

## VIRGIN NAPHTHA, SWEETENED

REV.: G

DATE: 02/11/2020

PREPARED BY: ICARO S.r.l

FOR: ALMA PETROLI S.p.A.

### SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND COMPANY/ORGANIZATION

#### 1.1 Product identification

Substance name: Virgin naphtha, sweetened<sup>1</sup>,  
 Synonyms: Naphtha, (petroleum), sweetened  
 CAS number: 64741-87-3  
 EC number: 265-089-2  
 Index number: 649-350-00-1  
 Registration number: 01-2119486791-26-0021

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

**Common uses** fuel for motors and other industrial uses

**Uses identified in the chemical safety report: general list of applications:**

**Life cycle:**

**Manufacture** manufacturing of the substance

**Formulation or (re)packing:** formulation & (re)packing of substances and mixtures

**Use at industrial sites:** use in fuels, use as an intermediate

**Generalised use by**

**professional operators:** use in fuels

**Consumer use (G28):** use in fuels

**Uses advised against:** Professional and consumer use of this substance in coatings and detergents is not recommended.

Although these uses were previously supported, in 2011 the ECHA Committee for Risk Assessment (RAC) held that petroleum-based products in the Naphtha and Kerosene categories present a risk of chronic toxicity to the central nervous system. This opinion proposes more stringent exposure limits that are incompatible with the chemical safety assessments carried out for these uses.

Consult the annex for a complete list of the uses for which an exposure scenario is envisaged.

#### 1.3 Information on the supplier of the safety data sheet:

Company name: ALMA PETROLI S.p.A.  
 Address: Via di Roma 67 - Via Baiona 195  
 City / Country: Ravenna, Italy  
 Telephone Tel.: 0039054434317-00390544696411  
 E-mail of competent technician: info@almapetroli.com

<sup>1</sup> Classified as H340, H350, or H361, containing from 0% to 1% benzene

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### 1.4 Emergency telephone number:

Poison centre with telephone consultation operative (24/7): Niguarda Hospital Milan Tel: 0039-02 66101029, Poison centre Pavia: Tel. 0039-0382-24444, Poison centre Bergamo: Tel: 0039-800 883300, Poison centre Foggia: Tel 0039-0881-732326, Poison centre Florence: Tel 0039-055-7947819, Poison centre Policlinico Umberto I Rome: Tel 0039-06-490663, Poison centre Policlinico "A. Gemelli": Tel 0039-06-3054343, Poison centre Cardarelli Naples: Tel: 081-5453333/7472870

Alma Petroli - Sciascia Antonino (Employer) - Mob. 0039-3461305790 (24/7)

Alma Petroli - Fabbri Maurizio (RSPP) - Mob. 0039-3461321422 (24/7)

## SECTION 2. IDENTIFICATION OF THE HAZARDS

Physical-chemical hazards:	the product is easily flammable
Health hazards:	the product is irritant for the skin. Inhalation of vapours may cause drowsiness and dizziness. Given its low viscosity, the product can be inhaled into the lungs either following direct swallowing or after spontaneous or induced vomiting; this can give rise to chemical pneumonia. May cause mutagenic and neoplastic effects. May reduce fertility and damage the unborn child.
Environmental hazards:	the product is toxic for aquatic organisms with long-term adverse effects in the aquatic environment.

### 2.1 Classification of the substance or mixture

Flam. Liquid 2: H225

Asp. Tox. 1: H304

Skin Irrit. 2: H315

STOT Single Exp. 3: H336

Muta. 1B: H340

Carc. 1B: H350

Repr. 2: H361f

Aquatic Chronic 2: H411

(list of H-phrases is reported in section 16).

Note: the substance was classified taking into account the following characteristics:

Flash point < 23 °C, initial boiling point > 35 °C, benzene ≥ 0.1%, toluene < 3%, and n-hexane > 3%.

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### 2.2 Elements in the label



GHS02



GHS07



GHS08



GHS09

**Signal word:** HAZARD

#### Hazard statements:

- H225: Highly flammable liquid and vapour
- H304: May be fatal if swallowed and enters airways
- H315: Causes skin irritation
- H336: May cause drowsiness or dizziness
- H340: May cause genetic defects
- H350: May cause cancer
- H361: Suspected of damaging fertility
- H411: Toxic to aquatic life with long lasting effects

#### Precautionary statements

##### Prevention:

- P201: Obtain special instructions before use
- P210: Keep away from heat, hot surface, sparks, open flames and other ignition sources. No smoking
- P273: Avoid release to the environment.
- P280: Wear protective gloves/protective clothing/eye protection/face protection

##### Reaction

- P301+310: IF SWALLOWED: immediately call a POISON CENTRE or doctor/physician
- P331: Do not induce vomiting

##### Storage:

- P403+233: Keep container tightly closed and store in a well ventilated place.

##### Disposal

- P501: Dispose of contents/container in compliance with It. Leg. Dec. 152/06 and subsequent amendments and integrations

**Additional information:** Note P

**Authorisation no.:** n.a.

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### 2.3 Other hazards

The vapours form flammable, explosive mixtures with air. The vapours are heavier than air: they can accumulate in confined or low-lying spaces, propagate at ground level and can lead to the risk of fire and explosion, even from a distance. In some situations, the product can accumulate electrostatic charges, even significant charges, with the risk of discharges which can ignite fires or explosions. The product does not meet the PBT or vPvB classification criteria as per REACH annex XIII.

## SECTION 3. COMPOSITION / INFORMATION ON THE INGREDIENTS

### 3.1 Substances

Name	EC no.	CAS no.	Index no.	Registration no.
Naphtha, (petroleum), sweetened	265-089-2	64741-87-3	649-350-00-1	01-2119486791-26-0021

UVCB substance: Complex combination of hydrocarbons produced by subjecting petroleum naphtha to a sweetening process to convert the mercaptans or eliminate acid impurities. It is composed of hydrocarbons generally containing between C4 and C12 carbon atoms and having a boiling point in the -10°C /- 230°C range (approx.).

