



## SAFETY DATA SHEET

### Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

#### SECTION 1: Identification of the substance/mixture and of the company/undertaking

##### 1.1. Product identifier

Product name	Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW
Product number	ID 14358
Internal identification	170263, 170248, 170264, 170249, 170265, 170246, 170266, 170260, 170267, 170253, 170385, 170391, 170390, 170381, 170380, 170382, 170383; 170710
EU REACH registration number	01-2119474894-22-0010

##### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Manufacture of substance Distribution of substance Formulation & (re)packing of substances and mixtures Use as an intermediate Use as a fuel
Uses advised against	Uses in coatings : Professional Road and construction applications : Professional

##### 1.3. Details of the supplier of the safety data sheet

Supplier	Neste Oyj Keilaranta 21, Espoo, P.O.B. 95, FIN-00095 NESTE, FINLAND Tel. +358 10 45811 SDS@neste.com (chemical safety)
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##### 1.4. Emergency telephone number

National emergency telephone number	+358 800 147 111, +358 9 471 977, Poison Information Centre
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#### SECTION 2: Hazards identification

##### 2.1. Classification of the substance or mixture

###### Classification (SI 2019 No. 720)

Physical hazards	Not Classified
Health hazards	Acute Tox. 4 - H332 Carc. 1B - H350 Repr. 2 - H361d STOT RE 2 - H373
Environmental hazards	Aquatic Acute 1 - H400 Aquatic Chronic 1 - H410

##### 2.2. Label elements

###### Hazard pictograms



Signal word

Danger

## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

<b>Hazard statements</b>	H332 Harmful if inhaled. H350 May cause cancer. H361d Suspected of damaging the unborn child. H373 May cause damage to organs through prolonged or repeated exposure. H410 Very toxic to aquatic life with long lasting effects.
<b>Precautionary statements</b>	P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P273 Avoid release to the environment. P308+P313 IF exposed or concerned: Get medical advice/ attention.
<b>Supplemental label information</b>	EUH066 Repeated exposure may cause skin dryness or cracking.
<b>Contains</b>	Fuel oil, residual

### 2.3. Other hazards

<b>Other hazards</b>	Combustible liquid. Mainly non-volatile. Unloading gases ( Hydrogen sulphide (H2S)., Hydrocarbons. ) : Irritating to eyes. Irritating to respiratory system. High concentrations can depress the central nervous system. Contact with hot product can cause serious thermal burns.  This product does not contain substances considered to have endocrine disrupting properties at levels of 0.1% or higher.
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## SECTION 3: Composition/information on ingredients

### 3.2. Mixtures

<b>Fuel oil, residual</b>	<b>~ 100%</b>
CAS number: 68476-33-5	EC number: 270-675-6
M factor (Acute) = 1	M factor (Chronic) = 1
<b>Classification</b>	
Acute Tox. 4 - H332	
Carc. 1B - H350	
Repr. 2 - H361d	
STOT RE 2 - H373	
Aquatic Acute 1 - H400	
Aquatic Chronic 1 - H410	

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

<b>Other information</b>	Mixture of a petroleum product and additives., Substance of Unknown or Variable composition, Complex reaction products or Biological materials (UVCB).
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## SECTION 4: First aid measures

### 4.1. Description of first aid measures

<b>Inhalation</b>	Obtain medical attention if oil mist is inhaled (risk of chemicals pneumonitis). Unloading gases ( Hydrogen sulphide (H2S)., Hydrocarbons. ) : Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. If breathing stops, provide artificial respiration. For breathing difficulties, oxygen may be necessary. Get medical attention.
<b>Ingestion</b>	Do not induce vomiting. Get medical attention if symptoms are severe or persist.

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<b>Skin contact</b>	Remove contaminated clothing. Wash skin thoroughly with soap and water or use an approved skin cleanser. Do not use the following: Solvent. Continue to rinse for at least 10 minutes. Get medical attention if irritation persists after washing.
<b>Eye contact</b>	Rinse immediately with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.

### 4.2. Most important symptoms and effects, both acute and delayed

<b>General information</b>	Repeated exposure may cause skin dryness or cracking. Oil mist: May cause eye and respiratory system irritation. Unloading gases ( Hydrogen sulphide (H <sub>2</sub> S)., Hydrocarbons. ) : Causes eye irritation. Irritating to respiratory system. High concentrations can depress the central nervous system.
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### 4.3. Indication of any immediate medical attention and special treatment needed

<b>Notes for the doctor</b>	Treat symptomatically. Hydrogen sulphide (H <sub>2</sub> S). : May cause nausea, headache, dizziness and intoxication. Drowsiness.
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## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

<b>Suitable extinguishing media</b>	Foam, carbon dioxide or dry powder.
<b>Unsuitable extinguishing media</b>	Do not use water jet as an extinguisher, as this will spread the fire.

### 5.2. Special hazards arising from the substance or mixture

<b>Specific hazards</b>	Containers can burst violently or explode when heated, due to excessive pressure build-up.
<b>Hazardous combustion products</b>	Sulphurous gases (SO <sub>x</sub> ). Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ). Hydrogen sulphide (H <sub>2</sub> S). Carbon monoxide (CO).

### 5.3. Advice for firefighters

<b>Protective actions during firefighting</b>	Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Prevent fire extinguishing water from contaminating surface water or the ground water system.
<b>Special protective equipment for firefighters</b>	Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing.

