Assessment of regulatory needs

Authority: European Chemicals Agency (ECHA)

Group Name: Esters from linear carboxylic acid and Pentaerythritol

General structure: "-"

Revision history

Version	*Date*	*Description*
1.0	14 March 2024	

Substances within this group:

EC/List no	CAS no	Substance name	Registration type (full, OSII or TII, NONS, cease manufacture), highest tonnage band among all the registrations (t/y) [1]
Subgroup 1 – Saturated linear esters			
204-110-1	115-83-3	pentaerythritol tetrastearate	Full, not (publicly) available
239-937-7	15834-04-5	2,2-bis[[(1-oxopentyl)oxy]methyl]propane-1,3-diyl divalerate	Full, >1000l
247-279-7	25811-35-2	2,2-bis[[(1-oxoheptyl)oxy]methyl]propane-1,3-diyl bisheptanoate	Full, not (publicly) available
267-022-2	67762-53-2	Fatty acids, C5-9, tetraesters with pentaerythritol	Full, 100-1000
269-495-0	68258-72-0	2,2-bis(hydroxymethyl)propane-1,3-diyl didocosanoate	Full, 10-100
270-291-9	68424-31-7	Fatty acids, C5-10, esters with pentaerythritol	Full, not (publicly) available
270-471-7	68441-67-8	Decanoic acid, mixed esters with heptanoic acid, octanoic acid and pentaerythritol	Full, not (publicly) available
270-472-2	68441-68-9	Decanoic acid, mixed esters with octanoic acid and pentaerythritol	Full, 10-100
274-765-6	70693-39-9	Nonanoic acid, mixed esters with heptanoic acid, pentaerythritol and valeric acid	Full, not (publicly) available
275-118-0	71010-76-9	Decanoic acid, mixed esters with heptanoic acid, octanoic acid, pentaerythritol and valeric acid	Full, not (publicly) available
287-827-2	85586-24-9	Fatty acids, C8-10, tetraesters with pentaerythritol	Full, 100-1000
293-029-5	91050-82-7	Fatty acids, C16-18, tetraesters with pentaerythritol	Full, 100-1000
451-070-8	not available	Pentanoic, octanoic and decanoic acid, mixed ester with pentaerythritol	NONS, not (publicly) available
701-020-9	71010-76-9	Decanoic acid, mixed esters with heptanoic acid, octanoic acid, pentaerythritol and valeric acid	Full, not (publicly) available
812-653-6	68441-94-1	Heptanoic acid, mixed esters with pentaerythritol and valeric acid	Full, >1000
812-655-7	2156595-37-6	Fatty acids, C8-16, tetraesters with pentaerythritol	Full, not (publicly) available
947-899-4	not available	Fatty acids C18-C22 (even numbered), tetraesters with pentaerythritol	Full, not (publicly) available

[1] The total aggregated tonnage band may be available on ECHA's webpage at https://echa.europa.eu/information-on-chemicals/registered-substances