Depending on the characteristics and source of the components, the final chemical composition of the naphtha may contain various chemical compounds. These compounds are not added deliberately. The most important of these for classification purposes are given below and included in the registration files (Se.1.2 IUCLID)

**a) Benzene: CAS 71-43-2 EINECS 200-753-7 INDEX No. 601-020-00-8. Concentration 0.28 p/p**

**Classification as per Regulation (EC) 1272/2008 (CLP)**

Flam. Liq. 2; H225

Carc. 1A; H350

Muta.1B; H340

STOT RE 1; H372 (hematopoietic system)

Asp.Tox.1.; H304

Eye.Irrit.2; H319

Skin.Irrit.2; H315

**b) Toluene: CAS 108-88-3 EINECS 203-625-9 INDEX No. 601-021-00-3 Concentration 1.47 % p/p**

**Classification as per Regulation (EC) 1272/2008 (CLP)**

Flam. Liq. 2; H225

Repr.2; H361d

STOT RE 2; H372 (central nervous system)

Asp.Tox.1.; H304

Skin.Irrit.2; H315

Eye.Irrit.2; H319

STOT SE 3; 336

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### c) n-hexane CAS 110-54-3 EINECS 203-777-6 INDEX No. 601-037-00-0 Concentration 5.78 % p/p

#### Classification as per Regulation (EC) 1272/2008 (CLP)

Flam.Liq.2; H225

Repr.2; H361f

Asp.Tox.1; H304

Skin Irrit.2; H315

STOT RE 3 Cat 2; H373 (CNS, inhalation)

STOT SE 3, H336 (depression CNS, inhalation)

Aquatic Chronic 1; H411

The complete text of all H phrases is given in section 16.

### 3.2 Mixtures

n.a.

## SECTION 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

- Eye contact:** Rinse cautiously with water for several minutes (814); remove contact lenses, if present and easy to do so (808). If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist (721).
- Skin contact:** remove contaminated clothing, contaminated footwear and dispose of safely (811). Wash the affected area with soap and water (849). If irritation, swelling or reddening occurs, obtain medical advice from a specialist (721).  
For minor thermal burns, cool the burn (705). Hold the burned area under cold running water for at least five minutes, or until the pain subsides (709). Body hypothermia must be avoided (659).  
When using high-pressure equipment, injection of product can occur (850). If high-pressure injuries occur, immediately seek professional medical attention (718). Do not wait for symptoms to develop (686).
- Ingestion/aspiration:** Do not induce vomiting as there is high risk of aspiration (680). Do not give anything by mouth to an unconscious person (679). In the event of spontaneous vomiting, keep the casualty's head down to prevent the risk of breathing vomit into the lungs
- Inhalation:** If breathing is difficult, bring the casualty to fresh air and keep at rest in a position comfortable for breathing (715)  
If the casualty is unconscious and (716) not breathing (790) ensure that there is no obstruction to breathing and give artificial respiration by trained personnel (694). If necessary, give external cardiac massage and obtain medical advice (723). If the casualty is breathing (660), place in the recovery position (724). Administer oxygen if necessary (649).

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#### 4.2 Primary symptoms and effects, both acute and delayed

May cause skin irritation (825), slight eye irritation (826). Inhalation of vapours may cause headache, nausea, vomiting and an altered state of consciousness (762). If swallowed, few or no symptoms expected (700). If any, nausea and diarrhoea might occur (711).

#### 4.3 Indication of any immediate medical attention and special treatment needed

In case of ingestion, always assume that aspiration has occurred (740). The casualty should be sent immediately to a hospital (823). Do not wait for symptoms to develop (686)

### SECTION 5. FIRE-FIGHTING MEASURES

#### 5.1 Extinguishing media

*Suitable extinguishing media:* Small scale fires: earth or sand (872), carbon dioxide (852), foam (859), dry chemical powder (856). Large scale fires: foam (859), water fog (887). Note: only specially trained personnel can use sprayed water (water fog). Other inert gases (subject to regulations) (870).

*Unsuitable extinguishing media:* Do not use direct water jets on the burning product (855), they could cause splattering and spread the fire (881). Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam (873).

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

Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide (867), H<sub>2</sub>S (Hydrogen sulphide), SO<sub>x</sub> (sulphur oxides), H<sub>2</sub>SO<sub>4</sub> (sulphuric acid) (861) and other unidentified organic and inorganic compounds (886).

#### 5.3 Recommendations for fire-fighting personnel

In case of a large fire or in confined or poorly ventilated spaces, wear full fire resistant protective clothing and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode (864).

### SECTION 6. ACCIDENTAL RELEASE MEASURES

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

##### 6.1.1 For those who do NOT intervene directly

Stop or contain leak at the source, if safe to do so (1006). Avoid direct contact with released material (903). Stay upwind (1003). In case of large spillages, alert occupants in downwind areas (956). Keep non-involved personnel away from the area of spillage. Alert emergency personnel (968). Except in case of small spillages (925), the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency (1007). Eliminate all ignition sources if safe to do so (e.g. electricity, sparks, fires, flares) (920). When the presence of dangerous amounts of H<sub>2</sub>S around the leaked/spilled product is suspected or proved, additional or special actions may be warranted, including access restrictions, use of special personal protection equipment, procedures and personnel training (963). If required, notify relevant authorities according to all applicable regulations (949). Concentration of H<sub>2</sub>S in tank headspaces may reach hazardous values, especially

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in case of prolonged storage (912). This situation is especially relevant for those operations which involve direct exposure to the vapours in the tank. (1014)

Spillages of limited amounts of product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous concentrations. (999). As H<sub>2</sub>S has a density greater than ambient air, a possible exception may regard the build-up of dangerous concentrations in specific spots, like trenches, depressions or confined spaces (902). In all these circumstances, however, the correct actions should be assessed on a case-by-case basis (954).

