not accounted for in the air release factor. See the background document for more information.	Y	Y
	Reference for RMM Efficiency (air):	<p>EU (2016). Best Available Techniques (BAT) Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector. Report EUR 28112 EN. European IPPC Bureau. Seville, Spain. <a href="http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf">http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf</a></p>	Y	N
	RMM limiting release to water:	Oil-water separation (e.g. via oil water separators, oil skimmers, or dissolved air flotation) is required.	Y	Y
	RMM Efficiency (water):	The efficiency of this RMM varies dependent on the treatment technology and the properties of the substance.	Y	Y
	Reference for RMM Efficiency (water):	<p>EU (2016). Best Available Techniques (BAT) Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector. Report EUR 28112 EN. European IPPC Bureau. Seville, Spain. <a href="http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf">http://eippcb.jrc.ec.europa.eu/reference/BREF/CWW_Bref_2016_published.pdf</a></p>	Y	N
	RMM limiting release to soil:	The sludge generated from wastewater treatment is not applied to agricultural soil.	Y	Y
	RMM Efficiency (soil):	Not applicable	Y	Y
	Reference for RMM Efficiency (soil):	<p>ECHA (2016). <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">Guidance on Information Requirements and Chemical Safety Assessment. Chapter R.16: Environmental Exposure Assessment</a> Version 3.0. European Chemicals Agency. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a></p>	Y	N
5. Exposure Assessment Input	5.1 Substance use rate			
	Amount of substance use per day:	50,000 kg/day	Y	Y
	Fraction of EU tonnage used in region:	100%	Y	N
	Fraction of Regional tonnage used locally:	100%	Y	N
	Justification / information source:	<p>ECHA, 2016. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">Guidance on Information Requirements and Chemical Safety Assessment. Chapter R.16: Environmental Exposure Assessment</a> Version 3.0. European Chemicals Agency. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a></p>	Y	N
	5.2 Days emitting			
	Number of emission days per year:	300 (default value)	Y	Y

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	<b>Justification / information source:</b>	ECHA, 2016. <i>Guidance on Information Requirements and Chemical Safety Assessment. Chapter R.16: Environmental Exposure Assessment</i> Version 3.0. European Chemicals Agency. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a>	Y	N
<b>5.3 Release factors</b>				
	<b>sub-SPERC identifier:</b>	ESVOC 2.18a.a.v3 WS <1 mg/l	Y	N
	<b>ERC</b>	ERC 2		
	<b>sub-SPERC applicability:</b>	Water solubility <1 mg/l	Y	N
<b>5.3.1 Release Factor – air</b>				
	<b>Numeric value / percent of input amount (Air)</b>	0.5%	Y	Y
	<b>Justification of RFs (Air):</b>	The value has been adopted from an authoritative literature source that documents the air release of non-methane volatile organic compounds (NMVOCs) during the production of high explosive chemicals. Hägvall, J., Hochschomer, E., Finnveden, G., Overcash, M., Griffing, E., 2004. Life Cycle Assessment of a PFHE Shell Grenade. FOI-R-1373-SE, Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N
<b>5.3.2 Release Factor – water</b>				
	<b>Numeric value / percent of input amount (Water):</b>	0.0002%	Y	Y
	<b>Justification of RFs (Water):</b>	The approach used to assign this value utilizes wastewater survey data from five explosive manufacturing sites. The facilities included small representative mixing plants that prepare explosives using batch processes that are expected to consume larger volumes of water than larger more automated facilities. USEPA, 1975. State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives. EPA 600/2-74-009b, U.S. Environmental Protection Agency, Office of Research and Development. Washington, DC. <a href="https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF">https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF</a>	Y	N
<b>5.3.3 Release Factor – soil</b>				
	<b>Numeric value / percent of input amount (Soil):</b>	0.01%	Y	Y