EC/List no	CAS no	Substance name	Registration type (full, OSII or TII, NONS, cease manufacture), highest tonnage band among all the registrations (t/y) [1]
948-383-1	not available	Fatty acids, C8-10-(even numberd), Esters with pentaerythritol and adipic acid	Full, not (publicly) available
Subgroup 2 – Unsaturated linear esters			
242-960-5	19321-40-5	pentaerythritol tetraoleate	Full, 100-1000
246-665-2	25151-96-6	2,2-bis(hydroxymethyl)-1,3-propanediyl dioleate	Full, 100-1000
271-694-2	68604-44-4	Fatty acids, C16-18 and C18-unsatd., tetraesters with pentaerythritol	Full, 100-1000
271-985-4	68648-28-2	Linseed oil, ester with pentaerythritol	Full, not (publicly) available
288-305-7	85711-45-1	Fatty acids, C16-18 and C18-unsatd., esters with pentaerythritol	Full, 100-1000
923-900-3	not available	Esterification products of fatty acids, C16 and C16-18 (even numbered, unsaturated) alkyl and adipic acid with pentaerythritol	Full, not (publicly) available
Subgroup 3 – Branched esters			
451-190-0	156558-98-4	Fatty acids, C6-12, mixed tetraesters with heptanoic acid, pentaerythritol, 3,5,5-trimethylhexanoic acid and valeric acid	Full, not (publicly) available
482-410-3	not available	Hatcol 1760	cease manufacture
Subgroup 4 – Other miscellaneous esters			
268-597-2	68130-55-2	Hexanedioic acid, mixed esters with decanoic acid, heptanoic acid, octanoic acid and pentaerythritol	Full, not (publicly) available
921-836-0	1190402-12-0	Fatty acids, C16 and C16-18-unsatd., mixed esters with adipic acid and pentaerythritol	Full, not (publicly) available
948-027-5	not available	Esterification product of castor oil fatty acids and pentaerythritol	Full, not (publicly) available
947-748-2	not available	Fatty acids lanolin, di-, tri- and tetraesters with pentaerythritol and rape fatty acid	Full, not (publicly) available

This table does not contain group members that are only notified under the CLP Regulation.

Contents

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Foreword

The assessment of regulatory needs of a group of substances is an iterative, informal process to help authorities consider the most appropriate way to address an identified concern for a group of substances or a single substance and decide whether further regulatory risk management activities are necessary.

The grouping is mainly based on structural similarity and associations made by the registrants between substances through read-across and category approaches as well as category associations from external sources (e.g. OECD categories)[2]. These methods are different from grouping as defined in Section 1.5 of Annex XI to REACH because the scope and intended use of ECHA's grouping is different. Thus, in this context, grouping does not aim to validate read-across and category approaches according to the Annex XI requirements but rather to support a faster and more consistent approach for regulating chemicals and avoid regrettable substitution.

The focus of the assessment is largely based on information available in the registration dossiers and on properties requiring regulatory risk management action at EU level[3]. The information reported on uses is from the registration dossiers (IUCLID) and is used as a proxy for assessing how widespread uses are and whether potential for exposure to humans and releases to the environment can be expected. The chemical safety reports are not necessarily consulted and no quantitative exposure assessment is performed at this stage.

The outcome of these assessments are proposals for immediate (the first action) and subsequent regulatory action(s), including the foreseen ultimate regulatory action (last foreseen regulatory action) to address the identified concern(s) in case the potential hazards are confirmed. For example, further data generation through compliance check is suggested as a first action, to confirm the identified hazard.

Where hazards are confirmed, regulatory risk management actions could be considered for the whole group, for a subgroup or for individual substances within the group. The robustness of the group depends on the stage of assessment and the level of certainty this stage requires. For example, the needs for grouping under restriction may differ from the needs for grouping for the purpose of harmonised classification. Group membership is reconsidered accordingly throughout the iterative assessment of regulatory needs, for example, after further information is generated and the hazard has been clarified or when new insights on uses and risks are available.

The assessment of regulatory needs in itself does not represent a regulatory action, but rather a preparatory step to consider further possible regulatory actions at the level of individual substances or groups/subgroups of substances.

[2] Working with Groups - ECHA (europa.eu)

[3] Regarding hazard properties the focus is for instance on CMR (carcinogenic, mutagenic and/or toxic to reproduction), sensitiser, ED (endocrine disruptor), PBT/vPvB or equivalent (e.g. substances being persistent, mobile and toxic), aquatic toxicity hazard endpoints and therefore only those are reflected in the report. This does not mean that the substances do not have other known or potential hazards. In some specific cases, ECHA may consider additional hazards (e.g. neurotoxicity, STOT RE).

Publication of ARNs makes it easier for companies to follow the latest status of their substances of interest, anticipate potential regulatory actions and make strategic choices in their chemicals portfolio.