### 6.1.2 For those who intervene directly

Small spillages (995): normal antistatic working clothes are usually adequate (983). Large spillages: full body suit of chemically resistant and antistatic material (973). Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons (1028). Gloves made of PVA (Polyvinyl alcohol) are not water-resistant and are not suitable for emergency use (933). Work helmet (1030). Antistatic non-skid safety shoes or boots (899) chemically resistant. Goggles or face shield, if splashes or contact with eyes is possible or anticipated (934). Respiratory protection: a half or full-face respirator with filter(s) for organic vapours (and when applicable for H<sub>2</sub>S) (892) or a Self-Contained Breathing Apparatus (SCBA) can be used according to the extent of the spill and predictable amount of exposure (895). If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used (951).

## 6.2 Environmental precautions

prevent product from entering sewers, rivers or other bodies of water. (985)

## 6.3 Methods and materials for containment and cleaning

Spillages onto land: If necessary dike the product with dry earth, sand or similar non-combustible materials (940). Large spillages may be cautiously covered with foam, if available, to limit fire risk (970). Do not use direct jets (918). When inside buildings or confined spaces, ensure adequate ventilation (1022). Absorb spilled product with suitable non-combustible materials (896). If it is necessary to store any contaminated materials for subsequent safe disposal, only suitable containers (airtight, sealed, waterproof, and earthed) should be used (939). In case of soil contamination, remove contaminated soil and treat in accordance with local regulations (959).

Spillage in water: In case of small spillages in closed waters (e.g.: in ports) (957), contain product with floating barriers or other equipment (958). Collect spilled product by absorbing with specific floating absorbents (910). Large spillages (972): if possible, large spillages in open waters should be contained with floating barriers or other mechanical means (948) only if this is strictly necessary and if the risk of fire or explosion can be adequately prevented; otherwise let the substance evaporate and disperse naturally (978). The use of dispersants should be advised by an expert, and, if required, approved by local authorities (1012). If possible, collect the product and contaminated materials with mechanical means, and store/dispose of according to relevant regulations (945).

Recommended measures are based on the most likely spillage scenarios for this material. Local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions (990).

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## 6.4 Reference to other sections

For more information regarding personal protective equipment see section "Exposure control/personal protection" (1086).

## SECTION 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

#### 7.1.1 Protective measures (containment and preventive measures)

Obtain special instructions before use (1105). Risk of explosive mixtures of vapour and air (1120). Ensure that all relevant regulations regarding explosive atmospheres, and handling and storage facilities of flammable products, are followed (1079).

Take precautionary measures against static electricity (1134). Ground/bond containers, tanks and transfer/receiving equipment (1087). The vapour is heavier than air (1137). Beware of accumulation in pits and confined spaces (1051). Keep away from heat/sparks/open flames/hot surfaces (1097). Do not smoke. Use only bottom loading of tankers, in compliance with European legislation (1151). Do not use compressed air for filling, discharging or handling operations (1073). Avoid contact with skin and eyes (1041). Do not swallow (1072). Do not breathe vapours (1070)

Product may release H<sub>2</sub>S (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 (E500). Use and store only outdoors or in a well-ventilated area (1148). Avoid contact with the product (1045). Use adequate personal protective equipment as needed (1146). Avoid release to the environment (1046)

#### 7.1.2 General recommendations regarding hygiene in the workplace

Do not breathe mist/vapours/spray (P260). Avoid contact with skin (1042). Keep away from food and beverages (1096). Do not eat, drink or smoke when using this product (1041). Wash the hands thoroughly after handling (1156). Do not reuse contaminated clothing.

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

Storage area layout, tank design, equipment and operating procedures must comply with the relevant European, national or local legislation (1127). Storage installations should be designed with adequate bunds so as to prevent ground and water pollution in case of leaks or spills (1129). Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations (1054), only after having cleaned out the tank. Store separately from oxidising agents (1133).

Recommended materials (1117) Use mild steel, stainless steel for containers or container linings. (1116) Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use (1125). Compatibility should be checked with the manufacturer (1055).

If the product is supplied in containers (1094) keep only in the original container or in a suitable container for this kind of product (1099). Store in a well-ventilated place (1131)

Keep containers tightly closed and properly labelled (1098). Protect from the sunlight (1114).

Light hydrocarbon vapours can build up in the headspace of containers (1100). These can cause flammability / explosion hazards (1138). Open slowly in order to control possible pressure release (1107). Empty containers may contain combustible product residues (1077). Do not weld, solder, drill, cut or incinerate empty containers, unless they have been properly cleaned (1075).

### 7.3 Special end uses

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See attached exposure scenarios

### SECTION 8. EXPOSURE CONTROL/PERSONAL PROTECTION

#### 8.1 Control parameters

GASOLINE [CAS 86290-81-5]

ACGIH:

TLV®-TWA: 300 ppm

TLV®-STEL: 500 ppm

#### BENZENE

It. legislative decree no. 81/08 and subsequent amendments and integrations

Limit values (8 hours): 1 ppm; 3.25 mg/m<sup>3</sup>

ACGIH:

TLV®-TWA: 0.5 ppm; 1.6 mg/m<sup>3</sup>

TLV®-STEL: 2.5 ppm; 8 mg/m<sup>3</sup>

#### N-HEXANE

It. legislative decree no. 81/08 and subsequent amendments and integrations

Limit values (8 hours): 20 ppm; 72 mg/m<sup>3</sup>

ACGIH:

TLV®-TWA: 50 ppm; 176 mg/m<sup>3</sup>

#### TOLUENE

It. legislative decree no. 81/08 and subsequent amendments and integrations

Limit values (8 hours): 50 ppm; 192 mg/m<sup>3</sup>

ACGIH:

TLV®-TWA: 20 ppm; 75.4 mg/m<sup>3</sup>

#### ACGIH Biological Exposure Indices (BEI)

##### BENZENE

BEI: S-phenylmercapturic acid in urine 25 µg/g creatinine; Trans acid, trans muconic acid in urine 500 µg/g creatinine

##### n-HEXANE

BEI: 2,5 hexanedione in urine: 0.4 mg/l

##### TOLUENE

BEI: toluene in blood: 0.02 mg/l; toluene in urine: 0.03 mg/l; o-cresol in urine: 0.3 mg/g creatinine

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### Toxicological information - DNEL naphtha (classified as carcinogenic): conclusions on hazards to workers

