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SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1	Product identifier			
	Product Name	Fuel	oil, residual	
	Product Description	V2005-HIGH SULFUR STRAIGHT RUN FO-FUEL OIL, RESIDUAL HIGH SULFUR STRAIGHT RUN FO		
	Trade Name			
	Product code	HSSI	R, V2005	
	CAS No.	6847	6-33-5	
	EC No.	270-6	675-6	
	REACH Registration No.	-		
1.2	Relevant identified uses of the substance or mixture			
	and uses advised against			
	Identified Use(s)	No.	Exposure Scenario	Page:
		1	Distribution of Fuel oil, residual	11
		2	Formulation and (re)packing of Fuel oil, residual	15
		3	Use of Fuel oil, residual as a Fuel (Industrial)	19
		4	Use of Fuel oil, residual as a Fuel (Professional)	22
	Uses Advised Against	Anyth	ning other than the above.	
1.3	Details of the supplier of the safety data sheet			
	Company Identification	Vitol	SA	
		Place	e des Bergues 3	
		P.O.	Box 2056	
		1211	Geneva 1	
		Switz	erland	
	Telephone	+31 1	0 498 7200	
	Fax	+31 1	0 452 9545	
	E-Mail (competent person)	xrea	ch@vitol.com	
1.4	Emergency telephone number			
	Emergency Phone No.	+44 (0) 1235 239 670, 24/7	
	Languages spoken	All of	ficial European languages.	

SECTION 2: HAZARDS IDENTIFICATION

- 2.1 Classification of the substance or mixture
- 2.1.1 Regulation (EC) No. 1272/2008 (CLP)

Asp. Tox. 1; H304 Acute Tox. 4; H332 Carc. 1B; H350 Repr. 2; H361d STOT RE 2; H373 (Thymus, Liver, blood effects) Aquatic Acute 1; H400 Aquatic Chronic 1; H410

2.2 Label elements Product Description

Hazard Pictogram(s)

According to Regulation (EC) No. 1272/2008 (CLP) V2005-HIGH SULFUR STRAIGHT RUN FO-FUEL OIL, RESIDUAL



Signal Word(s)

Danger

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Hazard Statement(s)	H304: May be fatal if swallowed and enters airways. 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: Thymus, Liver, blood effects H410: Very toxic to aquatic life with long lasting effects.
Precautionary Statement(s)	 P201: Obtain special instructions before use. P260: Do not breathe dust/fume/gas/mist/vapours/spray. P281: Use personal protective equipment as required. P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P331: Do NOT induce vomiting. P273: Avoid release to the environment.
Supplemental information	EUH066: Repeated exposure may cause skin dryness or cracking.
Other hazards	Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. Remove contaminated clothing and wash clothing before reuse. Vapour may create explosive atmosphere. The vapour is heavier than air; beware of pits and confined spaces.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

2.3

oubstances				
SUBSTANCE	CAS No.	EC No.	REACH Registration No.	%W/W
Fuel oil, residual	68476-33-5	270-675-6	-	100

SECTION 4: FIRST AID MEASURES



4.1	Description of first aid measures	
	Self-protection of the first aider	The vapour is heavier than air; beware of pits and confined spaces. If it is suspected that fumes are still present, the responder should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Avoid all contact. Do not ingest. If swallowed then seek immediate medical assistance.
	H2S Warning:	Hydrogen sulphide (H2S) can accumulate in the headspace of storage tanks and reach potentially hazardous concentrations. If there is any suspicion of inhalation: A self contained breathing apparatus should be worn. Remove to fresh air immediately.
	Inhalation	IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. If symptoms persist, obtain medical attention.
	Skin Contact	IF ON SKIN (or hair): Remove contaminated clothing immediately and drench affected skin with plenty of water, then wash with soap and water. If irritation (redness, rash, blistering) develops, get medical attention.
	Eye Contact	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.
	Ingestion	IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If vomiting occurs spontaneously, keep head below hips to prevent

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4.2 Most important symptoms and effects, both acute and delayed

4.3 Indication of any immediate medical attention and special treatment needed

Notes to a physician:

aspiration into the lungs. If unconscious, place in recovery position and get medical attention immediately. Do not give anything by mouth to an unconscious person. Get medical attention immediately. Do not wait for symptoms to appear. Inhalation: Vapour may be irritant to the respiratory tract.

Skin Contact: Repeated and/or prolonged skin contact may cause irritation. Eye Contact: May cause eye irritation.

Ingestion: Aspiration hazard. Aspiration into the lungs may cause chemical pneumonitis, which can be fatal.

If breathing is laboured, oxygen should be administered by qualified personnel. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

IF INHALED: If unconscious, place in recovery position and get medical attention immediately. Administer oxygen if available and artificial respiration if necessary.

IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If aspiration is suspected obtain immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration into the lungs.

SECTION 5: FIREFIGHTING MEASURES

5.1	Extinguishing media	
	Suitable Extinguishing media	Foam, Carb
	Unsuitable extinguishing media	Do not use
5.2	Special hazards arising from the substance or	Not flamma
	mixture	beware of

oam, Carbon dioxide, Water fog or dry powder.

Do not use water jet. Direct water jet may spread the fire.

Not flammable but will support combustion. The vapour is heavier than air; beware of pits and confined spaces. Will float and can be reignited on surface water. Decomposes in a fire giving off toxic fumes: A mixture of solid and liquid particulates and gases including unidentified organic and inorganic compounds. If sulphur compounds are present in appreciable amounts, combustion products may include also H2S and SOx (sulfur oxides) or sulfuric acid

5.3 Advice for fire-fighters

Fight fire with normal precautions from a reasonable distance. Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Keep containers cool by spraying with water if exposed to fire. Avoid release to the environment. Dike fire control water for later disposal.

SECI	SECTION 6: ACCIDENTAL RELEASE MEASURES			
6.1	Personal precautions, protective equipment and emergency procedures	Caution - spillages may be slippery. Ensure operatives are trained to minimise exposures. Ensure suitable personal protection during removal of spillages. Eliminate sources of ignition. Shut off leaks if without risk. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Avoid all contact with substance. Ensure adequate ventilation. Do not breathe vapour. Do not ingest. If swallowed then seek immediate medical assistance. Do not use sparking tools.		
	H2S Warning:	Product may release Hydrogen Sulphide. Exposure controls - These controls may include: Segregation of areas, Access only to authorised persons, Permit to work systems, Confined space working procedures, Area H2S alarms, Personal H2S alarms, Personal escape sets, H2S awareness training. Please see section 8 for appropriate personal protection equipment		
	Small spillages:	Wear flame-resistant antistatic protective clothing.		
	Large spillages:	Evacuate the area and keep personnel upwind. Drench contaminated clothing with water before removing to avoid risk of sparks from static electricity. Avoid all contact. Wear chemical protection suit and breathing apparatus. See Also Section: 8.		
6.2	Environmental precautions	Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be alerted to the Environment Agency or other appropriate regulatory body. If necessary: Dike area to contain the spill and prevent releases to sewers, drains, or other waterways.		
6.3	Methods and material for containment and cleaning	Provided it is safe to do so, isolate the source of the leak. The vapour is heavier		

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ир	than air; beware of pits and confined spaces. Ensure that the equipment is adequately grounded. Allow small spillages to evaporate provided there is
On ille and a state law de	adequate ventilation.
Spillages onto land:	In case of soil contamination, remove contaminated soil and treat in accordance
	with local regulations. Adsorb spillages onto sand, earth or any suitable
	adsorbent material. Transfer to a lidded container for disposal or recovery.
	Dispose of this material and its container as hazardous waste.
	Small spillages: Allow small spillages to evaporate provided there is adequate ventilation. Wear flame-resistant antistatic protective clothing.
	Large spillages: Cover spillage with foam to reduce evaporation. Do not use water jet.
Spillages on water or at sea:	Collect as much as possible in clean container for reuse or disposal.
	Small spillages: Contain product with floating barriers or other equipment.
	Collect spilled product by absorbing with specific floating absorbents.
	Large spillages: Open waters should be contained with floating barriers or
	other mechanical means and recovered, only if this is strictly necessary and if
	fire/explosion risks can be adequately prevented. Otherwise control the
	spreading of the spillage, and let the substance evaporate naturally.
Reference to other sections	See Section: 8.13