	<b>Justification of RFs (Soil):</b>	The value has been adopted from an authoritative literature source that documents the release factors for each environmental release category (ERC). The preceding value corresponds to to the default release factor for use of a non-reactive processing aid at an industrial site (ERC 2). ECHA (2016). <i>Guidance on Information Requirements and Chemical Safety Assessment Chapter R.16: Environmental exposure assessment</i> Version 3.0. Appendix A.16-1. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a>	Y	N
<b>5.3.4 Release Factor – waste</b>				
	<b>Percent of input amount disposed as waste:</b>	0.4%	Y	N
	<b>Justification of RFs:</b>	The quoted value was derived from a life cycle assessment for the commercial production of explosives used to manufacture military grenades (Hägvall, J. et al., 2004). The highest reported solid waste factor was judged to be representative of other explosive types. An uncertainty	Y	N

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		factor of 10 has been applied to this value based on the anticipated variability of this factor across different industry sectors. Hägwall, J. et al. (2004). Life Cycle Assessment of a PFHE Shell Grenade. Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>		
	<b>sub-SPERC identifier:</b>	<b>ESVOC 2.18a.b.v3</b> WS 1-10 mg/l	Y	N
	<b>ERC:</b>	ERC 2		
	<b>sub-SPERC applicability:</b>	Water solubility 1-10 mg/l	Y	N
<b>5.3.1 Release Factor – air</b>				
	<b>Numeric value / percent of input amount (Air):</b>	0.5%	Y	Y
	<b>Justification of RFs (Air):</b>	The value has been adopted from an authoritative literature source that documents the air release of non-methane volatile organic compounds (NMVOCs) during the production of high explosive chemicals. Hägwall, J., Hochschomer, E., Finnveden, G., Overcash, M., Griffing, E., 2004. Life Cycle Assessment of a PFHE Shell Grenade. FOI-R-1373-SE, Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N
<b>5.3.2 Release Factor – water</b>				
	<b>Numeric value / percent of input amount (Water):</b>	0.0007%	Y	Y
	<b>Justification of RFs (Water):</b>	The approach used to assign this value utilizes wastewater survey data from five explosive manufacturing sites. The facilities included small representative mixing plants that prepare explosives using batch processes that are expected to consume larger volumes of water than larger more automated facilities. USEPA, 1975. State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives. EPA 600/2-74-009b, U.S. Environmental Protection Agency, Office of Research and Development. Washington, DC. <a href="https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF">https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF</a>	Y	N
<b>5.3.3 Release Factor – soil</b>				
	<b>Numeric value / percent of input amount (Soil):</b>	0.01%	Y	Y
	<b>Justification of RFs (Soil):</b>	The value has been adopted from an authoritative literature source that documents the release factors for each environmental release category (ERC). The preceding value corresponds to the default release factor for use of a non-reactive processing aid at an industrial site (ERC 2). ECHA (2016). Guidance on Information Requirements and Chemical Safety Assessment Chapter R.16: Environmental exposure assessment Version 3.0. Appendix A.16-1. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a>	Y	N
<b>5.3.4 Release Factor – waste</b>				
	<b>Percent of input amount disposed as waste:</b>	0.4%	Y	N
	<b>Justification of RFs:</b>	The quoted value was derived from a life cycle assessment for the commercial production of explosives used to manufacture military grenades (Hägwall, J. et al., 2004). The highest reported solid waste factor was judged to be representative of other explosive types. An uncertainty factor of 10 has been applied to this value based on the anticipated variability of this factor across different industry sectors.	Y	N

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		Hägwall, J. et al. (2004). Life Cycle Assessment of a PFHE Shell Grenade. Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>		
	<b>sub-SPERC identifier:</b>	ESVOC 2.18a.c.v3 WS 10-100 mg/l	Y	N
	ERC	ERC 2		
	<b>sub-SPERC applicability:</b>	Water Solubility 10-100 mg/l	Y	N
<b>5.3.1 Release Factor – air</b>				
	<b>Numeric value / percent of input amount (Air):</b>	0.5%	Y	Y