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

<b>For emergency responders</b>	Keep unnecessary and unprotected personnel away from the spillage. Eliminate all ignition sources if safe to do so.
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### 6.2. Environmental precautions

<b>Environmental precautions</b>	Avoid release to the environment. Stop leak if safe to do so. Avoid the spillage or runoff entering drains, sewers or watercourses. Contain spillage with sand, earth or other suitable non-combustible material. Inform the relevant authorities if environmental pollution occurs (sewers, waterways, soil or air). Risk of soil and ground water contamination.
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### 6.3. Methods and material for containment and cleaning up

<b>Methods for cleaning up</b>	Immediately start clean-up of the liquid and contaminated soil. Allow hot product solidify first (if there is no risk of spreading into the environment). Solid product can be taken up. Stains can be cleaned with a hydrocarbon solvent. Pay attention to the fire and health hazards caused by the product. Wear adequate protective equipment at all operations.
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## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

### 6.4. Reference to other sections

**Reference to other sections** For personal protection, see Section 8. For waste disposal, see Section 13.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

#### Usage precautions

Eliminate all sources of ignition. Take precautionary measures against static discharges. Unloading gases : Avoid inhalation of vapours. ( Hydrogen sulphide (H<sub>2</sub>S)., Hydrocarbons. ) Provide adequate ventilation. Oil mist: Avoid inhalation of vapours and contact with skin and eyes. Use personal protective equipment and/or local ventilation when needed. Wash hands and any other contaminated areas of the body with soap and water before leaving the work site. Product is usually handled heated. Handling and storage temperature must not exceed the flash point. If there is a risk of contact with hot product, all protective equipment worn should be suitable for use with high temperatures. During tank operations follow special instructions (risk of oxygen displacement, hydrogen sulfide and hydrocarbons).

### 7.2. Conditions for safe storage, including any incompatibilities

#### Storage precautions

Flammable liquid storage. Can be stored heated. Store in a demarcated bunded area to prevent release to drains and/or watercourses. Change contaminated thermal insulation material (autoignition hazard). Store away from the following materials: Oxidising agents. Use containers made of the following materials: Carbon steel. Stainless steel.

### 7.3. Specific end use(s)

**Specific end use(s)** Not known.

## SECTION 8: Exposure controls/Personal protection

### 8.1. Control parameters

#### Occupational exposure limits

Oil mist: 5 mg/m<sup>3</sup> (8h) HTP 2020/FIN.

Hydrogen sulfide: 5 ppm (8h), 7 mg/m<sup>3</sup> (8h), 10 ppm (15 min), 14 mg/m<sup>3</sup> (15 min) HTP 2020/FIN, EU OELV (EC/2009/161).

#### Fuel oil, residual (CAS: 68476-33-5)

<b>DNEL</b>	Workers - Inhalation; Short term systemic effects: 4700 mg/m <sup>3</sup> , (15 min), Aerosol Workers - Inhalation; Long term systemic effects: 0,18 mg/m <sup>3</sup> , (8h), Aerosol Workers - Dermal; Long term systemic effects: 0,065 mg/kg
<b>PNEC</b>	- Oral; 66,7 mg/kg (food, secondary poisoning)

### 8.2. Exposure controls

#### Appropriate engineering controls

All handling should only take place in well-ventilated areas. Use personal protective equipment and/or local ventilation when needed. If there is a risk of contact with hot product, all protective equipment worn should be suitable for use with high temperatures. Handle in accordance with good industrial hygiene and safety practice.

#### Eye/face protection

Tight-fitting safety glasses. Face shield when needed.

#### Hand protection

Thick, thermally insulated protective gloves. It is recommended that gloves are made of the following material: Polyvinyl chloride (PVC). Nitrile rubber. Change protective gloves regularly. Protective gloves according to standards EN 374 and EN 407.

#### Other skin and body protection

Protective clothing when needed. If there is a risk of contact with hot product, all protective equipment worn should be suitable for use with high temperatures.

## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

<b>Respiratory protection</b>	Filter device/full mask Combination filter, type A2/P3. (B2) Filter device could be used maximum 2 hours at a time. Filter devices must not be used in conditions where the oxygen level is low (< 19 vol.-%). At high concentrations a breathing apparatus must be used (self-contained or fresh air hose breathing apparatus). Filter must be changed often enough. Respirators according standards EN 136 and EN 140.
<b>Environmental exposure controls</b>	Take precautions against leakage by constructing collecting pools and sewerage systems as well as by surfacing the loading and unloading stations.

### SECTION 9: Physical and chemical properties

#### 9.1. Information on basic physical and chemical properties

<b>Appearance</b>	Liquid.
<b>Colour</b>	Black.
<b>Odour</b>	Strong. Characteristic.
<b>Odour threshold</b>	-
<b>pH</b>	-
<b>Melting point</b>	Pour point < 30°C (ISO 3016)
<b>Initial boiling point and range</b>	150... > 750°C
<b>Flash point</b>	≥ 65°C
<b>Flammability (solid, gas)</b>	-
<b>Upper/lower flammability or explosive limits</b>	Lower flammable/explosive limit: ~ 1 % Upper flammable/explosive limit: ~ 6 %
<b>Vapour pressure</b>	< 1 kPa @ 38°C
<b>Vapour density</b>	-
<b>Relative density</b>	~ 0,9 - 1,0 @ 15/4°C
<b>Solubility(ies)</b>	The product has poor water-solubility.
<b>Partition coefficient</b>	log Kow: 4 - > 6
<b>Auto-ignition temperature</b>	> 400°C
<b>Decomposition Temperature</b>	-
<b>Viscosity</b>	Kinematic viscosity ≥ 20 mm <sup>2</sup> /s @ 50°C
<b>Explosive properties</b>	Not considered to be explosive.
<b>Oxidising properties</b>	Does not meet the criteria for classification as oxidising.