Route of exposure	Type of effect	Conclusions about risk	More sensitive endpoint
Inhalation	Systemic effects - Long term	DNEL 1.9 mg/m <sup>3</sup> (equivalent to the DNEL derived for benzene)	Repeated dose toxicity (by inhalation)
Inhalation	Systemic effects - Acute	DNEL 1286.4 mg/m <sup>3</sup>	neurotoxicity (by inhalation)
Inhalation	Local effects - Long term	DNEL 837.5mg/m <sup>3</sup>	Irritation (respiratory tract)
Inhalation	Local effects - Acute	DNEL 1066.67mg/m <sup>3</sup>	Irritation (respiratory tract)
Dermal	Systemic effects - Long term	high risk (no derived threshold)	
Dermal	Systemic effects - Acute	high risk (no derived threshold)	
Dermal	Local effects - Long term	high risk (no derived threshold)	
Dermal	Local effects - Acute	low risk (no derived threshold)	
Eyes	Local effects	No risk identified	

### Toxicological information - DNEL naphtha (classified as carcinogenic): conclusions on hazards for the general population

Route of exposure	Type of effect	Conclusions about risk	More sensitive endpoint
Inhalation	Systemic effects - Long term	DNEL 0.41 mg/m <sup>3</sup>	Repeated dose toxicity (by inhalation)
Inhalation	Systemic effects - Acute	DNEL 1152 mg/m <sup>3</sup>	Neurotoxicity (by inhalation)
Inhalation	Local effects - Long term	DNEL 178.57 mg/m <sup>3</sup>	Irritation (respiratory tract)
Inhalation	Local effects - Acute	DNEL 640 mg/m <sup>3</sup>	Irritation (respiratory tract)
Dermal	Systemic effects - Long term	high risk (no derived threshold)	
Dermal	Systemic effects - Acute	high risk (no derived threshold)	
Dermal	Local effects - Long term	high risk (no derived threshold)	
Dermal	Local effects - Acute	low risk (no derived threshold)	
Oral	Systemic effects - Long term	no risk identified	
Oral	Systemic effects - Acute	no risk identified	
Eyes	Local effects	no risk identified	

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### PNEC(S) (Predicted No Effect Concentration)

PNEC(S) Water, sediment, soil	
	<p>The substance is a UVCB hydrocarbon posing chronic danger to the aquatic environment. The “hydrocarbon block” method is used for the environmental risk assessment (REACH R7 Guide, section 13-1). PNECs cannot be derived for UVCB substances for which the aquatic PNECs for “hydrocarbon blocks” (i.e., a library of about 1500 representative hydrocarbons that are grouped according to their physical and chemical properties, breakdown and degradation properties) were obtained using the HC5 statistical extrapolation method and the Target Lipid Model (TLM). Following specific requests from ECHA, a revision of the TLM model was carried out, which led to new results used in the 2016 edition of CSR. For details, refer to the annex to section 13 of IUCLID.PETRORISK Product Library tab, PAH Phototoxicity, PNEC HC5, TLM Validation, PETROTOX Verification and NOS Heterocyclics.</p>

Exposure limit values (atmospheric contaminants)

Monitoring procedure: see It. Leg. Dec. 81/2008 and subsequent amendments and integrations or to good industrial hygiene practices.

## 8.2 Exposure control

### 8.2.1 Suitable technical checks

Minimise exposure to mist/ vapours/sprays. Before entering storage tanks and commencing any operation in a confined area, check the atmosphere for oxygen content, hydrogen sulphide (H<sub>2</sub>S) and flammability (1050)

### 8.2.2 Personal protection measures, such as personal protective equipment

#### (a) Eye/face protection:

In the absence of systems for containment, and if contact with the eyes/face is possible, head and facial protection (protective shield and/or safety goggles) should be used (EN 166) (1185).

#### (b) Skin protection:

##### i) Hand protection

In the absence of containment systems, and if contact with the skin is possible, use hydrocarbon-resistant gloves with long cuffs that are plush lined and thermally insulated. Materials assumed to be adequate: nitril, PVC or PVA (polyvinyl alcohol) with index of protection against chemical agents of at least 5 (permeation time > 240 minutes). Use gloves under the conditions and respecting the limits set by the manufacturer. If necessary, see UNI EN 374. Gloves must be periodically inspected and changed in case of wear, perforations or contaminations (1174).

##### ii) Other

Replace and clean clothing immediately in case of contamination.

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### (c) Respiratory protection

In confined spaces:

Use approved respiratory protection equipment: full face mask with cartridge/filter type AX (brown for organic vapours with low boiling point). If exposure levels cannot be determined or estimated with adequate confidence, or an oxygen deficiency is possible, only SCBA's should be used (EN 529). (1183).

In the absence of systems for containment:

Use approved respiratory protection equipment: full face mask with cartridge/filter type AX (brown for organic vapours with low boiling point).

### (d) Thermal hazards: see previous letter b)



### 8.2.3 Environmental exposure control

Avoid release to the environment (1046). Storage installations should be designed with adequate bunds so as to prevent ground and water pollution in case of leaks or spills (1129). Onsite wastewater treatment required (TCR13). Prevent discharge of undissolved substance to or recover from onsite wastewater. (TRC14) Do not apply industrial sludge to natural soils (OMS2). Industrial sludge should be incinerated, contained or reclaimed (OMS3).