For more information on assessments of regulatory needs please consult ECHA's website[4].

[4] https://echa.europa.eu/understanding-assessment-regulatory-needs

Glossary

ARN	Assessment of Regulatory Needs
CCH	Compliance Check
CLH	Harmonised classification and labelling
CMR	Carcinogenic, mutagenic and/or toxic to reproduction
DEv	Dossier evaluation
ED	Endocrine disruptor
NONS	Notified new substances
OEL	Occupational exposure limit
OSII or TII	On-site isolated intermediate or transported isolated intermediate
PBT/vPvB	Persistent, bioaccumulative and toxic / very persistent and very bioaccumulative
PMT/vPvM	Persistent, mobile, and toxic / very persistent and very mobile
RDT	Repeated dose toxicity
RMOA	Regulatory management options analysis
RRM	Regulatory risk management
SEv	Substance evaluation
STOT RE	Specific target organ toxicity, repeated exposure
SVHC	Substance of very high concern
TPE	Testing proposal evaluation

1 Overview of the group

Explanations on the scope of this assessment is available in the foreword to this document. Please read it carefully before going through the report.

ECHA has grouped together structurally similar linear carboxylic acid esters of pentaerythritol, a polyalcohol.

The carboxylic acids have total carbon numbers ranging from C5 to C22 and include saturated, unsaturated, and C9 branched fatty acids as well as some more complex carboxylic acids collected in the "miscellaneous esters" subgroup. The group includes full and partial esters.

Based on the nature of the acid moieties, the substances of the group have been divided into 4 subgroups:

- Subgroup 1 – Saturated linear esters
- Subgroup 2 – Unsaturated linear esters
- Subgroup 3 – Branched esters
- Subgroup 4 – Other miscellaneous esters, containing substances with adipic acid (a bifunctional fatty acid), fatty acids derived from lanolin or fatty acids from castor oil

There are 31 substances in the group, of which 30 have full registrations, and one substance is registered under the REACH Regulation, but is not currently being manufactured in and / or imported to the European Economic Area.

Based on information reported in the REACH registration dossiers, several substances of the group, across all four subgroups, are used at high volumes and in a high number of widespread uses with a high potential for exposure to workers and consumers and the environment. The substances are used in a variety of product categories (e.g. washing and cleaning, lubricants, rubber and plastics) by industrial and professional workers, consumers and in articles, including applications where other legislations than REACH/CLP apply (e.g. cosmetics, medical devices, plant protection products).

2 Conclusions and proposed actions

The conclusions and actions proposed in the table below are based mainly on the REACH and CLP information available at the time of the assessment by ECHA. The conclusions are preliminary suggestions from a screening-level assessment done by ECHA with the aim to propose the next steps for further work (e.g., strengthening of the hazard conclusions, clarification of the uses and/or potential for exposure). The main source of information is the registration dossiers. Relevant public assessments may also be considered. When new information (e.g., on hazards through evaluation processes, or on uses) will become available, the document may be updated, and conclusions and actions revisited.

Table 1: Conclusions and proposed actions

EC/ List number	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
204-110-1 239-937-7 242-960-5 246-665-2 247-279-7 267-022-2 268-597-2 269-495-0 270-291-9 270-471-7 270-472-2 271-694-2 271-985-4 274-765-6 275-118-0 285-547-5 287-827-2 288-305-7 293-029-5	No hazard or unlikely hazard except for EC 268-597-2 Known or potential hazard for skin sensitisation	No hazard or unlikely hazard	Widespread uses by workers and consumers and in articles e.g. in washing and cleaning products, lubricants, rubber or plastic articles. Potential for exposure for workers and consumers and release to the environment. EC 268-597-2 is used by industrial workers in lubricants. Potential for exposure for workers and release to the environment.	**Currently no need for EU RRM** <u>Justification</u>: Overall, no or unlikely hazard that would lead to concern for the reported uses. For EC 268-597-2 Harmonised/self-classification (will) require company level risk management measures (RMM) for workers to be in place.