#### 9.2. Other information

<b>Other information</b>	Not known.
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### SECTION 10: Stability and reactivity

#### 10.1. Reactivity

<b>Reactivity</b>	There are no known reactivity hazards associated with this product.
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#### 10.2. Chemical stability

<b>Stability</b>	Stable at normal ambient temperatures and when used as recommended.
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## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

### 10.3. Possibility of hazardous reactions

**Possibility of hazardous reactions** No potentially hazardous reactions known.

### 10.4. Conditions to avoid

**Conditions to avoid** Keep away from heat, sparks and open flame.

### 10.5. Incompatible materials

**Materials to avoid** Oxidising agents.

### 10.6. Hazardous decomposition products

**Hazardous decomposition products** Hydrogen sulphide (H<sub>2</sub>S). Combustion ash contains inorganic nickel and vanadium compounds, which are hazardous to health.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

**Toxicological effects** Harmful if inhaled.

#### Acute toxicity - inhalation

**ATE inhalation (dusts/mists mg/l)** 1.5

#### Skin corrosion/irritation

**Skin corrosion/irritation** Repeated exposure may cause skin dryness or cracking. Based on available data the classification criteria are not met. (OECD 404)

#### Serious eye damage/irritation

**Serious eye damage/irritation** Based on available data the classification criteria are not met. (EC B.5)

#### Respiratory sensitisation

**Respiratory sensitisation** Based on available data the classification criteria are not met.

#### Skin sensitisation

**Skin sensitisation** Based on available data the classification criteria are not met. (OECD 406)

#### Germ cell mutagenicity

**Genotoxicity - in vitro** Based on available data the classification criteria are not met. (OECD 471, 476)

**Genotoxicity - in vivo** Based on available data the classification criteria are not met. (OECD 475, EC B.12)

#### Carcinogenicity

**Carcinogenicity** May cause cancer. (OECD 451)

#### Reproductive toxicity

**Reproductive toxicity - fertility** Based on available data the classification criteria are not met.

**Reproductive toxicity - development** Suspected of damaging the unborn child. (EPA OTS 798.4900)

#### Specific target organ toxicity - single exposure

**STOT - single exposure** No adverse effects known.

#### Specific target organ toxicity - repeated exposure

**STOT - repeated exposure** May cause damage to organs through prolonged or repeated exposure. (EPA OPPTS 870.3250)

## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

### Aspiration hazard

**Aspiration hazard** Based on available data the classification criteria are not met.

### General information

Especially fresh product may contain traces of highly toxic hydrogen sulphide, which irritates severely eyes and respiratory tract. High concentrations can depress the central nervous system. The product contains traces of nickel and vanadium compounds, which are hazardous to health.

This product does not contain substances considered to have endocrine disrupting properties at levels of 0.1% or higher.

### Toxicological information on ingredients.

#### Fuel oil, residual

##### Acute toxicity - oral

**Notes (oral LD<sub>50</sub>)** LD<sub>50</sub> 4320 - 5270 mg/kg, Oral, Rat (OECD 401)

##### Acute toxicity - dermal

**Notes (dermal LD<sub>50</sub>)** LD<sub>50</sub> > 2000 mg/kg, Dermal, Rabbit (EC B.3, OECD 434)

##### Acute toxicity - inhalation

**Notes (inhalation LC<sub>50</sub>)** LC<sub>50</sub> 4100 mg/m<sup>3</sup>, Inhalation, Rat (EPA OTS 798.1150)

**ATE inhalation  
(dusts/mists mg/l)** 1.5

## SECTION 12: Ecological information

### 12.1. Toxicity

**Toxicity** Very toxic to aquatic life with long lasting effects.

### Ecological information on ingredients.

#### Fuel oil, residual

##### Acute aquatic toxicity

**LE(C)<sub>50</sub>** 0.1 < L(E)C<sub>50</sub> ≤ 1

**M factor (Acute)** 1

**Acute toxicity - fish** LL<sub>50</sub>, 96 hours: 79 mg/l, Oncorhynchus mykiss (Rainbow trout)  
WAF (OECD 203)

**Acute toxicity - aquatic invertebrates** EL<sub>50</sub>, 48 hours: 0,22 mg/l, Daphnia magna  
WAF (OECD 202)

**Acute toxicity - aquatic plants** EL<sub>50</sub>, 72 hours: 0,32 mg/l, Pseudokirchneriella subcapitata  
WAF (OECD 201)  
NOELR, 72 hours: 0,05 mg/l, Pseudokirchneriella subcapitata  
WAF (EPA-600/9-018)

**Acute toxicity - microorganisms** LL<sub>50</sub>, 72 hours: > 1000 mg/l, Micro-organisms (wastewater sludge), Tetrahymena pyriformis  
NOEL, 72 hours: 14,9 mg/l, Micro-organisms (wastewater sludge), Tetrahymena pyriformis  
Heavy fuel oil (QSAR)

## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

### Chronic aquatic toxicity

<b>M factor (Chronic)</b>	1
<b>Chronic toxicity - fish early life stage</b>	NOEL, 28 days: 0,1 mg/l, Oncorhynchus mykiss (Rainbow trout) Heavy fuel oil (QSAR)
<b>Chronic toxicity - aquatic invertebrates</b>	NOEL, 21 days: 0,27 mg/l, Daphnia magna Heavy fuel oil (QSAR)

### 12.2. Persistence and degradability

<b>Stability (hydrolysis)</b>	Not relevant.
<b>Biodegradation</b>	The product is slowly degradable. Lightest hydrocarbons are volatile.

### 12.3. Bioaccumulative potential

<b>Bioaccumulative potential</b>	Possibly bioaccumulative.
<b>Partition coefficient</b>	log Kow: 4 - > 6

### 12.4. Mobility in soil

<b>Mobility</b>	The product is insoluble in water. Mainly non-volatile. The product contains substances which are bound to particulate matter and are retained in soil.
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### 12.5. Results of PBT and vPvB assessment

<b>Results of PBT and vPvB assessment</b>	This product does not contain any substances classified as PBT or vPvB.
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### 12.6. Other adverse effects

<b>Other adverse effects</b>	Product causes fouling, and direct contact produces harmful effects e.g. to birds and vegetation. Adsorbed hydrocarbon residues can be harmful to sediment organisms.
<b>Endocrine-disrupting properties</b>	This product does not contain substances considered to have endocrine disrupting properties at levels of 0.1% or higher.