	<b>Justification of RFs (Air):</b>	The value has been adopted from an authoritative literature source that documents the air release of non-methane volatile organic compounds (NMVOCs) during the production of high explosive chemicals. Hägwall, J., Hochschorner, E., Finnveden, G., Overcash, M., Griffing, E., 2004. Life Cycle Assessment of a PFHE Shell Grenade. FOI-R-1373-SE, Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N
<b>5.3.2 Release Factor – water</b>				
	<b>Numeric value / percent of input amount (Water):</b>	0.007%	Y	Y
	<b>Justification of RFs (Water):</b>	The approach used to assign this value utilizes wastewater survey data from five explosive manufacturing sites. The facilities included small representative mixing plants that prepare explosives using batch processes that are expected to consume larger volumes of water than larger more automated facilities. USEPA, 1975. State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives. EPA 600/2-74-009b, U.S. Environmental Protection Agency, Office of Research and Development. Washington, DC. <a href="https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF">https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF</a>	Y	N
<b>5.3.3 Release Factor – soil</b>				
	<b>Numeric value / percent of input amount (Soil):</b>	0.01%	Y	Y
	<b>Justification of RFs (Soil):</b>	The value has been adopted from an authoritative literature source that documents the release factors for each environmental release category (ERC). The preceding value corresponds to the default release factor for use of a non-reactive processing aid at an industrial site (ERC 2). ECHA (2016). Guidance on Information Requirements and Chemical Safety Assessment Chapter R.16: Environmental exposure assessment Version 3.0. Appendix A.16-1. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a>	Y	N
<b>5.3.4 Release Factor – waste</b>				
	<b>Percent of input amount disposed as waste:</b>	0.4%	Y	N
	<b>Justification of RFs:</b>	The quoted value was derived from a life cycle assessment for the commercial production of explosives used to manufacture military grenades (Hägwall, J. et al., 2004). The highest reported solid waste factor was judged to be representative of other explosive types. An uncertainty factor of 10 has been applied to this value based on the anticipated variability of this factor across different industry sectors. Hägwall, J. et al. (2004). Life Cycle Assessment of a PFHE Shell Grenade. Swedish Defence Research Agency. Stockholm, Sweden.	Y	N

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		<a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>		
	<b>sub-SPERC identifier:</b>	ESVOC 2.18a.d.v3 WS 100-1000 mg/l	Y	N
	ERC	ERC 2		
	<b>sub-SPERC applicability:</b>	Water Solubility 100-1000 mg/l	Y	N
<b>5.3.1 Release Factor – air</b>				
	<b>Numeric value / percent of input amount (Air):</b>	0.5%	Y	Y
	<b>Justification of RFs (Air):</b>	The value has been adopted from an authoritative literature source that documents the air release of non-methane volatile organic compounds (NMVOCs) during the production of high explosive chemicals. Hägvall, J., Hochschorner, E., Finnveden, G., Overcash, M., Griffing, E., 2004. Life Cycle Assessment of a PFHE Shell Grenade. FOI-R-1373-SE, Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N
<b>5.3.2 Release Factor – water</b>				
	<b>Numeric value / percent of input amount (Water):</b>	0.07%	Y	Y
	<b>Justification of RFs (Water):</b>	The approach used to assign this value utilizes wastewater survey data from five explosive manufacturing sites. The facilities included small representative mixing plants that prepare explosives using batch processes that are expected to consume larger volumes of water than larger more automated facilities. USEPA, 1975. State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives. EPA 600/2-74-009b, U.S. Environmental Protection Agency, Office of Research and Development. Washington, DC. <a href="https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF">https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF</a>	Y	N
<b>5.3.3 Release Factor – soil</b>				
	<b>Numeric value / percent of input amount (Soil):</b>	0.01%	Y	Y
	<b>Justification of RFs (Soil):</b>	The value has been adopted from an authoritative literature source that documents the release factors for each environmental release category (ERC). The preceding value corresponds to the default release factor for use of a non-reactive processing aid at an industrial site (ERC 2). ECHA (2016). Guidance on Information Requirements and Chemical Safety Assessment Chapter R.16: Environmental exposure assessment Version 3.0. Appendix A.16-1. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a>	Y	N