EC / List number	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
451-070-8 451-190-0 482-410-3 701-020-9 805-289-4 812-653-6 812-655-7 921-836-0 923-900-3 947-748-2 947-899-4 948-027-5 948-383-1				

3 Justification for the no need for regulatory risk management action at EU level

Currently no need to suggest (further) regulatory risk management actions for all substances

None of the registered substances in the group needs further EU regulatory risk management actions at the moment due to low potential toxicological and environmental hazard.

The majority of the substances in the group have widespread uses in professional settings or consumer products, with high exposure potential and release in the environment

No hazard has been identified or is expected for skin sensitisation (except for EC 268-597-2 as explained below) mutagenicity, repeated dose toxicity, reproductive and developmental toxicity, carcinogenicity or endocrine disruption for these subgroups.

Based on the evaluations[5] from other safety bodies, group members are expected to be rapidly hydrolysed into corresponding carboxylic acids and alcohols by carboxylesterase enzymes found in most tissues throughout the body, including the gastrointestinal tract. The resulting alcohols will be oxidised to their corresponding aldehydes and linear carboxylic acids, which will in turn be metabolised to carbon dioxide via the fatty acid pathways and the tricarboxylic acid cycle. The resulting carboxylic acids will undergo different metabolic pathways, depending on the carbon chain length and branching: beta-oxidation for short chains, omega-oxidation for long chains and alfa- and/or beta-oxidation for acids with a methyl substituent.

The majority of the carboxylic acid parts of these group members have been or are being assessed by ECHA and are expected to be of low toxicity. In addition, no indication of CMR, ED, skin sensitisation toxicity has been identified for pentaerythritol. Pentaerythritol has no harmonised or self-classification (except eye irritant 2), and the repeated dose and reproductive toxicity studies do not indicate a specific hazard.

In vitro mutagenicity studies are available for some group members (mainly Ames studies, but also four *in vitro* chromosomal aberration tests and five *in vitro* mammalian cell gene mutation tests), showing no sign of genotoxicity.

Regarding skin sensitisation, negative OECD TG 406 studies are available for three substances and no functional group of concern has been identified for the group. One substance is self-classified as skin sensitiser 1, based on a OECD 442B (Local Lymph Node Assay) study. EC 268-597-2 was positive in an local lymph node assay, and it is self-classified as Skin Sens. 1. The positive finding is not in line with the biology of esters having no functional group that would be expected to result in skin sensitisation potential. This hazard does not apply on the basis of structural

[5] JECFA, 1999 http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2013.3169/epdf; COM, 2003 https://ec.europa.eu/food/sites/food/files/safety/docs/sci-com_scf_out158_en.pdf; EFSA, 2013 http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2013.3169/epdf

similarity to any of the other esters in the group since there are negative results from other esters and the breakdown products of esters are not skin sensitizers.

EC 268-597-2 has been reported to be used by industrial workers in lubricants. For industrial uses, sufficient and consistent self-classification by registrants should require company level risk management measures (RMM) to be in place for workers.

For industrial and professional uses, sufficient and consistent self-classification by registrants should require company level risk management measures (RMM) to be in place for workers.

Experimental data for repeated dose toxicity and reproductive and developmental toxicity data are available for 3 substances and include pre-natal developmental and repeated dose toxicity studies. No effects have been observed in one developmental toxicity study. Both the reproductive toxicity screening study (OECD 421), one EOGRTs study and one two-generation reproductive toxicity study (OECD 416) by the dietary route were without adverse effects on fertility and reproductive function parameters, with no effects on estrous cycle, sperm parameters, histological and organ weight changes, and reproductive indices.

No carcinogenicity study is available, but no carcinogenic effect is expected in view of the absence of mutagenic and repeated dose toxicity.