SECT	SECTION 7: HANDLING AND STORAGE			
7.1	Precautions for safe handling H2S Warning:	Obtain special instructions before use. Keep away from sources of ignition - No smoking. Use only outdoors or in a well-ventilated area. Prevent vapour build up by providing adequate ventilation during and after use. Take action to prevent static discharges. Use non-sparking tools. All parts of the plant and equipment should be electrically bonded together and connected to earth. Electrical continuity should be checked at regular intervals. Antistatic clothing and footwear should be used. The vapour is heavier than air; beware of pits and confined spaces. Avoid all contact with substance. Do not ingest. If swallowed then seek immediate medical assistance. Do not breathe vapour. See Section: 8. Keep good industrial hygiene. Wash hands thoroughly after handling. Contaminated clothing should be thoroughly cleaned. Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. These controls may include: Segregation of areas, Access only to authorised persons, Permit to work systems, Confined space working procedures, Area H2S alarms, Personal H2S alarms, Personal escape sets,		
7.2	Conditions for safe storage, including any incompatibilities	H2S awareness training. Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazards. Bund storage facilities to prevent soil and water pollution in the event of spillage. Keep only in original packaging. Keep containers properly sealed when not in use. Protect from sunlight. Containers of this material may be hazardous when empty since they retain product residue. Empty container may contain product residue which may result in flammable or explosive vapours inside the container. Stable at ambient temperatures. Suitable containers: Stainless steel, Mild steel Unsuitable containers: Synthetic materials		

Incompatible materials7.3 Specific end use(s)

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

No Occupational Exposure Limit assigned. Users are advised to consider national Occupational Exposure Limits or other equivalent values.

Keep away from oxidising agents.

See Section: 1.2 and/or Exposure Scenario.

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8.1.2 Biological limit value

8.1.3

PNECs and DNELs

Not established.

PNEC: Fuel Oil, Residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Provide adequate ventilation, including appropriate local extraction if dusts, fumes or vapours are likely to be evolved. Store in a cool/low-temperature, well-ventilated (dry) place away from heat and ignition sources. Guarantee that the eye flushing systems and safety showers are located close to the working place.

Protective clothing should be selected specifically for the working place,

depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with

Fuel Oil, Residual Derived No Effect Level	Oral	Inhalation	Dermal
Worker - Long Term - Systemic effects	0.015 mg/kg bw/day	0.18 mg/m ³	0.065 mg/kg bw/day
Worker - Short term - Systemic effects	-	4700 mg/m³	-

the respective supplier.

8.2 Exposure controls

- 8.2.1 Appropriate engineering controls
- 8.2.2 Individual protection measures, such as personal protective equipment (PPE)

Fuels are typically used, transferred and transported in closed systems. If exposure is likely (i.e. during sampling) the following advice may be appropriate. Keep good industrial hygiene. Always wash hands before smoking, eating and drinking. Do not eat, drink or smoke at the work place.
Refer to annexes for exposure scenarios detailing use specific exposure controls
Use eye protection according to EN 166, designed to protect against liquid splashes.
Hand protection: Wear impensious cloves (EN374). Cloves should be changed

Hand protection: Wear impervious gloves (EN374). Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer. Recommended: Nitrile rubber.

Body protection: Wear anti-static clothing and shoes. small scale: Wear suitable coveralls to prevent exposure to the skin. large scale: Chemical protection suit.

When the product is heated /In case of inadequate ventilation wear respiratory protection. The use of a high efficiency filter (EN143) is recommended. Filter type A2

Closed system(s): Not normally required.

Not applicable.

8.2.3 Environmental Exposure Controls

Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties Appearance Odour Odour threshold

Liquid, Viscous, May be coloured. Fuel oil-like Not established.





Eye/ face protection



Respiratory protection



Thermal hazards

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Not established. pН Melting point/freezing point < 30 °C Initial boiling point and boiling range > 350 °C Flash point > 60 °C Evaporation rate Not established . Flammability (solid, gas) Not applicable - Liquid Upper/lower flammability or explosive limits Not established. Vapour pressure 0.5 kPa @ 20°C Vapour density >1 (Air=1) Relative density 0.80 - 0.99 g/cm3 @ 15 °C Solubility(ies) Water: 0.4 mg/l @ 22 °C Slightly soluble. Partition coefficient: n-octanol/water 2.7 - 6 log P Auto-ignition temperature > 225 °C **Decomposition Temperature** Not established. Viscosity 7 - 20.5 mm²/s @ 40 °C (<60 mm²/s @ 100 °C) Explosive properties Not explosive. (Vapour may create explosive atmosphere.) Oxidising properties Not oxidising.

9.2 Other information

SECTION 10: STABILITY AND REACTIVITY

10.1	Stability and reactivity	Stable under normal conditions. Reacts with - Strong oxidising agents
10.2	Chemical stability	Stable under normal conditions. Hazardous polymerisation will not occur.
		Product may release Hydrogen Sulphide.
10.3	Possibility of hazardous reactions	Vapours are heavier than air and may travel considerable distances to a source
		of ignition and flashback. Product may release Hydrogen Sulphide.
10.4	Conditions to avoid	Elevated temperature: > 50 °C
		Keep away from heat, sources of ignition and direct sunlight.
10.5	Incompatible materials	Keep away from oxidising agents. Strong Acids and Alkalis.
10.6	Hazardous decomposition product(s)	A mixture of solid and liquid particulates and gases including unidentified
		organic and inorganic compounds. Decomposes in a fire giving off toxic fumes:
		COx, H2S, SOx,

None known.

SECTION 11: TOXICOLOGICAL INFORMATION				
11.1	Information on toxicological effects	All test data taken from existing ECHA registrations for the substances mentioned.		
	Acute toxicity - Ingestion	Based upon the available data, the classification criteria are not met. LD50 (oral,rat) mg/kg: >2000 (OECD 401)		
	Acute toxicity - Inhalation	Acute Tox. 4; Harmful if inhaled. LC50 (inhalation,rat) mg/l/4h: 4.1 (EPA OTS 798.1150)		
	Acute toxicity - Skin Contact	Based upon the available data, the classification criteria are not met. LD50 (skin,rabbit) mg/kg: >2000 (OECD 434)		
	Skin corrosion/irritation	Based upon the available data, the classification criteria are not met. Not irritating to skin. (rabbit) (OECD 404) EUH066: Repeated exposure may cause skin dryness or cracking. (rat) (OECD 410)		
	Serious eye damage/irritation	Based upon the available data, the classification criteria are not met. Not irritating to eyes. (rabbit) (EU Method B.5)		
	Respiratory or skin sensitization	Based upon the available data, the classification criteria are not met. Sensitisation (guinea pig) - Negative (OECD 406)		
	Germ cell mutagenicity	Based upon the available data, the classification criteria are not met. ECHA Registration Endpoint summary: Not classified. Studies showed no consistent evidence of mutagenic activity.		
	Carcinogenicity	Carc. 1B; May cause cancer. ECHA Registration Endpoint summary: Positive (mouse)		
	Reproductive toxicity	Repr. 2; H361d: Suspected of damaging the unborn child. ECHA Registration Endpoint summary:		

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		Reproductive toxicity: Negative	
		Developmental toxicity: Positive	
	STOT - single exposure	Based upon the available data, the classification criteria are not met.	
		Weight of evidence approach	
	STOT - repeated exposure	STOT RE 2; May cause damage to organs through prolonged or repeated	
		exposure.	
	Oral:	No data	
	Inhalation:	No data	
	Dermal:	NOAEL 1.06 mg/kg bw/day (rat) (OECD 410)	
	Aspiration hazard	Asp. Tox. 1; May be fatal if swallowed and enters airways.	
		Viscosity: 7 – 20.5 mm ² /s @ 40 °C (<60 mm ² /s @ 100 °C)	
11.2	Other information	None.	
SECTI	SECTION 12: ECOLOGICAL INFORMATION		