<b>5.3.4 Release Factor – waste</b>				
	<b>Percent of input amount disposed as waste</b>	0.4%	Y	N
	<b>Justification of RFs:</b>	The quoted value was derived from a life cycle assessment for the commercial production of explosives used to manufacture military grenades (Hägvall, J. et al., 2004). The highest reported solid waste factor was judged to be representative of other explosive types. An uncertainty factor of 10 has been applied to this value based on the anticipated variability of this factor across different industry sectors. Hägvall, J. et al. (2004). Life Cycle Assessment of a PFHE Shell Grenade. Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N

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	<b>sub-SPERC identifier:</b>	ESVOC 2.18a.e.v3 WS >1000 mg/l	Y	N
	ERC	ERC 2		
	<b>sub-SPERC applicability:</b>	Water Solubility >1000 mg/l	Y	N
<b>5.3.1 Release Factor – air</b>				
	<b>Numeric value / percent of input amount (Air):</b>	0.5%	Y	Y
	<b>Justification of RFs (Air):</b>	The value has been adopted from an authoritative literature source that documents the air release of non-methane volatile organic compounds (NMVOCs) during the production of high explosive chemicals. Hägvall, J., Hochschorner, E., Finnveden, G., Overcash, M., Griffing, E., 2004. Life Cycle Assessment of a PFHE Shell Grenade. FOI-R-1373-SE, Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N
<b>5.3.2 Release Factor – water</b>				
	<b>Numeric value / percent of input amount (Water):</b>	0.2%	Y	Y
	<b>Justification of RFs (Water):</b>	The approach used to assign this value utilizes wastewater survey data from five explosive manufacturing sites. The facilities included small representative mixing plants that prepare explosives using batch processes that are expected to consume larger volumes of water than larger more automated facilities. USEPA, 1975. State-of-the-Art for the Inorganic Chemicals Industry: Commercial Explosives. EPA 600/2-74-009b, U.S. Environmental Protection Agency, Office of Research and Development. Washington, DC. <a href="https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF">https://nepis.epa.gov/Exe/ZyPDF.cgi/910141ZL.PDF?Dockey=910141ZL.PDF</a>	Y	N
<b>5.3.3 Release Factor – soil</b>				
	<b>Numeric value / percent of input amount (Soil):</b>	0.01%	Y	Y
	<b>Justification of RFs (Soil):</b>	The value has been adopted from an authoritative literature source that documents the release factors for each environmental release category (ERC). The preceding value corresponds to the default release factor for use of a non-reactive processing aid at an industrial site (ERC 2). ECHA (2016). Guidance on Information Requirements and Chemical Safety Assessment Chapter R.16: Environmental exposure assessment Version 3.0. Appendix A.16-1. Helsinki, Finland. <a href="https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf">https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf</a>	Y	N
<b>5.3.4 Release Factor – waste</b>				
	<b>Percent of input amount disposed as waste:</b>	0.4%	Y	N
	<b>Justification of RFs:</b>	The quoted value was derived from a life cycle assessment for the commercial production of explosives used to manufacture military grenades (Hägvall, J. et al., 2004). The highest reported solid waste factor was judged to be representative of other explosive types. An uncertainty factor of 10 has been applied to this value based on the anticipated variability of this factor across different industry sectors. Hägvall, J. et al. (2004). Life Cycle Assessment of a PFHE Shell Grenade. Swedish Defence Research Agency. Stockholm, Sweden. <a href="http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf">http://www.dtic.mil/dtic/tr/fulltext/u2/a430092.pdf</a>	Y	N
References to SPERC Background Document				

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	<b>Reference to Background Document</b>	ESIG/ESVOC (2019). SpERC Background Document. Specific Environmental Release Categories (SpERCs) for the use of solvents and solvent borne substances in the industrial production and/or use of explosives, synthetic rubbers, and blowing agents. European Solvents Industry Group. Brussels, Belgium	Y	N