The available systemic toxicity studies do not indicate any relevant target organ toxicity in endocrine organs, including the thyroid or the reproductive organs.

No hazard for the environment has been identified for any group member. All substances in the group are unlikely to be PBT/vPvB, PMT/vPvM, toxic for the aquatic environment (except 271-985-4), or have potential for endocrine disruption for the environment.

None of the substances in the group is expected to be persistent. Almost all substances in the group (except seven) can be considered as readily biodegradable. For all of them the ready biodegradability studies are available. One substance (List 805-289-4) in the whole group contains branched carboxylic acid moiety. This substance is also readily biodegradable and the PBT potential for it is unlikely.

Six group members (EC 268-597-2, EC 269-495-0, EC 451-070-8, EC 482-410-3, List 947-748-2, List 947-899-4) have extremely low water solubility (from 0.15 mg/L to < 1 mg/L) compared to the rest of the group that could limit the degradation at environmentally unrealistic high testing concentrations. In addition, most of these substances have the longest alkyl chain with the range of C18-C22 and the unsaturated bonds, which can also limit the degradation at the stringent test conditions.

All substances are claimed to be not B based on negligible bioconcentration factor values estimated with QSAR, weight of evidence or read across from constituents of the substances. No experimental fish bioaccumulation studies are available. Despite all the substances have very high logKow (significantly above 6), they are expected to be metabolised by aquatic organisms via enzymatic hydrolysis or eliminated via urinary excretion to corresponding free fatty acids and alcohols (literature data on metabolism available). In addition, the availability of the substances in water is reduced due to high hydrophobicity and poor solubility, therefore, the bioaccumulation concern is unlikely.

All substances (except of two) in this group range from poorly water soluble to highly insoluble (3.5 µg - < 1mg/L), and for most of them the long-term aquatic toxicity tests are missing. The data on long-term toxicity to fish are waived for all the substances and long-term toxicity to Daphnia is either missing in the dossier or a read across only is provided.

Available short-term studies show no acute effects to aquatic organisms, but as the substances are poorly water soluble, these studies cannot be used to conclude on presence/absence of toxicity or to assess the species sensitivity (for example EC 285-547-5). For List 812-655-7 the short-term data are missing despite the substances are poorly water soluble.

One substance (EC 271-985-4) has water solubility of 4.06 mg/L (i.e. above the “poorly soluble” threshold of 1mg/L) and is self-classified as Aquatic Chronic 3, H412.

All substances in this group are made of very large molecules. As such, they might not be bioavailable enough to exert aquatic toxicity, even after long-term exposure.

Currently no compliance check (CCH) is proposed for any of the substances in this group.

Data generation is ongoing for two substances (EC 239-937-7, List No. 923-900-3).

There is some remaining uncertainty regarding the breakdown of the esters, more specifically regarding the rate of hydrolysis, as the information available is mostly from literature sources and refers to the generic ability of carboxylesterases to breakdown the esters.

Information from the potential breakdown products (acids and alcohols) ARNs and other structurally similar esters when available will further inform on their hazardous properties and the strategy can be revisited.

Annex 1: Overview of classifications

Data extracted on 7 May 2020.