12.1	Toxicity	Aquatic Acute 1; Very toxic to aquatic life.
		Aquatic Chronic 1; Very toxic to aquatic life with long lasting effects.
	Short Term (acute):	EL50 48hr (Daphnia magna) 0.22 mg/l (OECD 202)
	Long Term (Chronic):	The aquatic toxicity was estimated using the PETROTOX computer model.
		Estimated: 0.1 mg/l (Fish)
12.2	Persistence and degradibility	Substance is complex UVCB. Standard tests for this endpoint are intended for
		single substances and are not appropriate for this complex substance.
12.3	Bioaccumulative potential	Substance is complex UVCB. Standard tests for this endpoint are intended for
		single substances and are not appropriate for this complex substance.
12.4	Mobility in soil	Substance is complex UVCB. Standard tests for this endpoint are intended for
		single substances and are not appropriate for this complex substance.
12.5	Results of PBT and vPvB assessment	Not classified as PBT or vPvB.
12.6	Other adverse effects	None known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point. Disposal should be in accordance with local, state or national legislation. Containers of this material may be hazardous when empty since they retain product residue. Containers must not be punctured or destroyed by burning, even when empty. Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company. Waste code: Fuel Oil (13 07 01)

SECTION 14: TRANSPORT INFORMATION

		ADR/RID	IMDG/ADN	
14.1	UN number	UN 3082	UN 3082	
14.2	Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, FUEL OIL, RESIDUAL	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, FUEL OIL, RESIDUAL	
14.3	Transport hazard class(es)	9	9 (N1, CMR, F)	
14.4	Packing group	III	III	
14.5	Environmental hazards	MILIEUGEVAARLIJK / ENVIRONMENTALLY HAZARDOUS/ UMWELTGEFÄHREND /DANGEREUX POUR/ L'ENVIRONNEMENT		
14.6	Special precautions for user	See Section: 2		
14.7	Transport in bulk according to Annex II of MARPOL	This product is being carried under the	he scope of MARPOL Annex 1. Special	
	73/78 and the IBC Code	Precautions: Refer to Chapter 7 'Handling and Storage' for special precautions which a user needs to be aware of, or needs to comply with, in connection with transport.		
14.8	Additional Information	ADR HIN: 90	EmS: F-A, S-F	
		Tunnel Restriction Code: 3 E Limited Quantity: 5L	Limited Quantity: 5L	

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SECTION 15: REGULATORY INFORMATION

15.1	Safety, health and environmental regulations/legislation specific for the substance or mixture	
15.1.1	EU regulations	Authorisations and/or Restrictions On Use
	Annex XVII (Restrictions)	In accordance with REACH Annex XVII entry 30 (c) this substance is exempt
		from Entry 28 and 29 of REACH Annex XVII as it is to be sold as a fuel in a
		closed system.
	Seveso	Upper Tier: 25000 tonnes
		Lower Tier: 2500 tonnes
15.1.2	National regulations	
	Germany	Wassergefährdungsklasse (Germany). WGK number: 3
15.2	Chemical Safety Assessment	A REACH chemical safety assessment (CSA) has been carried out. Refer to annexes for exposure scenarios detailing use specific exposure controls.

SECTION 16: OTHER INFORMATION

Sections indicated with the following have been revised

Header and Section 1.3

Updated version and date. Please review SDS with care.

References:

Existing ECHA registration(s) for Fuel Oil, Residual (CAS No. 68476-33-5) and Chemical Safety Report.

This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830.

LEGEND

LTEL	Long Term Exposure Limit
STEL	Short Term Exposure Limit
DNEL	Derived No Effect Level
PNEC	Predicted No Effect Concentration
PBT	PBT: Persistent, Bioaccumulative and Toxic
vPvB	very Persistent and very Bioaccumulative
OECD	Organisation for Economic Cooperation and Development

Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

Disclaimers

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Annex to the extended Safety Data Sheet (eSDS)

See below -

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Fuel oil, residual

CAS No. EINECS No. 68476-33-5 270-675-6

Summary of Parameters

Physical parameters			
Vapour pressure (Pa)			Value used for exposure assessment = 2.0E+02
Partition coefficient (Ic	og K _{ow})		1.99 – 18.02
Aqueous solubility (mg	g/l)		2.7E-12 – 2.0E+03 Value used for environmental exposure assessment = 7.3E+00
Molecular weight			Not applicable
Biodegradability			Standard tests for this endpoint are intended for single substances and are not appropriate for this complex substance.
Human Health (DNEI	_)		
	Short term	Inhalation (mg/m³)	4700
Workers		Dermal (mg/kg bw/day)	Not defined
workers	Long Term	Inhalation (mg/m³)	0.18
		Dermal (mg/kg bw/day)	0.065
Consumer		Inhalation (mg/m ³)	Not defined
		Dermal (mg/kg bw/day)	Not defined
		Oral (mg/kg bw/day)	0.015

Environmental Parameters (PNECs)

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

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Exposure scenario 4	Use of Fuel oil, residual as a Fuel (Professional)	22	

Contributing Scenarios

Workers	
PROC1 Use in close	d process, no likelihood of exposure
PROC2 Use in close	d, continuous process with occasional controlled exposure
(Storage)	Bulk product storage.
(Sampling) Product sampling.
(Fuel filter	ng) Operation of solids filtering equipment.
	d batch process (synthesis or formulation)
	substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
	nce) Equipment cleaning and maintenance.
	substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
	Iarine vessel or barge loading.
	I) Road tanker/rail car loading.
	um or batch transfers.
	k closed loading and unloading.
	g) Refuelling.
PROC15 Use as lab	
	rial as fuel sources, limited exposure to unburned product to be expected
Environment	
ERC2 Formulation o	
	of processing aids in processes and products, not becoming part of articles
	resulting in inclusion into or onto a matrix
	e resulting in manufacture of another substance (use of intermediates)
	of reactive processing aids
	of monomers for manufacture of thermo-plastics
	of process regulators for polymerisation processes in production of resins, rubbers, polymers
	of substances in closed systems
	ive indoor use of substances in closed systems
ERC9b Wide dispers	ive outdoor use of substances in closed systems

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FUEL OIL, RESIDUAL V2005a

Exposure Scenario 1 – Distribution of Fuel oil, residual

1.0 Contributing scenarios	
Sector of Use [SU]	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites
	PROC1
	PROC2
	PROC2 (Storage)
	PROC2 (Sampling)
Process Category [PROC]	PROC3
	PROC8a (Maintenance)
	PROC8b (Marine)
	PROC8b (Road/Rail)
	PROC15
Chemical Product Category [PC]	Not applicable
Article Categories [AC]	Not applicable
	ERC4
	ERC5
	ERC6a
Environmental Release Categories [ERC]	ERC6b
	ERC6c
	ERC6d
	ERC7
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 1.1b.v1

2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid	
Vapour pressure	<0.5 kPa @ STP	
Concentration of substance in product		in the product up to 100 % (unless stated differently).
Human factors not influenced by risk n		······································
Potential exposure area	Not defined	
Frequency and duration of use		
	PROC1, PROC8a (Maintenance), PROC15	Covers daily exposures up to 8 hours (unless stated differently).
Exposure duration per day	PROC2 (Storage), PROC3, PROC8b (Marine)	Covers exposure up to 1 - 4 hour(s)
	PROC8b (Road/Rail)	Covers exposure up to 15 min - 1 hour(s)
	PROC2, PROC2 (Sampling)	Covers exposure up to 15 min
Emission days (days/year):	300	•
Other operational conditions affecting	worker exposure	
Area of use	PROC2 (Sampling)	Outdoor
Area or use	All other PROC's	Not defined (default = Indoor)
Characteristics of the surroundings	Not defined	
General measures applicable to all acti	vities	
Assumes a good basic standard of occupa	ational hygiene is implemented. Ass	sumes activities are at ambient temperature (unless stated differently).
General measures (carcinogens)		
Consider technical advances and process	s upgrades (including automation) fo	or the elimination of releases. minimise exposure using measures such
as closed systems, dedicated facilities ar	nd suitable general/local exhaust ver	ntilation. Drain down systems and clear transfer lines prior to breaking
containment. Clean/flush equipment, who	ere possible, prior to maintenance	Where there is potential for exposure: restrict access to authorised
persons; provide specific activity training t	to operators to minimise exposures;	wear suitable gloves and coveralls to prevent skin contamination; wear
respiratory protection when its use is iden	tified for certain contributing scenari	io; clear up spills immediately and dispose of waste safely. Ensure safe
systems of work or equivalent arrangeme	ents are in place to manage risks. F	Regularly inspect, test and maintain all control measures. Consider the
need for risk based health surveillance.		
Technical conditions of use		
PROC1, PROC2, PROC2 (Storage),	Handle substance within a clo	