### 8.3 Other

For more information regarding personal protective equipment and operational conditions see Exposure scenarios

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on essential physical and chemical properties

a) Appearance	clear liquid
b) Odour	of petroleum
c) Olfactory threshold	n.d.
d) pH	n.a.
e) Melting/freezing point	< - 60 °C (Eaton, 1990 - data for the UVCB)
f) Initial boiling point and boiling range	37 °C 37-192.6 °C (TEST REPORT: GE14-0122.001)
g) Flash point	< - 40 °C (EN ISO 13736- Concawe 1992) < 0 °C (ASTM D56 TEST REPORT No. GE14-02150.001)
h) Evaporation rate	n.a.
i) Flammability (solids, gases)	n.a.
j) Upper/lower flammability or explosive limits	LEL 1.4%; UEL 7.6% (Eaton 1990)
k) Vapour pressure	4-240 kPa at 37.8 °C (EN 13016-1-Concawe 2010)
l) Vapour density	n.a.
m) Density	715.5 kg/m <sup>3</sup> at 15 °C (ASTM D4052 TEST REPORT no. GE14-02150.001)

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n) Solubility	2.69E-12 – 2000 mg/l (calculated range-QSAR)
o) Partition coefficient (n-octanol/water)	1.99-18.2 (calculated range-QSAR)
p) Auto-ignition temperature	280 °C-470 °C (Concawe 2010)
q) Decomposition temperature	n.a.
r) Viscosity	< 1 mm <sup>2</sup> /s at 37.8 °C (Concawe 1992)
s) Explosive properties	None of the chemical groups associated with the molecule have explosive properties
t) Oxidising properties	Not necessary (column 2 of the REACH in annex VII)

### 9.2 Additional information

The characteristic analysis methods are the nationally and internationally recognized methods.

## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

The product does not present any further hazard related to reactivity, above and beyond those reported in the following subsections.

### 10.2 Chemical stability

This product is stable as regards its inherent properties.

### 10.3 Possibility of dangerous reactions

Contact with strong oxidizers (peroxides, chromates, etc.) may cause a fire hazard. A mixture with nitrates or other strong oxidisers (e.g. chlorates, perchlorates, liquid oxygen) may create an explosive mass. Sensitivity to heat, friction or shock cannot be assessed in advance.

### 10.4 Conditions to be avoided

Store separately from oxidising agents (1133). Keep away from heat/sparks/open flames/hot surfaces (1097). Do not smoke. Prevent the formation of electrostatic charges.

### 10.5 Non-compatible materials

Strong oxidizers.

### 10.6 Hazardous decomposition products

The product does not decompose when used for the envisaged purposes.

## SECTION 11. TOXICOLOGICAL INFORMATION

No experimental data are available on the absorption, distribution, metabolism and excretion of the product as a whole, however, there are numerous toxicokinetic studies on the main constituents. Most of the components are absorbed by

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inhalation. Absorption by inhalation is directly proportional to the molecular weight of the constituents and thus n-paraffins are absorbed more readily than iso paraffins, and aromatics are absorbed more readily than the corresponding paraffins. Low molecular weight constituents (butane and pentane) are poorly absorbed because they are exhaled. Absorbed molecules have a metabolism similar to that of alcohols with excretion through the kidneys. Skin absorption of the components in vapour phase is low, around 1% of total absorption by inhalation. Even skin absorption of liquid components is very low since they evaporate quickly.

Most of the components are absorbed by the gastrointestinal tract.

### 11.1 Information on toxicological effects

#### a) Acute toxicity:

Although the product is dangerous if inhaled into the lungs and prolonged exposure produces serious central nervous system depression, studies on acute toxicity of naphtha absorbed via the oral, dermal and inhalation routes showed no effects under the conditions defined by the test protocols according to the regulations concerning hazardous substances. Therefore, given these results, the standards on hazardous substances do not require any classification.

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
<b>Oral Route</b>			
RAT Oral (forced feeding) OECD Guideline 401	LD50:>5000 mg/kg (M/F)	Key study Reliable without restrictions CAS 86290-81-5	UBTL Inc (1986a)
<b>Inhalation route</b>			
RAT Vapour inhalation OECD Guideline 403	LC50:>5610 mg/m <sup>3</sup> /4 hours (M/F)	Key study Reliable without restrictions CAS 86290-81-5	UBTL Inc (1992g)
<b>Cutaneous route</b>			
RABBIT OECD Guideline 402	LD50: > 2000 mg/kg (M/F)	Key study Reliable with restrictions CAS 86290-81-5	UBTL Inc (1986d)

#### b) Skin corrosion/skin irritation

The skin irritation potential of samples belonging to the category of this product was tested in a large number of studies, generally performed in rabbits. The conclusions drawn by these studies indicate that gasoline causes skin irritation, without any evident in-depth lesions (corrosion). Given these results, the substance requires a classification of Skin Irrit. 2 H315 (Causes skin irritation).

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
RABBIT Semi-Occlusive Patch test at 24/48/72 hours OECD Guideline 404	Irritant Average erythema score: 2.56	Key study Reliable without restrictions CAS 86290-81-5	American Petroleum Institute (API) 1995

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### c) Serious eye damage / eye irritation

The eye irritation potential of samples belonging to this product category was tested in a large number of studies, generally performed in rabbits. The conclusions drawn by these studies indicate that the potential for eye irritation is moderate with exposure to vapours at concentrations above 200 ppm, however, the dose-response information is not conclusive.

Given these results, the standards on hazardous substances do not require any classification.

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
RABBIT Patch test at 24/48/72 hours OECD Guideline 405	Non irritant Average conjunctival score: 0.06	Key study Reliable without restrictions CAS 86290-81-5	UBTL Inc (1985a)

### d) Sensitization of respiratory tract and skin

#### *Sensitization of respiratory tract*

This endpoint is not required by REACH. The Naphtha category of products do not cause respiratory tract sensitization, and thus no substance classification is required.

#### *Sensitization of skin*

Various skin sensitization studies have been performed with naphtha (annex V method B.6 (skin sensitization); Buehler method).

The results obtained from these studies indicate that there is no potential for skin sensitization and thus no substance classification is required.

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
GUINEA PIG Guideline 406	Non sensitising	Key study Reliable without restrictions CAS 86290-81-5	UBTL Inc (1990i)

### e) Germ cell mutagenicity

The mutagenic potential of naphtha has been widely studied in a series of in vivo and in vitro tests. Most of the studies did not reveal coherent proof of mutagenic activity. Classification as mutagen is assigned because of the presence of benzene in C>0.1%: Muta 1 B H340 (May cause genetic defects).