EC/ List No	Substance name	Harmonised classification	Classification in registrations
204-110-1	pentaerythritol tetrastearate	-	-
239-937-7	2,2-bis[[(1-oxopentyl)oxy]methyl]propane-1,3-diyl divalerate	-	-
242-960-5	pentaerythritol tetraoleate	-	-
246-665-2	2,2-bis(hydroxymethyl)-1,3-propanediyl dioleate	-	-
247-279-7	2,2-bis[[(1-oxoheptyl)oxy]methyl]propane-1,3-diyl bisheptanoate	-	-
267-022-2	Fatty acids, C5-9, tetraesters with pentaerythritol	-	-
268-597-2	Hexanedioic acid, mixed esters with decanoic acid, heptanoic acid, octanoic acid and pentaerythritol	-	*Skin Sens. 1, H317*
269-495-0	2,2-bis(hydroxymethyl)propane-1,3-diyl didocosanoate	-	-
270-291-9	Fatty acids, C5-10, esters with pentaerythritol	-	-
270-471-7	Decanoic acid, mixed esters with heptanoic acid, octanoic acid and pentaerythritol	-	-
270-472-2	Decanoic acid, mixed esters with octanoic acid and pentaerythritol	-	-
271-694-2	Fatty acids, C16-18 and C18-unsatd., tetraesters with pentaerythritol	-	-
271-985-4	Linseed oil, ester with pentaerythritol	-	*Aquatic Chronic 3, H412*
274-765-6	Nonanoic acid, mixed esters with heptanoic acid, pentaerythritol and valeric acid	-	-
275-118-0	Decanoic acid, mixed esters with heptanoic acid, octanoic	-	-

EC/ List No	Substance name	Harmonised classification	Classification in registrations
	acid, pentaerythritol and valeric acid		
285-547-5	Fatty acids, C16-18, esters with pentaerythritol	-	-
287-827-2	Fatty acids, C8-10, tetraesters with pentaerythritol	-	-
288-305-7	Fatty acids, C16-18 and C18-unsatd., esters with pentaerythritol	-	-
293-029-5	Fatty acids, C16-18, tetraesters with pentaerythritol	-	-
451-070-8	Pentanoic, octanoic and decanoic acid, mixed ester with pentaerythritol	-	-
451-190-0	Fatty acids, C6-12, mixed tetraesters with heptanoic acid, pentaerythritol, 3,5,5-trimethylhexanoic acid and valeric acid	-	-
482-410-3	Hatcol 1760	-	-
701-020-9	Decanoic acid, mixed esters with heptanoic acid, octanoic acid, pentaerythritol and valeric acid	-	-
805-289-4	Tetraesters of pentaerythritol with heptanoic acid and 3,5,5-trimethylhexanoic acid	-	-
812-653-6	Heptanoic acid, mixed esters with pentaerythritol and valeric acid	-	-
812-655-7	Fatty acids, C8-16, tetraesters with pentaerythritol	-	-
921-836-0	Fatty acids, C16 and C16-18-unsatd., mixed esters with adipic acid and pentaerythritol	-	-
923-900-3	Esterification products of fatty acids, C16 and C16-18 (even numbered, unsaturated) alkyl and adipic acid with pentaerythritol	-	-

EC/ List No	Substance name	Harmonised classification	Classification in registrations
947-748-2	Fatty acids lanolin, di-, tri- and tetraesters with pentaerythritol and rape fatty acid	-	-
947-899-4	Fatty acids C18-C22 (even numbered), tetraesters with pentaerythritol	-	-
948-027-5	Esterification product of castor oil fatty acids and pentaerythritol	-	-
948-383-1	Fatty acids, C8-10-(even numberd), Esters with pentaerythritol and adipic acid	-	-

Annex 2: Overview of uses based on information available in registration dossiers

Data extracted on 7 May (EC 247-279-7 from 7 March 2023).

Tables 4 a-f: Overview of main uses

Main types of applications structured by product or article types	204-110-1	239-937-7	242-960-5	246-665-2	247-279-7	267-022-2	268-597-2	269-495-0
use in ink/toner	F, I, **P, C**							
use in manufacture of rubber products		F, I, **C, A**						
use in coatings		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in polymer processing		F, I, **P, A**						
use as fuel		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in cosmetic products		F, **C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
de-icing and anti-icing applications		F, **P, C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in agrochemicals		F, **P, C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in tyres		F, I, **C, A**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in fragrance/perfume products			F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in biocidal products		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in cleaning agents		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in solvents		F, I, **P, C, A**	F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in laboratory		F, I, **P**			F, I			
use of medical devices		F, I, **P, C, A**						