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PROC3			
PROC8b (Road/Rail)	Ensure material transfers are under containment or extract ventila		under containment or extract ventilation (Efficiency of at least 80%)
PROC15	Handle in a fume	cupboard or	under extract ventilation. (Efficiency of at least 90 %).
Organisational measures			
PROC2; PROC3	Sample via a close	ed loop or ot	her system to avoid exposure.
PROC8b (Marine)	Transfer via enclo	sed lines. Cl	ear transfer lines prior to de-coupling.
PROC8a (Maintenance)			prior to equipment break-in or maintenance.
PROC8a (Maintenance), PROC8b (Marine)	Retain drain down	is in sealed s	storage pending disposal or for subsequent recycle.
PROC8b (Road/Rail)	Ensure material tra	ansfers are I	under containment or extract ventilation
Risk management measures related to hu	man health		
Respiratory protection	No special measu	res are requ	ired.
Hand and/or Skin protection	PROC1, PROC2, (Storage), PROC2 (Sampling), PROC PROC8b (Marine) (Road/Rail)	2 C3,	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.(Efficiency of at least 90 %).
	PROC15		Wear suitable gloves tested to EN374. (Efficiency of at least 80 %).
	PROC8a (Mainter	nance)	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 75%)
Eye Protection	No special measu	res are requ	ired.
2.2 Control of environmental exposure			
Amounts used			
Fraction of EU tonnage used in region:		0.1	
Regional use tonnage (tons/year):		9.3E+06	
Fraction of Regional tonnage used locally (tor	ns/year):	2.0E-03	
Annual site tonnage (tons/year):		1.9E+04	
Maximum daily site tonnage (kg/day):		6.2E+04	
Environment factors not influenced by risl	k management		
Flow rate of receiving surface water (m ³ /d):	-	Not define	ed (default = 18,000)
Local freshwater dilution factor:		10	
Local marine water dilution factor:		100	
Operational conditions		1	
Emission days (days/year):		300	
Release fraction to air from process (initial release prior to RMM):		1.0E-04	
Release fraction to wastewater from process (initial release prior to RMM):		1.0E-06	
Release fraction to soil from process (initial release prior to RMM):		1.0E-05	
Technical conditions and measures at pro			
Common practices vary across sites thus con			
Technical onsite conditions and measures			
		1	primarily ingestion). No wastewater treatment required.
Treat air emission to provide a typical remova	, , ,	90	
Treat onsite wastewater (prior to receiving water discharge) to		0	
provide the required removal efficiency of (%): If discharging to domestic sewage treatment plant, provide the		0	
required onsite wastewater removal efficiency of (%):		U	
Treat soil emission to provide a typical removal efficiency of (%): Not defined			d
Organisational measures to prevent/limit r	elease from site		
Do not apply industrial sludge to patural sails			optained or realaimed
Do not apply industrial sludge to natural soils.	Sludge should be in		
Conditions and measures related to munic	Sludge should be in	nent plant	
Conditions and measures related to munic Size of municipal sewage system/treatment p	Sludge should be in cipal sewage treatment		
Conditions and measures related to munic	Sludge should be in cipal sewage treatment	nent plant	
Conditions and measures related to munic Size of municipal sewage system/treatment p	Sludge should be in Sipal sewage treatm lant (m ³ /d):	2.0E+03 94.2	
Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%):	Sludge should be in <i>cipal sewage treatm</i> lant (m ³ /d): nal treatment of was	ent plant 2.0E+03 94.2 ste for disp	osal
Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%): Conditions and measures related to extern External treatment and disposal of waste sho Conditions and measures related to extern	Sludge should be in <i>cipal sewage treatment</i> lant (m ³ /d): <i>nal treatment of was</i> uld comply with apple <i>nal recovery of was</i>	ent plant 2.0E+03 94.2 ste for disposicable local a te	osal and/or national regulations.
Conditions and measures related to munic Size of municipal sewage system/treatment p Degradation effectiveness (%): Conditions and measures related to extern External treatment and disposal of waste sho	Sludge should be in <i>cipal sewage treatment</i> lant (m ³ /d): <i>nal treatment of was</i> uld comply with apple <i>nal recovery of was</i>	ent plant 2.0E+03 94.2 ste for disposicable local a te	osal and/or national regulations.

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FUEL OIL, RESIDUAL V2005a

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830

Release to waste water from process (mg/l):	Not defined
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/d):	8.0E+04

3. Exposure estimation and reference to its source 3.1 Human exposure prediction Exposure assessment (method/calculation model) The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC15) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC3, PROC8 (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).

	Inhalation			mal	Combined	
Process Category [PROC]	Inhalation exposure (mg/m ³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)	
PROC1	0.01	0.04	0.03	0.57	0.61	
PROC2	0.04	0.19	0.03	0.57	0.76	
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78	
PROC2 (Sampling)	0.04	0.19	0.03	0.57	0.76	
PROC3	0.04	0.21	0.03	0.57	0.78	
PROC8a (Maintenance)	0.00	0.01	0.05	0.83	0.85	
PROC8b (Marine)	0.06	0.35	0.03	0.57	0.92	
PROC8b (Road/Rail)	0.03	0.19	0.03	0.57	0.76	
PROC15	0.05	0.28	0.01	0.10	0.38	

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	1.9E-03 mg/l	1.9E-04 mg/l	1.9E-05 mg/l	6.2E-02 mg/kg ww	1.4E+00 mg/kg ww	3.7E-02 mg/kg ww
Risk characterisation ratio (RCR)	2.0E-03	7.6E-03	7.6E-04	3.3E-05	1.3E-02	9.9E-04

Human exposure prediction:

Route of Exposure	Exposure (µg/kg/Day)	Risk characterisation ratio (RCR)
Oral	2.0E+01	7.7E-01
Inhalation	1.6E-01	3.2E-03

4. Evaluation guidance to downstream user

For scaling see	are managed to at least equivalent Available hazard data do not suppo	easures/Operational Conditions are adopted, then users should ensure that risks levels. ort the need for a DNEL to be established for other health effects. ntrol technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-
Exposure assessment	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless

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instrument/tool/method		otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC15) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).
	Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

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ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 2015/830

Exposure Scenario 2 – Formulation and (re)packing of Fuel oil, residual

1.0 Contributing scenarios	
Sector of Use [SU]	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites SU10 Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
Process Category [PROC]	PROC1 PROC2 PROC2 (Storage) PROC2 (Sampling) PROC3 PROC8a (Maintenance) PROC8b (Marine) PROC8b (Marine) PROC8b (Road/Rail) PROC8b (Drum) PROC15
Chemical Product Category [PC]	Not applicable
Article Categories [AC]	Not applicable
Environmental Release Categories [ERC]	ERC2
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 2.2.v1