## SECTION 13: Disposal considerations

### 13.1. Waste treatment methods

<b>Disposal methods</b>	Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. When handling waste, the safety precautions applying to handling of the product should be considered. Care should be taken when handling emptied containers that have not been thoroughly cleaned or rinsed out. Product residues retained in emptied containers can be hazardous.
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## SECTION 14: Transport information

### 14.1. UN number

<b>UN No. (ADR/RID)</b>	3082
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### 14.2. UN proper shipping name

<b>Proper shipping name (ADR/RID)</b>	UN 3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (FUEL OIL)
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### 14.3. Transport hazard class(es)

<b>ADR/RID class</b>	9
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## Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW

### 14.4. Packing group

ADR/RID packing group III

### 14.5. Environmental hazards

Environmentally hazardous substance/marine pollutant

MARINE POLLUTANT

### 14.6. Special precautions for user

Hazard Identification Number 90  
(ADR/RID)

Tunnel restriction code (-)

### 14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No

## SECTION 15: Regulatory information

### 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

**National regulations** EU regulatory references for the safety data sheet: Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (as amended) Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as amended)

### 15.2. Chemical safety assessment

A chemical safety assessment has been carried out.

## SECTION 16: Other information

**Abbreviations and acronyms used in the safety data sheet** DNEL = Derived No-Effect Level  
PNEC = Predicted No-Effect Concentration  
NOEL = No Observed Effect Level  
VAK = Vaarallisten Aineiden Kuljetus; Finnish Transport Legislation  
WAF = Water Accommodated Fraction

**Key literature references and sources for data** Concawe Report no. 13/17, Chemical Safety Report Heavy Fuel Oil Components (HFO) ; CAS-number 68476-33-5, Fuel oil, residual, 2018.

**Revision comments** Updated, sections: 2.3, 11, 12. NOTE: Lines within the margin indicate significant changes from the previous revision.

**Revision date** 29/03/2023

**Supersedes date** 15/06/2021

**SDS number** 5680

**Hazard statements in full** H332 Harmful if inhaled.  
H350 May cause cancer.  
H361d Suspected of damaging the unborn child.  
H373 May cause damage to organs through prolonged or repeated exposure.  
H400 Very toxic to aquatic life.  
H410 Very toxic to aquatic life with long lasting effects.

**Heavy fuel oil 40...420, low sulphur grade; Neste heavy fuel oil LS 40...LS 420 (PORL40,...,PORL420, PORLS40...PORLS420); PORLSW****Use Descriptor Codes,  
Industrial uses**

Manufacture of substance, (SU NA; PROC 1, 2, 3, 8a, 8b, 15; ERC 1)  
Use as an intermediate, (SU 8, 9; PROC 1, 2, 3, 8a, 8b, 15; ERC 6a)  
Distribution of substance, (SU NA; PROC 1, 2, 3, 8a, 8b, 15; ERC 4, 5, 6a, 6b, 6c, 6d, 7)  
Formulation & (re)packing of substances and mixtures, (SU NA; PROC 1, 2, 3, 8a, 8b, 15; ERC 2)  
Use as a fuel, (SU NA; PROC 1, 2, 3, 8a, 8b, 16; ERC 7)

**Use Descriptor Codes,  
Professional uses**

Use as a fuel, (SU NA; PROC 1, 2, 3, 8a, 8b, 16; ERC 9a, 9b)

## Exposure scenario

### Use of Substance as Intermediate - Industrial

#### Identification

<b>Product name</b>	Fuel oil, residual
<b>CAS number</b>	68476-33-5
<b>EC number</b>	270-675-6
<b>Version number</b>	2018
<b>Es reference</b>	ES01b

#### 1. Title of exposure scenario

<b>Main title</b>	Use of Substance as Intermediate - Industrial
<b>Process scope</b>	Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).
<b>Sector of use</b>	SU8 Manufacture of bulk, large-scale chemicals (including petroleum products) SU9 Manufacture of fine chemicals
<b>Environment</b>	
<b>Environmental release category</b>	ERC6a Use of intermediate
<b>SPERC</b>	ESVOC SPERC 6.1a.v1
<b>Worker</b>	
<b>Process category</b>	PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15 Use as laboratory reagent.

#### 2. Conditions of use affecting exposure (Industrial - Environment 1)

##### Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

##### Amounts used

Fraction of EU tonnage used in region: 0.1  
Regional use tonnage: 1.8E+06 tonnes/year  
Fraction of Regional tonnage used locally: 8.3E-03  
Annual site tonnage: 1.5E+04 tonnes  
Maximum daily site tonnage: 5.0E+04 kg

##### Frequency and duration of use

Continuous release.  
Emission days: 300 days/year

## Use of Substance as Intermediate - Industrial

### Other given operational conditions affecting environmental exposure

<b>Emission factor - air</b>	Release fraction to air from process (initial release prior to RMM): 1.0E-04
<b>Emission factor - water</b>	Release fraction to wastewater from process (initial release prior to RMM): 9.9E-07
<b>Emission factor - soil</b>	Release fraction to soil from process (initial release prior to RMM): 0.001

### Environmental factors not influenced by risk management measures

<b>Dilution</b>	Local freshwater dilution factor: 10 Local marine water dilution factor: 100
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### Risk management measures

<b>Good practice</b>	Common practices vary across sites, thus conservative process release estimates used.  Risk from environmental exposure is driven by terrestrial secondary poisoning.
<b>STP details</b>	Not applicable as there is no release to wastewater. Estimated substance removal from wastewater via domestic sewage treatment: 94.2% Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 7.3E+04 kg/day Assumed domestic sewage treatment plant flow (m <sup>3</sup> /day): 2000.

### Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

<b>Air</b>	Treat air emission to provide a typical removal efficiency of 80%.
<b>Water</b>	If discharging to domestic sewage treatment plant, no onsite wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): $\geq 0.0$ . If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of $\geq 0.0\%$ . Prevent discharge of undissolved substance to or recover from onsite waste water.
<b>Soil</b>	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to external treatment of waste for disposal

<b>Waste treatment</b>	This substance is consumed during use and no waste of the substance is generated.
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### Conditions and measures related to external recovery of waste

<b>Recovery method</b>	This substance is consumed during use and no waste of the substance is generated.
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## 2. Conditions of use affecting exposure (Workers - Health 1)

### Product characteristics

<b>Physical state</b>	Liquid
<b>Vapour pressure</b>	Vapour pressure < 0.5 kPa at STP.
<b>Concentration details</b>	Covers percentage substance in the product up to 100% (unless stated differently).

### Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

### Other given operational conditions affecting workers exposure

<b>Setting</b>	Assumes a good basic standard of occupational hygiene is implemented.
<b>Temperature</b>	Operation is carried out at elevated temperature (> 20°C above ambient temperature).

## Use of Substance as Intermediate - Industrial

### Organisational measures to prevent/limit releases, dispersion and exposure

#### **Organisational measures**

General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

#### **Risk management measures**

## Use of Substance as Intermediate - Industrial

### General exposures (closed systems)

Handle substance within a closed system.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Process sampling

Outdoor.

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 15 minutes.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Bulk product storage

Store substance within a closed system.

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Laboratory activities

Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

Wear suitable gloves tested to EN374.

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### Marine vessel/barge (un)loading.

Avoid carrying out activities involving exposure for more than 4 hours.

Transfer via enclosed lines.

Clear transfer lines prior to de-coupling.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Road tanker/rail car loading.

Ensure material transfers are under containment or extract ventilation.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Equipment cleaning and maintenance

Drain down and flush system prior to equipment break-in or maintenance.

Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

### 3. Exposure estimation (Environment 1)

<b>Assessment method</b>	Used Petrorisk model. (Hydrocarbon Block Method)
	Risk-driving RCR - air compartment driven 6.9E-01
	Risk-driving RCR - water compartment driven 1.1E-02

### 4. Guidance to check compliance with the exposure scenario (Environment 1)

## Use of Substance as Intermediate - Industrial

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

### 3. Exposure estimation (Health 1)

#### Assessment method

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Qualitative approach used to conclude safe use.

### 4. Guidance to check compliance with the exposure scenario (Health 1)

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

## Exposure scenario

### Distribution of Substance - Industrial

#### Identification

<b>Product name</b>	Fuel oil, residual
<b>CAS number</b>	68476-33-5
<b>EC number</b>	270-675-6
<b>Version number</b>	2018
<b>Es reference</b>	ES01a

#### 1. Title of exposure scenario

<b>Main title</b>	Distribution of Substance - Industrial
<b>Process scope</b>	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities.
<b>Sector of use</b>	NA
<b>Environment</b>	
<b>Environmental release category</b>	ERC4 Use of non-reactive processing aid at industrial site (no inclusion into or onto article) ERC5 Use at industrial site leading to inclusion into/onto article ERC6a Use of intermediate ERC6b Use of reactive processing aid at industrial site (no inclusion into or onto article) ERC6c Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article) ERC6d Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article) ERC7 Use of functional fluid at industrial site
<b>SPERC</b>	ESVOC SPERC 1.1b.v1
<b>Worker</b>	
<b>Process category</b>	PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15 Use as laboratory reagent.

#### 2. Conditions of use affecting exposure (Industrial - Environment 1)

##### Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

##### Amounts used



## Distribution of Substance - Industrial

Fraction of EU tonnage used in region: 0.1  
 Regional use tonnage: 9.3E+06 tonnes/year  
 Fraction of Regional tonnage used locally: 2.0E-03  
 Annual site tonnage: 1.9E+04 tonnes  
 Maximum daily site tonnage: 6.2E+04 kg

### Frequency and duration of use

Continuous release.  
 Emission days: 300 days/year

### Other given operational conditions affecting environmental exposure

**Emission factor - air** Release fraction to air from process (initial release prior to RMM): 1.0E-03  
**Emission factor - water** Release fraction to wastewater from process (initial release prior to RMM): 1.0E-06  
**Emission factor - soil** Release fraction to soil from process (initial release prior to RMM): 0.00001

### Environmental factors not influenced by risk management measures

**Dilution** Local freshwater dilution factor: 10  
 Local marine water dilution factor: 100

### Risk management measures

**Good practice** Common practices vary across sites, thus conservative process release estimates used.  
 Risk from environmental exposure is driven by terrestrial secondary poisoning.

**STP details** Not applicable as there is no release to wastewater.  
 Estimated substance removal from wastewater via domestic sewage treatment: 94.2%  
 Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2%  
 Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 8.9E+04 kg/day  
 Assumed domestic sewage treatment plant flow (m<sup>3</sup>/day): 2000.

### Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

**Air** Treat air emission to provide a typical removal efficiency of 90%.  
**Water** No wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):  $\geq 0.0$ . If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%.  
**Soil** Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to external treatment of waste for disposal

**Waste treatment** External treatment and disposal of waste should comply with applicable local and/or national regulations.

### Conditions and measures related to external recovery of waste

**Recovery method** External recovery and recycling of waste should comply with applicable local and/or national regulations.