Main types of applications structured by product or article types	204-110-1	239-937-7	242-960-5	246-665-2	247-279-7	267-022-2	268-597-2	269-495-0
use in industrial treatment of textile			F, I, **P, C, A**	F, I, **P, C, A**		F, I, **P, C, A**		F, I, **P, C, A**
use as fertilizers			F, I, **P, C**	F, I, **P, C**	**C**	F, I, **P, C**		F, I, **P, C**
use in construction chemicals			F, I, **P, C, A**	F, I, **P, C, A**	**C**	F, I, **P, C, A**		F, I, **P, C, A**
use in air fresheners aerosol			F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
use in pest control products insecticides and repellents			F, I, **P, C**	F, I, **P, C**		F, I, **P, C**		F, I, **P, C**
functional fluids			F, I, **P, C**	F, I, **P, C**	I, **P, C**	F, I, **P, C**		F, I, **P, C**
use in lubricants		F, I, **P, C, A**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I	F, I, **P, C**
use in polishes and wax blends		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	**C**	F, I, **P, C**		F, I, **P, C**
use as mining chemicals			F, I, **P**	F, I, **P**		F, I, **P**		F, I, **P**
use in water treatment		F, I, **P**	F, I, **P**	F, I, **P**		F, I, **P**		F, I, **P**
Use as intermediate				I				

F: formulation, I: industrial use, P: professional use, C: consumer use, A: article service life; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release**.**

Main types of applications structured by product or article types	270-291-9	270-471-7	270-472-2	271-694-2	271-985-4	274-765-6
use in pulp and paper			F, I, **P, C, A**			
use in coatings				F, I, **P, C**		
use in polymer processing						
use as fuel				F, I, **P, C**		
use in cosmetic products			F, I, **P, C, A**	F, I, **P, C**		
de-icing and anti-icing applications				F, I, **P, C**		
use in agrochemicals				F, I, **P, C**		
use in tyres				F, I, **P, C**		
use in fragrance / perfume products			F, I, **P, C, A**	F, I, **P, C**		
use in biocidal products				F, I, **P, C**		
use in cleaning agents				F, I, **P, C**		
use in solvents				F, I, **P, C**		
use in industrial treatment of textile				F, I, **P, C, A**		
use as fertilizers				F, I, **P, C**		
use in construction chemicals				F, I, **P, C, A**		
use in air fresheners aerosol				F, I, **P, C**		
use in pest control products insecticides and repellents				F, I, **P, C**		
functional fluids			F, I, **P**	F, I, **P, C**		
use in lubricants	F, I, **P, C**	F, I, **P, C**	F, I, **P**	F, I, **P, C**		F, I, **P**
preparation of polymers					F, I	

Main types of applications structured by product or article types	270-291-9	270-471-7	270-472-2	271-694-2	271-985-4	274-765-6
use in polishes and wax blends				F, I, **P, C**		
use as mining chemicals				F, I, **P**		
use in water treatment				F, I, **P**		

F: formulation, I: industrial use, P: professionl use, C: consumer use, A: article service life; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release**.**

Main types of applications structured by product or article types	275-118-0	285-547-5	287-827-2	288-305-7	293-029-5	451-190-0
use in coatings		F, I, **P, C, A**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in polymer processing		F, I, **P, C, A**				
use as fuel		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in cosmetic products		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
de-icing and anti-icing applications		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in agrochemicals		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in tyres		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in fragrance/perfume products		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in biocidal products		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in cleaning agents		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**

Main types of applications structured by product or article types	275-118-0	285-547-5	287-827-2	288-305-7	293-029-5	451-190-0
use in solvents		F, I, **P, C, A**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in industrial treatment of textile		F, I, **P, C, A**	F, I, **P, C, A**	F, I, **P, C, A**	F, I, **P, C, A**	F, I, **P, C, A**
use as fertilizers		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in construction chemicals		F, I, **P, C, A**	F, I, **P, C, A**	F, I, **P, C, A**	F, I, **P, C, A**	F, I, **P, C, A**
use in air fresheners aerosol		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in pest control products insecticides and repellents		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
functional fluids	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in lubricants	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use in polishes and wax blends		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**
use as mining chemicals		F, I, **P**	F, I, **P**	F, I, **P**	F, I, **P**	F, I, **P**
use in water treatment		F, I, **P**	F, I, **P**	F, I, **P**	F, I, **P**	F, I, **P**

F: formulation, I: industrial use, P: professional use, C: consumer use, A: article service life; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release.