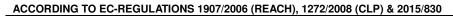
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid	
Vapour pressure	<0.5 kPa @ STP	
Concentration of substance in product	Covers percentage substance	in the product up to 100 % (unless stated differently).
Human factors not influenced by risk n	nanagement	
Potential exposure area	Not defined	
Frequency and duration of use		
	PROC1, PROC8a (Maintenance), PROC15	Covers daily exposures up to 8 hours (unless stated differently).
Exposure duration per day	PROC2 (Storage), PROC3, PROC8b (Marine)	Covers exposure up to 1 - 4 hour(s)
	PROC8b (Road/Rail), PROC8b (Drum)	Covers exposure up to 15 min - 1 hour(s)
	PROC2, PROC2 (Sampling)	Covers exposure up to 15 min
Emission days (days/year):	300	l.
Other operational conditions affecting	worker exposure	
Area of use	All contributing scenarios	Not defined (default = Indoor)
Characteristics of the surroundings	Not defined	
General measures applicable to all act		
	ational hygiene is implemented. Ass	sumes activities are at ambient temperature (unless stated differently).
as closed systems, dedicated facilities ar containment. Clean/flush equipment, wh persons; provide specific activity training respiratory protection when its use is iden systems of work or equivalent arrangement need for risk based health surveillance.	nd suitable general/local exhaust ve ere possible, prior to maintenance to operators to minimise exposures; itified for certain contributing scenari	or the elimination of releases. minimise exposure using measures such ntilation. Drain down systems and clear transfer lines prior to breaking Where there is potential for exposure: restrict access to authorised wear suitable gloves and coveralls to prevent skin contamination; wear io; clear up spills immediately and dispose of waste safely. Ensure safe Regularly inspect, test and maintain all control measures. Consider the
Technical conditions of use		
PROC1, PROC2, PROC3	Handle substance within a clo	
PROC8b (Drum)		under containment or extract ventilation. (Efficiency of at least 97%).
PROC15	Handle in a fume cupboard or	under extract ventilation. (Efficiency of at least 90 %).
Organisational measures		
PROC2, PROC2 (Sampling)	Minimise the volume and frequencies	uency of sampling. Ensure dedicated sample points are provided.