## 2. Conditions of use affecting exposure (Workers - Health 1)

### Product characteristics

**Physical state** Liquid

## Distribution of Substance - Industrial

<b>Vapour pressure</b>	Vapour pressure < 0.5 kPa at STP.
<b>Concentration details</b>	Covers percentage substance in the product up to 100% (unless stated differently).
<b><u>Frequency and duration of use</u></b>	Covers daily exposures up to 8 hours (unless stated differently).
<b><u>Other given operational conditions affecting workers exposure</u></b>	
<b>Setting</b>	Assumes a good basic standard of occupational hygiene is implemented.
<b>Temperature</b>	Assumes use at not more than 20°C above ambient temperature, unless stated differently.
<b><u>Organisational measures to prevent/limit releases, dispersion and exposure</u></b>	
<b>Organisational measures</b>	General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
<b><u>Risk management measures</u></b>	

## Distribution of Substance - Industrial

### Process sampling

Outdoor.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 15 minutes.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### General exposures (closed systems)

Handle substance within a closed system.

Avoid carrying out activities involving exposure for more than 4 hours.

Sample via a closed loop or other system to avoid exposure.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Bulk product storage

Store substance within a closed system.

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Product sampling

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 15 minutes.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Laboratory activities

Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

Wear suitable gloves tested to EN374.

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### Marine vessel/barge (un)loading.

Avoid carrying out activities involving exposure for more than 4 hours.

Transfer via enclosed lines.

Clear transfer lines prior to de-coupling.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Road tanker/rail car loading.

Ensure material transfers are under containment or extract ventilation.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Equipment cleaning and maintenance

Drain down and flush system prior to equipment break-in or maintenance.

Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

## 3. Exposure estimation (Environment 1)

## Distribution of Substance - Industrial

<b>Assessment method</b>	Used Petrorisk model. (Hydrocarbon Block Method)
	Maximum Risk Characterisation Ratios for air emissions 7.0E-01
	Maximum Risk Characterisation Ratios for wastewater emissions 1.3E-02

### 4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

### 3. Exposure estimation (Health 1)

<b>Assessment method</b>	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated
	Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Qualitative approach used to conclude safe use.

### 4. Guidance to check compliance with the exposure scenario (Health 1)

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

## Exposure scenario

### Formulation & (Re)packing of Substances and Mixtures - Industrial

#### Identification

<b>Product name</b>	Fuel oil, residual
<b>CAS number</b>	68476-33-5
<b>EC number</b>	270-675-6
<b>Version number</b>	2018
<b>Es reference</b>	ES02

#### 1. Title of exposure scenario

<b>Main title</b>	Formulation & (Re)packing of Substances and Mixtures - Industrial
<b>Process scope</b>	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.
<b>Sector of use</b>	NA
<b>Environment</b>	
<b>Environmental release category</b>	ERC2 Formulation into mixture
<b>SPERC</b>	ESVOC SPERC 2.2.v1
<b>Worker</b>	
<b>Process category</b>	<p>PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions</p> <p>PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions</p> <p>PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition</p> <p>PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities</p> <p>PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities</p> <p>PROC15 Use as laboratory reagent.</p>

#### 2. Conditions of use affecting exposure (Industrial - Environment 1)

##### Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

##### Amounts used

Fraction of EU tonnage used in region: 0.1  
 Regional use tonnage: 7.5E+06 tonnes/year  
 Fraction of Regional tonnage used locally: 4.0E-03  
 Annual site tonnage: 3.0E+04 tonnes  
 Maximum daily site tonnage: 100 tonnes

##### Frequency and duration of use

Continuous release.  
 Emission days: 300 days/year

## Formulation & (Re)packing of Substances and Mixtures - Industrial

### Other given operational conditions affecting environmental exposure

<b>Emission factor - air</b>	Release fraction to air from process (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements): 2.5E-03
<b>Emission factor - water</b>	Release fraction to wastewater from process (initial release prior to RMM): 9.5E-06
<b>Emission factor - soil</b>	Release fraction to soil from process (initial release prior to RMM): 0.0001

### Environmental factors not influenced by risk management measures

<b>Dilution</b>	Local freshwater dilution factor: 10 Local marine water dilution factor: 100
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### Risk management measures

<b>Good practice</b>	Common practices vary across sites, thus conservative process release estimates used. Risk from environmental exposure is driven by terrestrial secondary poisoning.
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<b>STP details</b>	Not applicable as there is no release to wastewater. Estimated substance removal from wastewater via domestic sewage treatment: 94.2% Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 1.1E+05 kg/day Assumed domestic sewage treatment plant flow (m <sup>3</sup> /day): 2000.
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### Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

<b>Air</b>	Treat air emission to provide a typical removal efficiency of 0%.
<b>Water</b>	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 60.9. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%. Prevent discharge of undissolved substance to or recover from onsite waste water. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
<b>Soil</b>	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to external treatment of waste for disposal

<b>Waste treatment</b>	External treatment and disposal of waste should comply with applicable local and/or national regulations.
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### Conditions and measures related to external recovery of waste

<b>Recovery method</b>	External recovery and recycling of waste should comply with applicable local and/or national regulations.
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## 2. Conditions of use affecting exposure (Workers - Health 1)

### Product characteristics

<b>Physical state</b>	Liquid
<b>Vapour pressure</b>	Vapour pressure < 0.5 kPa at STP.
<b>Concentration details</b>	Covers percentage substance in the product up to 100% (unless stated differently).

### Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

### Other given operational conditions affecting workers exposure

## Formulation & (Re)packing of Substances and Mixtures - Industrial

**Setting** Assumes a good basic standard of occupational hygiene is implemented.

**Temperature** Assumes use at not more than 20°C above ambient temperature, unless stated differently.

### Organisational measures to prevent/limit releases, dispersion and exposure

**Organisational measures** General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

### Risk management measures

## Formulation & (Re)packing of Substances and Mixtures - Industrial

General exposures (closed systems)

Process sampling

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 15 minutes.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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General exposures (closed systems)

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Bulk product storage

Store substance within a closed system.