Main types of applications structured by product or article types	701-020-9	805-289-4	812-653-6	812-655-7	921-836-0	923-900-3
use in coatings	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
use in polymer processing			F, I, **P, C, A**			
use as fuel	F, I, **P, C**		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	
use in cosmetic products	F, I, **P, C**		F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	
de-icing and anti-icing applications	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
use in agrochemicals	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
use in tyres			F, I, **P, C, A**	F, I, **P, C**		
use in biocidal products	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
use in cleaning agents	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
use in industrial treatment of textile					F, I, **P, C, A**	
use as fertilizers					F, I, **P, C**	
use in construction chemicals	F, I, **P, C**			F, I, **P, C**	F, I, **P, C, A**	
use in air fresheners aerosol	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
use in pest control products insecticides and repellents					F, I, **P, C**	
use in polishes furniture floor & leather care	F, I, **P, C**			F, I, **P, C**	F, I, **P, C**	
functional fluids	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	
use in lubricants	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	F, I, **P, C**	
use as binders and release agents					F, I, **P**	
Use as intermediate						F, I, **C**

F: formulation, I: industrial use, P: professional use, C: consumer use, A: article service life; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release**.**

Main types of applications structured by product or article types	947-748-2	947-899-4	948-027-5	948-383-1	451-070-8	482-410-3
use in ink/toner	F, I, **P**	F, I, **P, C**				
use in polyurethane resins			F, I	F, I		
use in coatings	F, I, **P, C**			F, I, **P, C**		
use in polymer processing					F, I, **P**	
use as fuel				F, I, **P, C**		
use in cosmetic products				F, I, **C**		
de-icing and anti-icing applications				F, **P, C**		
use in agrochemicals				F, **P, C**		
use in tyres				F, I, **C**		
use in laundry products				F, I, **P, C**		
use in liquid washing and cleaning products	F, I, **P, C**			F, I, **P, C**		
use in biocidal products	F, I, **P, C**			F, **P, C**		
use in cleaning agents				F, I, **P, C**		
use in cleaning and care products				F, I, **P, C**		
use in laboratory				F, I, **P**		
vehicle cleaning products car wash product				F, I, **P, C**		
use of medical devices				F, **P**		
use as fertilizers				F, **P, C**		
use in processing aids						
use in construction chemicals				F, I, **P, C, A**		

Main types of applications structured by product or article types	947-748-2	947-899-4	948-027-5	948-383-1	451-070-8	482-410-3
use in air fresheners aerosol	F, I, **P, C**			F, **C**		
use in pest control products insecticides and repellents				F, **C**		
use in polishes furniture floor & leather care				F, I, **P, C**		
functional fluids				F, I, **P, C**		
use in lubricants	F, I, **P, C**			F, I, **P, C**		F, **P**
use as binders and release agents				F, I, **P**		
lubricants and greases in vehicles or machinery	F, I, **P**					
use in polishes and wax blends	F, I, **P, C**					
use as mining chemicals				F, I		
use in water treatment				F, I, **P**		
Use as intermediate			I			

F: formulation, I: industrial use, P: professional use, C: consumer use, A: article service life; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release**.**

Annex 3: Overview of completed or ongoing regulatory risk management activities

Data extracted in May 2020.

There are no relevant completed or ongoing regulatory risk management activities for any of the substances.