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PROC8a (Maintenance), PROC8b (Drum) Retain drain downs in sealed storage pending disposal or for subsequent recycle. PROC8b (Noad/Rail), PROC8b (Drum) Ensure material transfers are under containment or extract ventilation Isk management measures related to human health No special measures are required. PROC8b (Nadi/Rail), PROC8b (Drum) No special measures are required. Isad and/or Skin protection No special measures are required. Isad and/or Skin protection PROC6B (Mainte), PROC8b (Mainte), PROC8b (Drum) Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.(Efficiency of at least 90 %). Isad and/or Skin protection PROC8b (Maintenance) Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 90 %). Isad and/or Skin protection No special measures are required. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 80 %). Isad (Maintenance) PROC8b (Maintenance) Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 80 %). Isys Protection Isos special measures are required. Isos are required. Itorian factor O Isos pacial measures are required. Isos are required. Itorian factor <th>PROC8b (Marine)</th> <th colspan="4">Transfer via enclosed lines. Clear transfer lines prior to de-coupling.</th>	PROC8b (Marine)	Transfer via enclosed lines. Clear transfer lines prior to de-coupling.			
PROCE: IndiadFall, PROCEB (Dum) Ensure material transfers are under containment or extract vertiliation Its: management messures releted to human health No special measures are required. Its: management messures releted to human health No special measures are required. Its: management messures releted to human health PROCI: PROC2 (Sigmaphi, PROC2 (Sigmaphi, PROC2 (Sigmaphi, PROC2 (Sigmaphi, PROC2 (CC)) Its: management messures releted to EN374) in combination PROC8 (Marine), PROC8 (Marine), PROC8 (Proce (CC)) Its: management messures releted to EN374) in combination War chemically resistant gloves (tested to EN374) in combination Its: management for environmental exposure PROC3 (Marine), PROC8 (Proce (CC)) War chemically resistant gloves (tested to EN374) (Efficiency of at least 80 %). Yes Protection No special measures are required. 2 Control of environmental exposure 2 Control of environmental exposure 0.1 War chemically resistant gloves (tested to EN374) (Efficiency of at least 80 %). Yes Protection No special measures are required. 2 Control of environmental exposure 3.0.1 2 Control of environmental exposure 0.1 1.0.1 1.0.1 Reside fination to reaction in filteneod by risk management 3.0.2-04 1.0.2-05 Revironment factor:	PROC8a (Maintenance)				
Bits margement mesures related to human health lespiratory protection No special measures are required. PROC1, PROC2, PROC2 (Stanging), PROC3 (Stanging), PROC3 (PROC8B) (Marine), PROC8 (RoadRail), PROC8b (Drum) Wear chemically resistant gloves (rested to EN374) in combination with "basic" employee training, Efficiency of at least 90 %). Iand and/or Skin protection PROC8a (Marine), PROC8b (Drum) Wear chemically resistant gloves (rested to EN374) in combination with specific activity training, Efficiency of at least 90 %). ye Protection No special measures are required. Wear chemically resistant gloves (rested to EN374, (Efficiency of at least 90 %). ye Protection No special measures are required. Wear chemically resistant gloves (rested to EN374, (Efficiency of at least 90 %). ye Protection No special measures are required. State Stat					
Image: Image and the set of the			ansfers are ι	under containment or extract ventilation	
Iand and/or Skin protection PROC1, PROC2, PROC3 (Storapiling), PROC3 PROC8B (Marine), PROC8b (Read/Rail), PROC8b (Read/Rail), PROC8b (Read/Rail), PROC8b (Read/Rail), PROC8b (Read/Rail), PROC8b (Drum) Wear chemically resistant glowes (tested to EN374) in combination with "basic" employee training (Efficiency of at least 90 %). year Chemically resistant glowes (tested to EN374) in combination with specific activity training. (Efficiency of at least 90 %). Wear chemically resistant glowes (tested to EN374, (Efficiency of at least 80 %). year Chemical system PROC8a (Maintenance) Wear chemically resistant glowes (tested to EN374, (Efficiency of at least 80 %). year Chemical system PROC8a (Maintenance) Wear chemically resistant glowes (tested to EN374, (Efficiency of at least 80 %). year Chemical system TSE-66 PROC15 Wear chemically resistant glowes (tested to EN374, (Efficiency of at least 80 %). year Chemical system 10.1 TSE-66 PROC15 Year Chemical system reaction of Egional tornage (torsiyea): 3.0E+04 Societar System Societar System reaction of reaciving surface water (m ¹⁴ G): Not defined (dataut = 18,000) Societar System Societar System release fraction to sol from process (initial release prior 10 1.0E+03 Societar System Societar System reaction to sol from process (initial release prior	Risk management measures related to hur	man health			
Isorage). FROC2 (Sampling). PROC3, PROC8b (Mainep, PROC8b (Prout Rain), PROC8b (Prout Rain), PROC8b (Drum) Wear chemically resistant gloves (tested to EN374) in combination with basic' employee training (Efficiency of at least 90 %). // PROC8b (Mainep, PROC8b (Drum) Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. (Efficiency of at least 90 %). // PROC8b (Maineparce) Wear chemically resistant gloves (tested to EN374, (Efficiency of at least 80 %). // PROC10 No special measures are required. // Control of environmental exposure immounts used formage used locally (tons/year): 0.1 // SECondo for the function of the	Respiratory protection	No special measu	res are requ	ired.	
PROCea with specific activity training. (Efficiency of at least 75%). Proces Wear suitable gloves tested to EN374. (Efficiency of at least 80 %). 22 Ontiol of environmental exposure Mospecial measures are required. isginal use tonnage (tons/year): 0.1 raction of EU tonnage used in region: 0.1 isginal use tonnage (tons/year): 3.0E+04 atamium daily site tonnage (types) 1.0E+05 Environment factors not influenced by risk management 10 oral reshwater dilution factor: 10 ocal freshwater dilution factor: 10 oral reshwater dilution receives resk (soucce) to prevent release onsit	Hand and/or Skin protection (Storage), PROC2 (Sampling), PROC3 PROC8b (Marine), (Road/Rail), PROC		2 33, , PROC8b		
by Protection No special measures are required. 22 Control of environmental exposure 0.1 inaction of EU tonnage used in region: 0.1 reaction of Regional use tonnage (tinskyear): 7.5E-06 iraction of Regional use tonnage (tinskyear): 3.0E-04 asimum daily site tonnage (kg/day): 1.0E+05 invironment factors not influenced by risk management Not defined (default = 18,000) ocal marine water dilution factor: 100 persitional Conditions 1.0E-03 entease fraction to asil from process (after typical onsite RMMs) 1.0E-03 elsease fraction to vasitewater form process (initial release prior to the asset of the asset asset of the asset of the asset of the asse		``	ance)	with specific activity training. (Efficiency of at least 75%)	
2 Control of environmental exposure impunts used impunts used raction of EU tonnage used in region: 0.1 regional use tornage (tons/year): 7.5E+06 includ set tornage (tons/year): 3.0E+04 traction of Regional tornage used locally (tons/year): 3.0E+04 traction of Regional consigne values (biology): 1.0E+05 travinoment factors not influenced by risk management toteline (default = 18,000) ooal restwater dividing tote tornage (tody): 10 ocal marine water dilution factor: 10 ocal marine water dilution factor: 10 ocal restwater requirements): 1.0E-03 telease fraction to air from process (after typical onsite RMMs onsistent with EU Solvent Emission Directive requirements): 2.0E-05 telease fraction to soli from process (initial release prior to the requirements): 1.0E-04 tMM): 1.0E-04 1.0E-04 Cenhical conditions and measures at process level (source) to prevent release continget forming tigestion). No wastewater treatment required. teat ar emission days (or process release estimates used). Cenhical conditions and measures to reduce or ifficiency of (%): 0 reat ar emission to provide a typical removal efficiency of (%): 0		PROC15		Wear suitable gloves tested to EN374. (Efficiency of at least 80 %).	
Imports used 0.1 iraction of EU tonnage used in region: 0.1 iraction of Regional tornage used locally (tons/year): 7.5E+06 iraction of Regional tornage used locally (tons/year): 3.0E+04 the multiple of the tornage (tons/year): 1.0E+05 invinual site tonnage (tons/year): 1.0E+05 invinual site tonnage (tons/year): 1.0E+05 invinual site tonnage (tons/year): 100 ocal marine water dilution factor: 100 orisiterit with EU Solvent Emissions Directive requirements): 3000 elsease fraction to soli from process (initial release prior to 1.0E-04 cehnical conditions and measures at process level (source) to prevent release 0 orat onsite water water of thor to receiving water discharge to domess. 0 orat onsite water water (herion to receiving water discharge) to 0	Eye Protection	No special measu	res are requ	ired.	
Imports used 0.1 iraction of EU tonnage used in region: 0.1 iraction of Regional tornage used locally (tons/year): 7.5E+06 iraction of Regional tornage used locally (tons/year): 3.0E+04 the multiple of the tornage (tons/year): 1.0E+05 invinual site tonnage (tons/year): 1.0E+05 invinual site tonnage (tons/year): 1.0E+05 invinual site tonnage (tons/year): 100 ocal marine water dilution factor: 100 orisiterit with EU Solvent Emissions Directive requirements): 3000 elsease fraction to soli from process (initial release prior to 1.0E-04 cehnical conditions and measures at process level (source) to prevent release 0 orat onsite water water of thor to receiving water discharge to domess. 0 orat onsite water water (herion to receiving water discharge) to 0	2.2 Control of environmental exposure				
legional use tonnage (ons/year): 7.5E+06 raction of Regional tonnage used locally (tons/year): 3.0E+04 Maximum daily site tonnage (kg/day): 1.0E+05 <i>Trivronment factors not influenced by risk management</i> 10 ocal marine water dilution factor: 100 Dyperational conditions 300 insistion days (days/year): 300 lelease fraction to air from process (after typical onsite RMMs) 1.0E-03 onsistent with EU Solvent Emissions Directive requirements): 2.0E-05 PRMM): 1.0E-04 release fraction to soil from process (initial release prior to tMM): 1.0E-04 restrict or sors sites thus conservative process release estimates used. Conditions and measures to reduce or limit discharges, air emissions and releases to soil retat air emission to provide a typical removal efficiency of (%): 0 81.3 discharging to domestic sewage treatment plant, provide the equired onsite wastewater removal efficiency of (%): 81.3 ori dent wastewater removal efficiency of (%): 94.2 Donot apply industrial sludge to natural soils. Sludge s	Amounts used				
legional use tonnage (ons/year): 7.5E+06 raction of Regional tonnage used locally (tons/year): 3.0E+04 Maximum daily site tonnage (kg/day): 1.0E+05 <i>Trivronment factors not influenced by risk management</i> 10 ocal marine water dilution factor: 100 Dyperational conditions 300 insistion days (days/year): 300 lelease fraction to air from process (after typical onsite RMMs) 1.0E-03 onsistent with EU Solvent Emissions Directive requirements): 2.0E-05 PRMM): 1.0E-04 release fraction to soil from process (initial release prior to tMM): 1.0E-04 restrict or sors sites thus conservative process release estimates used. Conditions and measures to reduce or limit discharges, air emissions and releases to soil retat air emission to provide a typical removal efficiency of (%): 0 81.3 discharging to domestic sewage treatment plant, provide the equired onsite wastewater removal efficiency of (%): 81.3 ori dent wastewater removal efficiency of (%): 94.2 Donot apply industrial sludge to natural soils. Sludge s			0.1		
Traction of Regional tonnage used locally (tons/year): 4.0E-03 Aumund daily set tonnage (tons/year): 3.0E+04 Aakimund daily set tonnage (tons/year): 1.0E+05 Environment factors not influenced by risk management 1.0E+06 Iow rate of receiving surface water (m*i/d): Not defined (default = 18,000) ocal marine water dilution factor: 10 Operational conditions 100 Operational conditions 300 Ielease fraction to air from process (after typical onsite RMMs) 1.0E-03 Ielease fraction to air from process (initial release prior to fifth): 2.0E-05 Index and measures at process level (source) to prevent release 1.0E-04 Cenhnical conditions and measures to reduce or filmid lischarges, air emissions and releases to soil 1.0E-04 Teat onsite wastewater (more or ceeving water discharge) of (%): 0 Itsk from environmental exposure is driven by humans via indirect exposure (primarily ingestion). No wastewater treatment required. 1.0E-04 Teat onsite wastewater (more) receiving water discharge) to receiving water discharge) of (%): 0 Itsk from environmental exposure is driven by humans via indirect exposure (primarily ingestion). No wastewater treatment required. Teat onsite wastewater (more) receiving water discharge) to receiving water discharge) to			-		
Animum daily site tonnage (kog/year): 3.0E+04 Animum daily site tonnage (kg/day): 1.0E+05 Environment factors not influenced by risk management 1.0E+05 Ioor ate of receiving surface water (m%d): Not defined (default = 18,000) ocal marine water dilution factor: 10 ocal marine water dilution factor: 10 ocal marine water dilution factor: 100 Operational conditions 300 Release fraction to air from process (after typical onsite RMMs onsister RMMs: 1.0E-03 Release fraction to soil from process (initial release prior to RMM): 1.0E-04 Release fraction to soil from process (initial release prior to RMM): 1.0E-04 Rechnical conditions and measures at process level (source) to prevent release 2.0E-05 Retinities (mark on the structure) of reduce or limit discharges, air emission and releases to soil 1.0E-04 Fechnical conditions and measures at process level (source) to prevent release 0 Treat onsite conditions and measures of reduce or limit discharges, air emissions and releases to soil 1.0E-04 Fechnical constructure (prior to receiving water discharge) to gravity indestructure) (reduce the required removal efficiency of (%): 0 Treat onsite wastewater (prior to receiving water discharge) 0 81.3		ns/vear).			
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3. Exposure estimation and reference to its source						
3.1 Human exposure prediction						
Exposure assessment (method/calculation model)	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC8b (Drum), PROC15) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a (Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).					