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
In vitro gene mutations in Salmonella thyphimurium OECD TG 471	Negative	Key study Reliable without restrictions CAS 86290-81-5	American Petroleum Institute (API) 1977
In vivo chromosomal aberration RAT EPA OPPTS 870.5395	Negative	Key study Reliable without restrictions CAS 86290-81-5	Huntingdon Life Sciences. 2005

### f) Carcinogenicity

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Most animal studies conducted using vaporized product have revealed a higher incidence of liver tumours. However, the vaporized product contains the heavier aromatic components responsible for onset of tumours which, instead, are not present in the vapour phase that humans are normally exposed to. Carcinogenesis studies performed on naphtha do not adequately support the classification as carcinogen which is, nevertheless, assigned because of the presence of benzene in C>0.1%: Carc. 1B H350 (May cause cancer).

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
<b>Cutaneous route</b>			
MOUSE OECD Guideline 451 Exposure 102 weeks (3 times a week)	NOAEL (carcinogenicity) 0.05 ml male No neoplastic effect observed	Key study Reliable without restrictions CAS 86290-81-5	American Petroleum Institute (1983b)

NOTE: Carcinogenicity via the oral route is not an endpoint required by REACH.

### g) Reproductive Toxicity

#### *Fertility toxicity*

Most of the studies did not reveal coherent proof of toxicity for fertility. The hazard classification for fertility is assigned because of the presence of n-hexane in C>3 % Repr. 2: H361f (Suspected of damaging fertility).

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
RAT Doses: 5000, 10000, 20000 mg/m <sup>3</sup> OECD Guideline 416 Vapour inhalation	NOAEL > 20000 mg/m <sup>3</sup> (M/F)	Key study Reliable without restrictions CAS 64741-66-8	McKee et al., (2000)
RAT Doses: 5090, 12490, 24690 mg/m <sup>3</sup> OECD Guideline 421 Vapour inhalation	NOAEL 24700 mg/m <sup>3</sup> (M/F)	Support study Reliable without restrictions CAS 64741-66-8	Bui Q.Q., Burnett D.M., Breglia R.J., Koschier F.J., Lapadula E.S. (1998)

#### *Toxicity for development/teratogenesis*

Most of the studies did not reveal coherent proof of toxicity for the unborn child.

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
RAT Doses: 2653, 7960, 23900 mg/m <sup>3</sup> OECD Guideline 414 (Prenatal developmental toxicity study) Vapour inhalation	NOAEL 23900 mg/m <sup>3</sup> no adverse effects	Key study Reliable without restrictions Condensed gasoline vapours	L.Roberts, R White, Q. Bui. W.Daughtrey, F.Koschier, S.Rodney (2001)

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### h) Specific target organ toxicity (STOT) - single exposure

Gasoline is classified STOT SE3 3 H336 (May cause drowsiness or dizziness)

### i) Specific target organ toxicity (STOT) - repeated exposure

Oral: no information in the registration file

Inhalation: At very high doses (20,000-30,000 mg/m<sup>3</sup>), only some studies have shown some minor effects such as changes in body weight, organ weight, blood parameters.

Skin: the studies show a low systemic toxicity potential.

The standards on hazardous substances do not require any classification.

Below is a summary of the most representative studies found in the registration file.

Method	Result	Comments	Source
<b>Oral</b>			
RAT Subacute (forced feeding) Dose 1: 500 mg/kg/day Dose 2: 2000 mg/kg/day 28 days/once a day for 5 days a week	NOAEL < 500mg/kg (male): specific effects on kidneys seen in male rats not deemed biologically significant for humans.	Support study Reliable with restrictions CAS 64741-63-5	Halder CA et al. 1985
<b>Inhalation</b>			
RAT Systemic effects (M/F) Inhalation (vapours) Repeated doses for 107-109 weeks 6 hours a day, 5 days a week OECD 453	NOAEC: 1402 mg/m <sup>3</sup> Decrease in body weight gain	Key study Reliable without restrictions CAS 86290-81-5	MacFarland et al. 1984
RAT Systemic effects (M/F) Inhalation (vapours) Repeated doses for 28 days OECD 412	NOAEC: 9840 mg/m <sup>3</sup> specific effects on kidneys seen in male rats not deemed biologically significant for humans.	Support study Reliable without restrictions CAS 86290-81-5	IIT Research Institute (1993a)
RAT Local/systemic effects (M/F) Inhalation (vapours) Repeated doses for 90 days Test Guidelines OPPTS 870.3465 (1998) 90-Day Inhalation Toxicity	NOAEC (local effects): 10000 mg/m <sup>3</sup> reddish nasal secretions (Males/females)  NOAEC (systemic effects): 20000 mg/m <sup>3</sup> specific effects on kidneys seen in male rats not deemed biologically significant for humans.	Support study Reliable without restrictions	API 2005
<b>Skin</b>			
OECD Guideline 410 (21/28 days)	NOAEL (systemic effects): 3750 mg/kg	Support study Reliable with restrictions CAS 86290-81-5	BTL, Inc. (1985b)

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### j) Aspiration hazard

Since gasoline has a viscosity of less than 1 mm<sup>2</sup>/sec at 37.8 °C, the product might be breathed into the lungs according to the criteria in Annex I to Part 3 of Regulation 1272/2008.

Therefore, it is classified as Asp. Tox. 1 H304 (May be fatal if swallowed and enters airways).

### Additional information

No additional information available

## SECTION 12. ECOLOGICAL INFORMATION

On the basis of the ecological information reported below, the toxicity for invertebrates and algae, and the criteria indicated in the standards on hazardous substances, naphtha is classified as hazardous for the environment: Aquatic Chronic 2 H411.

### 12.1 Toxicity

Below is a summary of the most representative studies found in the registration file.