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Product sampling

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 15 minutes.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Laboratory activities

Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.

Wear suitable gloves tested to EN374.

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Marine vessel/barge (un)loading.

Transfer via enclosed lines.

Avoid carrying out activities involving exposure for more than 4 hours.

Clear transfer lines prior to de-coupling.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Road tanker/rail car loading.

Ensure material transfers are under containment or extract ventilation.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Drum/batch transfers

Ensure material transfers are under containment or extract ventilation.

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

, or:

Ensure operation is undertaken outdoors.

Avoid carrying out activities involving exposure for more than 1 hour.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Equipment cleaning and maintenance



## Formulation & (Re)packing of Substances and Mixtures - Industrial

Drain down and flush system prior to equipment break-in or maintenance.  
 Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.  
 Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

### 3. Exposure estimation (Environment 1)

**Assessment method** Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 7.0E-01  
 Maximum Risk Characterisation Ratios for wastewater emissions 1.5E-01

### 4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

### 3. Exposure estimation (Health 1)

**Assessment method** The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Available hazard data do not enable the derivation of a DNEL for carcinogenic effects.  
 Available hazard data do not support the need for a DNEL to be established for other health effects. Qualitative approach used to conclude safe use.

### 4. Guidance to check compliance with the exposure scenario (Health 1)

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

## Exposure scenario

### Use as a Fuel - Industrial

#### Identification

Product name	Fuel oil, residual
CAS number	68476-33-5
EC number	270-675-6
Version number	2018
Es reference	ES12a

#### 1. Title of exposure scenario

<b>Main title</b>	Use as a Fuel - Industrial
<b>Process scope</b>	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.
<b>Sector of use</b>	NA
<b><u>Environment</u></b>	
<b>Environmental release category</b>	ERC7 Use of functional fluid at industrial site
<b>SPERC</b>	ESVOC SPERC 7.12a.v1
<b><u>Worker</u></b>	
<b>Process category</b>	<p>PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions</p> <p>PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions</p> <p>PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition</p> <p>PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities</p> <p>PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities</p> <p>PROC16 Use of fuels</p>

#### 2. Conditions of use affecting exposure (Industrial - Environment 1)

##### Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

##### Amounts used

Fraction of EU tonnage used in region: 0.1  
 Regional use tonnage: 5.9E+06 tonnes/year  
 Fraction of Regional tonnage used locally: 2.6E-01  
 Annual site tonnage: 1.5E+06 tonnes  
 Maximum daily site tonnage: 5000 tonnes

##### Frequency and duration of use

Continuous release.  
 Emission days: 300 days/year

##### Other given operational conditions affecting environmental exposure

## Use as a Fuel - Industrial

<b>Emission factor - air</b>	Release fraction to air from process (initial release prior to RMM): 2.0E-04
<b>Emission factor - water</b>	Release fraction to wastewater from process (initial release prior to RMM): 1.9E-07
<b>Emission factor - soil</b>	Release fraction to soil from process (initial release prior to RMM): 0

### Environmental factors not influenced by risk management measures

<b>Dilution</b>	Local freshwater dilution factor: 10 Local marine water dilution factor: 100
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### Risk management measures

<b>Good practice</b>	Common practices vary across sites, thus conservative process release estimates used.  Risk from environmental exposure is driven by terrestrial secondary poisoning.
<b>STP details</b>	Not applicable as there is no release to wastewater. Estimated substance removal from wastewater via domestic sewage treatment: 94.2% Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 7.2E+06 kg/day Assumed domestic sewage treatment plant flow (m <sup>3</sup> /day): 2000.

### Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

<b>Air</b>	Treat air emission to provide a typical removal efficiency of 95%.
<b>Water</b>	If discharging to domestic sewage treatment plant, no onsite wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): ≥ 61.1. If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%.
<b>Soil</b>	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to external treatment of waste for disposal

<b>Waste treatment</b>	Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment. External treatment and disposal of waste should comply with applicable local and/or national regulations.
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### Conditions and measures related to external recovery of waste

<b>Recovery method</b>	This substance is consumed during use and no waste of the substance is generated.
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## 2. Conditions of use affecting exposure (Workers - Health 1)

### Product characteristics

<b>Physical state</b>	Liquid
<b>Vapour pressure</b>	Vapour pressure < 0.5 kPa at STP.
<b>Concentration details</b>	Covers percentage substance in the product up to 100% (unless stated differently).

### Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

### Other given operational conditions affecting workers exposure

<b>Setting</b>	Assumes a good basic standard of occupational hygiene is implemented.
<b>Temperature</b>	Assumes use at not more than 20°C above ambient temperature, unless stated differently.

## Use as a Fuel - Industrial

### Organisational measures to prevent/limit releases, dispersion and exposure

**Organisational measures**      General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

### Risk management measures

## Use as a Fuel - Industrial

### General exposures (closed systems)

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### General exposures (closed systems)

#### Product sampling

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 1 hour.

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Bulk closed unloading

Outdoor.

Transfer via enclosed lines.

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Drum/batch transfers

Ensure material transfers are under containment or extract ventilation.

, or:

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

Avoid carrying out activities involving exposure for more than 1 hour.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Operation of solids filtering equipment

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Bulk product storage

Store substance within a closed system.

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

Avoid carrying out activities involving exposure for more than 4 hours.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Use as a fuel

(closed systems)

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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### Equipment cleaning and maintenance

Drain down and flush system prior to equipment break-in or maintenance.

Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

## Use as a Fuel - Industrial

### 3. Exposure estimation (Environment 1)

<b>Assessment method</b>	Used Petrorisk model. (Hydrocarbon Block Method)
	Maximum Risk Characterisation Ratios for air emissions 6.9E-01
	Maximum Risk Characterisation Ratios for wastewater emissions 1.5E-01

### 4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

### 3. Exposure estimation (Health 1)

<b>Assessment method</b>	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated
	Available hazard data do not enable the derivation of a DNEL for carcinogenic effects.
	Available hazard data do not support the need for a DNEL to be established for other health effects. Qualitative approach used to conclude safe use.

### 4. Guidance to check compliance with the exposure scenario (Health 1)

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

## Exposure scenario

### Use as a Fuel - Professional

#### Identification

<b>Product name</b>	Fuel oil, residual
<b>CAS number</b>	68476-33-5
<b>EC number</b>	270-675-6
<b>Version number</b>	2018
<b>Es reference</b>	ES12b

#### 1. Title of exposure scenario

<b>Main title</b>	Use as a Fuel - Professional
<b>Process scope</b>	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.
<b>Sector of use</b>	NA
<b>Environment</b>	
<b>Environmental release category</b>	ERC9a Widespread use of functional fluid (indoor) ERC9b Widespread use of functional fluid (outdoor)
<b>SPERC</b>	ESVOC SPERC 9.12b.v1
<b>Worker</b>	
<b>Process category</b>	PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC16 Use of fuels

#### 2. Conditions of use affecting exposure (Industrial - Environment 1)

##### Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

##### Amounts used

Fraction of EU tonnage used in region: 0.1  
Regional use tonnage: 1.7E+06 tonnes/year  
Fraction of Regional tonnage used locally: 5.0E-04  
Annual site tonnage: 8.5E+02 tonnes  
Maximum daily site tonnage: 2.3E+03 kg

##### Frequency and duration of use

Continuous release.  
Emission days: 365 days/year

##### Other given operational conditions affecting environmental exposure

## Use as a Fuel - Professional

<b>Emission factor - air</b>	Release fraction to air from wide dispersive use (regional only): 1.0E-04
<b>Emission factor - water</b>	Release fraction to wastewater from wide dispersive use: 7.0E-10
<b>Emission factor - soil</b>	Release fraction to soil from wide dispersive use (regional only): 0.00001

### Environmental factors not influenced by risk management measures

<b>Dilution</b>	Local freshwater dilution factor: 10 Local marine water dilution factor: 100
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### Risk management measures

<b>Good practice</b>	Common practices vary across sites, thus conservative process release estimates used.  Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).
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<b>STP details</b>	Not applicable as there is no release to wastewater. Estimated substance removal from wastewater via domestic sewage treatment: 94.2% Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs: 94.2.% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 3.8E+03 kg/day Assumed domestic sewage treatment plant flow (m <sup>3</sup> /day): 2000.
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### Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

<b>Air</b>	Treat air emission to provide a typical removal efficiency of N/A%.
<b>Water</b>	No wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): $\geq 0.0$ . If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of 0.0%.
<b>Soil</b>	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to external treatment of waste for disposal

<b>Waste treatment</b>	Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment. External treatment and disposal of waste should comply with applicable local and/or national regulations.
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### Conditions and measures related to external recovery of waste

<b>Recovery method</b>	This substance is consumed during use and no waste of the substance is generated.
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## 2. Conditions of use affecting exposure (Workers - Health 1)

### Product characteristics

<b>Physical state</b>	Liquid
<b>Vapour pressure</b>	Vapour pressure < 0.5 kPa at STP.
<b>Concentration details</b>	Covers percentage substance in the product up to 100% (unless stated differently).

### Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

### Other given operational conditions affecting workers exposure

<b>Setting</b>	Assumes a good basic standard of occupational hygiene is implemented.
<b>Temperature</b>	Assumes use at not more than 20°C above ambient temperature, unless stated differently.



## Use as a Fuel - Professional

### Organisational measures to prevent/limit releases, dispersion and exposure

**Organisational measures**      General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenario; clear up spills immediately and dispose of waste safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

### Risk management measures

## Use as a Fuel - Professional

General exposures (closed systems)

Product sampling

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 1 hour.

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.

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General exposures (closed systems)

Handle substance within a closed system.

Sample via a closed loop or other system to avoid exposure.

Avoid carrying out activities involving exposure for more than 1 hour.

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Bulk closed unloading

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Avoid carrying out activities involving exposure for more than 1 hour.

, or:

Ensure material transfers are under containment or extract ventilation.

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Drum/batch transfers

Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Avoid carrying out activities involving exposure for more than 1 hour.

, or:

Ensure material transfers are under containment or extract ventilation.

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Refuelling

Ensure material transfers are under containment or extract ventilation.

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Avoid carrying out activities involving exposure for more than 1 hour.

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Use as a fuel

(closed systems)

Wear chemically-resistant gloves (tested to EN374) in combination with 'basic' employee training.

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Equipment cleaning and maintenance

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

Wear chemically-resistant gloves (tested to EN374) in combination with specific activity training.

Drain down and flush system prior to equipment break-in or maintenance.

Retain drain-downs in sealed storage pending disposal or for subsequent recycle.

Clear spills immediately.

### 3. Exposure estimation (Environment 1)

## Use as a Fuel - Professional

<b>Assessment method</b>	Used Petrorisk model. (Hydrocarbon Block Method)
	Maximum Risk Characterisation Ratios for air emissions 5.6E-01
	Maximum Risk Characterisation Ratios for wastewater emissions 3.2E-03

### 4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

### 3. Exposure estimation (Health 1)

<b>Assessment method</b>	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated
	Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Qualitative approach used to conclude safe use.

### 4. Guidance to check compliance with the exposure scenario (Health 1)

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.