	Inhalation		Der	mal	Combined	
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)	
PROC1	0.01	0.04	0.03	0.57	0.61	
PROC2	0.04	0.19	0.03	0.57	0.76	
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78	
PROC2 (Sampling)	0.04	0.19	0.03	0.57	0.76	
PROC3	0.04	0.21	0.03	0.57	0.78	
PROC8a (Maintenance)	0.00	0.01	0.05	0.83	0.85	
PROC8b (Marine)	0.06	0.36	0.03	0.57	0.92	
PROC8b (Road/Rail)	0.03	0.20	0.03	0.57	0.76	
PROC8b (Drum)	0.02	0.12	0.03	0.57	0.68	
PROC15	0.05	0.28	0.01	0.10	0.38	

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	6.1E-02 mg/l	6.1E-03 mg/l	6.1E-04 mg/l	6.3E-02 mg/kg ww	1.5E+00 mg/kg ww	5.5E-02 mg/kg ww
Risk characterisation ratio (RCR)	6.4E-02	2.4E-01	2.4E-02	5.3E-04	3.1E-01	3.1E-02

Human exposure prediction:

Route of Exposure	Exposure (µg/kg/Day)	Risk characterisation ratio (RCR)
Oral	2.1E+01	8.1E-01
Inhalation	6.6E+00	1.3E-01

4. Evaluation guidance to downstream user				
For scaling see	are managed to at least equivalent Available hazard data do not supp	easures/Operational Conditions are adopted, then users should ensure that risks t levels. ort the need for a DNEL to be established for other health effects. trol technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-		
Exposure assessment	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless		

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instrument/tool/method		otherwise indicated. (PROC1, PROC2, PROC2 (Sampling), PROC8b (Drum),
		PROC15)
		The Advanced REACH Tool (ART) has been used to estimate workplace
		exposures unless otherwise indicated. (PROC2 (Storage), PROC3, PROC8a
		(Maintenance), PROC8b (Marine), PROC8b (Road/Rail)).
	Environment	The Hydrocarbon Block Method has been used to calculate environmental
Environment		exposure with the Petrorisk model.

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Exposure Scenario 3 – Use of Fuel oil, residual as a Fuel (Industrial)

1.0 Contributing scenarios	
Sector of Use [SU]	SU3 Industrial uses: Uses of substances as such or in preparations at industrial sites
Process Category [PROC]	PROC1 PROC2 PROC2 (Fuel filtering) PROC2 (Storage) PROC3 PROC8a (Maintenance) PROC8b (Bulk) PROC8b (Drum) PROC16
Chemical Product Category [PC]	Not applicable
Article Categories [AC]	Not applicable
Environmental Release Categories [ERC]	ERC7
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 7.12a.v1

2.0 Operational conditions and risk management measures

Product characteristics				
Physical form of product	Liquid			
Vapour pressure	<0.5 kPa @ STP			
Concentration of substance in product	Covers percentage substance	e in the product up to 100 % (unless stated differently).		
Human factors not influenced by risk r	nanagement			
Potential exposure area	Not defined	Not defined		
Frequency and duration of use				
Exposure duration per day	PROC1, PROC8a (Maintenance), PROC8b (Bulk), PROC16	Covers daily exposures up to 8 hours (unless stated differently).		
	PROC2 (Fuel filtering), PROC2 (Storage), PROC3	Covers exposure up to 1 - 4 hour(s)		
	PROC2, PROC8b (Drum)	Covers exposure up to 15 min - 1 hour(s)		
Emission days (days/year):	300	300		
Other operational conditions affecting	worker exposure			
Area of usa	PROC8b (Bulk)	Outdoor		
Area of use	All other PROC's	Not defined (default = Indoor)		
Characteristics of the surroundings	Not defined			

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.

Technical conditions of use

PROC1, PROC2, PROC3	Handle substance within a closed system.
Organisational measures	
PROC2	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).
PROC8b (Bulk)	Transfer via enclosed lines.
PROC8b (Drum), PROC2 (Fuel filtering), PROC2 (Storage), PROC16	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

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PROC8a (Maintenance)	Retain drain downs in sealed storage pending disposal or for subsequent re			
Risk management measures related to hu	nan health			
Respiratory protection	No special measu	res are requ	ired.	
Hand and/or Skin protection	PROC1, PROC2, (Fuel filtering), PF (Storage), PROC		Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training (Efficiency of at least 90 %).	
	PROC8a (Mainten	nance)	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training (Efficiency of at least 75 %).	
Eye Protection	No special measu	res are requ	ired.	
2.2 Control of environmental exposure				
Amounts used				
Fraction of EU tonnage used in region:		0.1		
Regional use tonnage (tons/year):		5.9E+06		
Fraction of Regional tonnage used locally (tor	ns/year):	2.6E-01		
Annual site tonnage (tons/year):	- 1	1.5E+06		
Maximum daily site tonnage (kg/day):		5.0E+06		
Environment factors not influenced by risk	k management	0.02100		
Flow rate of receiving surface water (m ³ /d):		Not define	d (default = 18,000)	
Local freshwater dilution factor:		10		
Local marine water dilution factor:		100		
Operational conditions		100		
Emission days (days/year):		300		
Release fraction to air from process (initial rel RMM):	ease prior to	2.0E-04		
Release fraction to wastewater from process (initial release prior to RMM):		1.0E-06		
Release fraction to soil from process (initial release prior to RMM):		0		
Technical conditions and measures at pro				
Common practices vary across sites thus con				
Technical onsite conditions and measures				
		t exposure (primarily ingestion). No wastewater treatment required.	
Treat air emission to provide a typical remova	I efficiency of (%):	95		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):		92.5		
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%):		0		
Treat soil emission to provide a typical remov		Not defined		
Common practices vary across sites thus con				
Organisational measures to prevent/limit r				
Do not apply industrial sludge to natural soils.		cinerated. c	ontained or reclaimed.	
Conditions and measures related to munic				
Size of municipal sewage system/treatment p		2.0E+03		
Degradation effectiveness (%)		94.2		
Conditions and measures related to extern	al treatment of was		osal	
			tion emissions considered in regional exposure assessment. Externa	
treatment and disposal of waste should comp				
Substance release quantities after risk ma				
Release to waste water from process (mg/l)	nagement measure	Not define	d	
Maximum allowable site tonnage (MSafe) bas following total wastewater treatment removal		5.4E+06		
ionowing total wastewater treatment removal	(ng/u).	l		

3. Exposure estimation and reference to its source	
3.1 Human exposure prediction	
Exposure assessment (method/calculation model)	The ECETOC TRA tool has been used to estimate workplace exposures unless
	otherwise indicated. (PROC1, PROC2, PROC16)
	The Advanced REACH Tool (ART) has been used to estimate workplace

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exposures unless otherwise indicated. (PROC2 (Storage), PROC2 (Fuel filtering), PROC3, PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum))

	Inhalation		Dermal		Combined
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.01	0.04	0.03	0.57	0.61
PROC2	0.03	0.17	0.03	0.57	0.73
PROC2 (Fuel filtering)	0.04	0.21	0.03	0.57	0.78
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78
PROC3	0.04	0.21	0.03	0.57	0.78
PROC8a (Maintenance)	0.00	0.01	0.05	0.83	0.85
PROC8b (Bulk)	0.06	0.36	0.03	0.57	0.92
PROC8b (Drum)	0.03	0.19	0.03	0.57	0.76
PROC16	0.01	0.06	0.03	0.57	0.62

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environmental exposure	STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predicted Environmental Exposure (PEC)	1.5E-01 mg/l	1.5E-02 mg/l	1.5E-03 mg/l	6.3E-02 mg/kg ww	1.8E+00 mg/kg ww	4.6E-02 mg/kg ww
Risk characterisation ratio (RCR)	1.6E-01	6.1E-01	6.1E-02	3.0E-04	7.7E-01	7.7E-02

Human exposure prediction:

Route of Exposure	Exposure (µg/kg/Day)	Risk characterisation ratio (RCR)
Oral	2.2E+01	8.7E-01
Inhalation	3.4E+00	6.6E-02

4. Evaluation guidance to downstream user				
For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for- industries-libraries.html).			
Exposure assessment instrument/tool/method	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC16) The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC2 (Fuel filtering), PROC3, PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum))		
	Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.		