Endpoint	Result	Comments
<b>Aquatic toxicity</b>		
Invertebrates Daphnia magna Short term OECD Guideline 202	EL50 48/hours: 4.5 mg/l NOELR 48/hours: 0.5 mg/l	CONCAWE (1995h) CONCAWE (1996j) CONCAWE (1996K) Reliable without restrictions
Invertebrates Daphnia magna Long term OECD Guideline 211	NOELR 21/days: 2.6 mg/l EL50 21/days: 10 mg/l	Key study Reliable without restrictions Springborn Laboratories, Inc. (1999d) Light alkylate naphtha
Algae Short term Selenastrum capricornutum OECD Guideline 201	EL50 72/hours: 3.1 mg/l EC50 96/hours: 3.7 mg/l NOELR 72/hours: 0.5 mg/l	Key study Exxon Biomedical Sciences, Inc., East Millstone, NJ 1995 Reliable without restrictions
Fish Short term OECD Guideline 203	LC50 48/hours: 5.4 mg/l	Support study CAS 86290-81-5 Lockhart WL, Danell RW and Murray DAJ 1987 Reliable with restrictions
Fish Short term Pimephales promelas EPA method 66013-75-009	LL50 96/hours: 8.2 mg/l	Key study CAS 64741-66-8 Petroleum Product Stewardship Council (PPSC) 1995 Reliable without restrictions
Fish Long term Pimephales promelas OECD Guideline 204	NOELR 14/days: 2.6 mg/l LL50 14 days: 5.2 mg/l	Support study CAS 64741-55-5 Springborn Laboratories, Inc. 1999 Reliable with restrictions

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Microorganisms  
Tetrahymena pyriformis  
QSAR

EC50 40/hours: 15.41 mg/l

Key study  
Redman, A. et al. 2010  
Reliable with restrictions

## 12.2 Persistence and degradability

### Abiotic degradability

Hydrolysis: naphthas are resistant to hydrolysis because they lack a hydrolytically reactive functional group. Therefore, this process does not lead to any measurable loss of substance degradation in the environment.

Photolysis in air: endpoint not required by REACH

Photolysis in water and soil: endpoint not required by REACH

### Biotic degradability:

the standard tests for this endpoint are not applicable to UVCB substances.

The following biodegradation values were calculated for UVCB constituents using QSAR:

Water: range of 1.02-165496 days.

Sediment: range of 4.07-661986 days

Soil: range of 1.02-165496 days

## 12.3 Bioaccumulation potential

The standard tests for this endpoint are not applicable to UVCB substances

A BCF for aquatic species-fish of 0.4-6280 L/kg was calculated for UVCB constituents using QSAR.

## 12.4 Mobility in the soil

Koc absorption: the standard tests for this endpoint are not applicable to UVCB substances.

A Log Koc of 1.71-14.70 was calculated for UVCB constituents using QSAR.

## 12.5 Results of PBT and vPvB evaluation

Comparison with the criteria established in annex XIII of REACH regulation

*Persistence evaluation:* some hydrocarbon structures contained in this category show characteristics deemed P (Persistent) or vP (very Persistent).

*Bioaccumulation potential evaluation:* the structure of most hydrocarbons contained in this category do NOT present characteristics deemed vB (very Bioaccumulative) although some components do present characteristics deemed B (Bioaccumulative).

*Toxicity evaluation:* for the structures with characteristics of P and B, toxicity was evaluated although none of the main components met the toxicity criteria except anthracene which has been confirmed to be PBT. Since anthracene is present in concentrations < 0.1%, the product is not deemed PBT/vPvB.

## 12.6 Other adverse effects

None.

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## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

Do not discharge on the ground or in sewers, tunnels or waterways.

To dispose of waste derived from this product, including empty uncleaned containers, comply with It. Leg. Dec. 152/06 and subsequent amendments and integrations

European Waste Catalogue Code: 13 07 02 (It. Leg. Decree no. 152/06 and subsequent amendments and integrations). The code indicated provides only general indication, based on the original composition of the product and the envisaged uses thereof.

The user (producer of the wastes) is responsible for choosing the most appropriate code to apply according to the real use of the product, any alterations and contaminations. The product 'as is' does not contain halogenated compounds.

Disposal of containers: Do not dispose of the containers in the environment. Dispose of them in compliance with current local standards.

Do not drill, cut, grind, weld, solder, burn or incinerate empty containers or drums, unless they have been drained and cleaned.

## SECTION 14. TRANSPORT INFORMATION

### 14.1 UN number:

1203

### 14.2 UN shipping name

GASOLINE

### 14.3 Hazard classes related to transport:

*Land/rail transport (ADR/RID/ADN):*

Class:	3
Classification code:	F1
Hazard labels:	3+material that is hazardous for the environment
Hazard ID number:	33
Tunnel restriction code (ADR):	D/E

*Maritime transport (IMDG):*

Class 3

*Air transport (IATA):*

Class 3, Flamm liquid

### 14.4 Packaging group:

III, Label 3 + Environmental Hazard mark

### 14.5 Environmental hazard:

Substance dangerous for the environment as per ADR, RID, ADN and IMDG regulations

### 14.6 Special precautions for users:

Ensure that the material is transferred under extraction ventilation or containment conditions (E66).

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## 14.7 Bulk transport as per annex II of the MARPOL Convention 73/78 and IBC code

Not applicable.

## SECTION 15. REGULATORY INFORMATION

### 15.1 Specific health, safety, and environmental regulations and legislation for the substance or mixture

- Title VII Authorization as per REACH (Reg. EC no. 1907/2006 and subsequent amendments and integrations: not subject to authorization.
- Title VIII Restrictions as per REACH (Reg. EC no. 1907/2006 and subsequent amendments and integrations: the product is subject to restrictions (Item 3: hazardous substances/liquid mixtures; Item 40: flammable substances, Appendix 2 Point 28 - Carcinogens category 1B, Appendix 4 Point 29 - Mutagens: category 1B)

Other EU regulations and national transpositions:

- Seveso category (Dir. 2012/18/EU) It. legislative decree no. 105/2015):  
Annex I part 1:  
category P5a- Flammable liquids,  
category E2- Hazardous for the aquatic environment, chronic toxicity category 2  
Annex I part 2:  
category 34-Petroleum products and alternative fuels
- Title IX section I (transposition of Dir. 98/24/EC) of It. Leg. Decree 81/08 and subsequent amendments and integrations: dangerous chemical agent
- Title IX section II (transposition of Dir. 2004/37/EC) of It. Leg. Decree 81/08: carcinogenic and mutagenic agents.  
For waste disposal, see It. leg. Dec. 152/06 and subsequent amendments and integrations