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Exposure Scenario 4 – Use of Fuel oil, residual as a Fuel (Professional)

1.0 Contributing scenarios	
Sector of Use [SU]	SU22 Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Process Category [PROC]	PROC1 PROC2 PROC2 (Storage) PROC3 PROC8a (Maintenance) PROC8b (Bulk) PROC8b (Drum/batch transfers) PROC8b (Refuelling) PROC16
Chemical Product Category [PC]	Not applicable
Article Categories [AC]	Not applicable
Environmental Release Categories [ERC]	ERC9a ERC9b
Specific Environmental Release Categories [SPERC]	ESVOC SpERC 9.12b.v1

2.0 Operational conditions and risk management measures

0.1 Control of worker			
2.1 Control of worker exposure			
Product characteristics			
Physical form of product	Liquid		
Vapour pressure	<0.5 kPa @ STP		
Concentration of substance in product		e in the product up to 100 % (unless stated differently).	
Human factors not influenced by risk mana	, , , , , , , , , , , , , , , , , , ,		
Potential exposure area	Not defined		
Frequency and duration of use			
	PROC1, PROC8a (Maintenance), PROC16	Covers daily exposures up to 8 hours (unless stated differently).	
	PROC2 (Storage)	Covers exposure up to 1 - 4 hour(s)	
Exposure duration per day	PROC2, PROC8b (Bulk), PROC8b (Drum), PROC8b (Refuelling)	Covers exposure up to 15 min - 1 hour(s)	
	PROC3	Covers exposure up to 15 min	
Exposure duration (days/year)	365		
Other operational conditions affecting wor	ker exposure		
Area of use	All PROC's	Not defined (default = Indoor)	
Characteristics of the surroundings	Not defined		
General measures applicable to all activitie			
Assumes a good basic standard of occupation	al hygiene is implemented. As	sumes activities are at ambient temperature (unless stated differently).	
as closed systems, dedicated facilities and so containment. Clean/flush equipment, where persons; provide specific activity training to op respiratory protection when its use is identified	itable general/local exhaust ver possible, prior to maintenance perators to minimise exposures d for certain contributing scenar	or the elimination of releases. minimise exposure using measures such entilation. Drain down systems and clear transfer lines prior to breaking where there is potential for exposure: restrict access to authorised wear suitable gloves and coveralls to prevent skin contamination; wear rio; clear up spills immediately and dispose of waste safely. Ensure safe Regularly inspect, test and maintain all control measures. Consider the	
Technical conditions of use			
PROC1, PROC2, PROC3 Handle substance within a closed system.			
Organisational measures			
PROC2, PROC3, PROC8b (Bulk), PROC8b (Drum)	Provide a good standard of controlled ventilation (10 to 15 air changes per hour).		
PROC2 (Storage), PROC8a (Maintenance), PROC16	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		

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PROC8b (Bulk), PROC8b (Drum)	Ensure material transfers are under containment or extract ventilation. Clear transfer lines prior to de-coupling.				
PROC8b (Bulk), PROC8b (Drum), PROC8a (Maintenance)	Retain drain downs in sealed storage pending disposal or for subsequent recycle.				
Risk management measures related to hu	man health				
Respiratory protection	No special measu	res are requ	ired.		
	PROC1, PROC2 (Storage),				
	PROC3, PROC8b	(Bulk),	Wear chemically resistant gloves (tested to EN374) in combination		
Liend and the Older much attact	PROC8b (Drum), PROC8b		with 'basic' employee training (Efficiency of at least 90 %).		
Hand and/or Skin protection	(Refuelling),				
	PROC2, PROC8a		Wear chemically resistant gloves (tested to EN374) in combination		
	(Maintenance)		with specific activity training (Efficiency of at least 95 %).		
Eye Protection	No special measu	res are requ	ired.		
2.2 Control of environmental exposure					
Amounts used					
Fraction of EU tonnage used in region:		0.1			
Regional use tonnage (tons/year):		1.7E+06			
Fraction of Regional tonnage used locally (to	ns/year):	5.0E-04			
Annual site tonnage (tons/year):	- /	8.5E+02			
Maximum daily site tonnage (kg/day):		2.3E+03			
Environment factors not influenced by ris	k management				
Flow rate of receiving surface water (m ³ /d):		Not define	d (default = 18,000)		
Local freshwater dilution factor:		10			
Local marine water dilution factor:		100			
Operational conditions		100			
Emission days (days/year):		365			
Release fraction to air from wide dispersive u	se (regional only).	1.0E-05			
Release fraction to wastewater from wide dispersive use:		1.0E-07			
Release fraction to soil from wide dispersive		1.0E-05			
Technical conditions and measures at pro	cess level (source)	to prevent	release		
Common practices vary across sites thus cor	servative process re	lease estima	ates used.		
Technical onsite conditions and measures	s to reduce or limit of	discharges,	air emissions and releases to soil		
Risk from environmental exposure is driven b	y humans via indirec	t exposure (primarily ingestion). No wastewater treatment required.		
Treat air emission to provide a typical remova	al efficiency of (%):	Not applicable			
Treat onsite wastewater (prior to receiving wa	ater discharge) to	0			
provide the required removal efficiency of (%):	0			
If discharging to domestic sewage treatment plant, provide the		0			
required onsite wastewater removal efficienc	/ of (%):	0			
Treat soil emission to provide a typical remov	al efficiency of (%):	Not defined			
Common practices vary across sites thus cor		lease estima	ates used.		
Organisational measures to prevent/limit					
Do not apply industrial sludge to natural soils			ontained or reclaimed.		
Conditions and measures related to muni-	cipal sewage treatm	ent plant			
			2.0E+03		
Degradation effectiveness (%): 94.2					
Conditions and measures related to exter	nal treatment of was	ste for disp	osal		
Combustion emissions limited by required ex	haust emission contr	ols. Combus	tion emissions considered in regional exposure assessment. External		
treatment and disposal of waste should comp	· · · · ·				
Conditions and measures related to extern	nal treatment of was	ste for disp	osal		
This substance is consumed during use and	no waste of the subst	tance is gen	erated.		
	nagement measure				
Substance release quantities after risk ma					
Release to waste water from process (mg/l):		Not define	d		
		Not define 3.0E+03	d		

3. Exposure estimation and reference to its source	
3.1 Human exposure prediction	
Exposure assessment (method/calculation model)	The ECETOC TRA tool has been used to estimate workplace exposures unless

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otherwise indicated. (PROC1, PROC2, PROC3, PROC16). The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum) and PROC8b (Refuelling))

	Inhalation		Dermal		Combined	
Process Category [PROC]	Inhalation exposure (mg/m³)	Risk characterisation ratio (RCR)	Dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)	
PROC1	0.01	0.06	0.03	0.57	0.62	
PROC2	0.06	0.33	0.02	0.28	0.62	
PROC2 (Storage)	0.04	0.21	0.03	0.57	0.78	
PROC3	0.03	0.17	0.03	0.57	0.73	
PROC8a (Maintenance)	0.01	0.05	0.05	0.83	0.88	
PROC8b (Bulk)	0.03	0.19	0.03	0.57	0.76	
PROC8b (Drum)	0.03	0.19	0.03	0.57	0.76	
PROC8b (Refuelling)	0.03	0.19	0.03	0.57	0.76	
PROC16	0.01	0.06	0.03	0.57	0.62	

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Fuel oil, residual is a hydrocarbon UVCB. The hydrocarbon block method is used in PETRORISK to calculate the environmental toxicity (HC5) of each group of components in the substance. These are used to estimate the environmental risk for the substance. Therefore individual environmental compartments PNECs are not available for this product.

Environr expos		STP	Freshwater	Marine water	Soil	Freshwater sediment	Marine sediment
Predic Environn Exposure	nental	7.2E-06 mg/l	1.1E-04 mg/l	7.3E-07 mg/l	6.2E-02 mg/kg ww	1.4E+00 mg/kg ww	3.6E-02 mg/kg ww
Ris character ratio (F	isation	7.5E-06	4.7E-03	6.2E-05	5.7E-05	3.5E-03	4.1E-05

Human exposure prediction:

Route of Exposure	Exposure (µg/kg/Day)	Risk characterisation ratio (RCR)
Oral	2.0E+01	7.7E-01
Inhalation	1.2E-01	2.3E-03

4. Evaluation guidance to downstream user				
For scaling see	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data do not support the need for a DNEL to be established for other health effects. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for- industries-libraries.html).			
Exposure assessment instrument/tool/method	Worker	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. (PROC1, PROC2, PROC3, PROC16). The Advanced REACH Tool (ART) has been used to estimate workplace exposures unless otherwise indicated. (PROC2 (Storage), PROC8a (Maintenance), PROC8b (Bulk), PROC8b (Drum) and PROC8b (Refuelling))		
	Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.		

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