### 15.2 Chemical safety assessment

A chemical safety assessment has been performed

## SECTION 16. OTHER INFORMATION

### List of pertinent hazard statements (H):

H225:	Highly flammable liquid and vapour
H304:	May be fatal if swallowed and enters airways
H315:	Causes skin irritation
H319:	Causes serious eye irritation
H336:	May cause drowsiness or dizziness
H340:	May cause genetic defects
H350:	May cause cancer
H361:	Suspected of damaging fertility or the unborn child
H361d:	Suspected of damaging the unborn child
H361f:	Suspected of damaging fertility
H372:	Causes damage to organs through prolonged or repeated exposure
H373:	May cause damage to organs through prolonged or repeated exposure.
H411:	Toxic to aquatic life with long lasting effects

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### Indications for training:

Provide workers who may be exposed to the substance with adequate training as outlined in this safety data sheet.

### Main bibliography and sources of data:

Registration file

CSR 2016

CSR 2017

CSR 2018

CSR 2019

CSR 2020

### Key to abbreviations and acronyms:

ACGIH = American Conference of Governmental Industrial Hygienists

CSR = Chemical Safety Report

DNEL = Derived No-Effect Level

DMEL = Derived Minimum Effect Level

EC50 = Effective concentration, 50%

IC50 = Inhibitory concentration, 50%

Klimisch = Criterion for assessing reliability of method used.

LC50 = Lethal Concentration, 50%

LD50 = Lethal Dose, 50%

PNEC = Predicted No Effect Concentration

n.a. = Not applicable

n.d. = Not available

PBT = Persistent, bioaccumulative, toxic substance

CNS = Central nervous system

STOT = Specific target organ toxicity

(STOT) RE = Repeated exposure

(STOT) SE = Single exposure

Key Study= Most pertinent study

TLV®TWA = Threshold Limit Value – Time Weighted Average

TLV®STEL = Threshold Limit Value – Short Term Exposure Limit

UVCB = substances of Unknown or Variable Composition

vPvB = Very Persistent and Very Bioaccumulative

note P = Classification as carcinogenic or mutagenic is not necessary if it can be demonstrated that the substance has a benzene content below 0.1% weight/weight.

If the substance is not classified as a carcinogen, at the very least, the following precautionary statements must appear: (P102-)P260-P262-P301 + P310-P331 (Table 3.1)

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Drafted on 29/11/2010

Revision date 01/10/2014

Reason for Rev. 00 of 01/10/2014: Update to comply with Annex I of EU Regulation 453/2010, of EC CLP Regulation 1272/2008 including the 4th ATP (Adaptations to Technical Progress) envisaged for substances since 1.12.14, of DSD Regulation (67/548/EEC) including the 31st ATP, of the 5th rev. of UN GHS 2013.

Revision date 04/05/2015

Reason for Rev. A of 04/05/2015: Update emergency telephone numbers. Update to 5th ATP

Revision date 21/12/2015

Reason for Rev.B of 21/12/2015: Update the following sections: 2, 8, 11, 14, 15, 16 and exposure scenarios

Revision date 14/07/2016

Reason for Rev. C of 14/07/2016: Update of sections 2, 8, 11, 12, 16 and exposure scenarios, including exposure scenario for "production of other substances" as per CSR 2016

Revision date 05/11/2018

Reason for Rev. D of 05/11/2018: Update of sections 1, 16 and exposure scenarios.

Revision date 02/01/2020

Reason for Rev. E of 02/01/2020: Update the following sections: 8 (changes to DNELs), 9 (calculated values for solubility and Log-Pow are included), 11 (new studies for Reproductive Toxicity and Specific Target Organ Toxicity (STOT) - repeated exposure are included), 12 (calculated values for biodegradation, bioaccumulation, and mobility in soil are included) and exposure scenarios (changes to the environmental risk assessment), as per CSR 2019.

Revision date 20/04/2020

Reason for Rev. F of 20/04/2020: Update of the safety data sheet format (all sections). Update of section 8 (replacement of pictograms in accordance with UNI EN 7010 Safety Signs 2019).

Revision date 02/11/2020

Reason for Rev. G of 02/11/2020: Update of sections 1 (uses), 8 (DNEL), 14 (transport information, removal of section 14.8), and 16 (literature references) and exposure scenarios as per CSR 2020.

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**ANNEX 1**

**EXPOSURE SCENARIOS**

**Naphtha gasoline**

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Name of identified use	Life cycle	Sector of Use (SU)	Product Categories (PC)	Process categories (PROC)	Environmental release categories (ERC)	Specific environmental release categories (SpERC)
01 - Manufacture of substance (classified; includes H340 and/or H350 and/or H361; (containing from 0% to 1% benzene))	Manufacture	n.a.	n.a.	1, 2, 3, 8a, 8b, 15, 28	1	ESVOC SpERC, 1.1.v1
02 - Formulation and (re)packing of substances and mixtures (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))	Formulation	n.a.	n.a.	1, 2, 3, 8a, 8b, 15, 28	2	ESVOC SpERC 2.2.v1
01b - Use as an intermediate (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))	Use at industrial sites	8, 9	n.a.	1, 2, 3, 8a, 8b, 15, 28	6a	ESVOC SpERC 6.1a.v1
12a - Use in fuels: industrial (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))	Use at industrial sites	n.a.	n.a.	1, 2, 8a, 8b, 16, 28	7	ESVOC SpERC 7.12a.v1
12b - Use in fuels: Professional (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))	Generalised use by professional operators:	n.a.	n.a.	1, 2, 8a, 8b, 16, 28	9a, 9b	ESVOC SpERC 9.12b.v1
12c - Use in fuels: consumers (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))	Consumer use	n.a.	13	n.a.	9a, 9b	ESVOC SpERC 9.12c.v1

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02 - Formulation and (re)packing of substances and mixtures (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene)) .....	34
01b - Use as an intermediate (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene)) .....	41
12a - Use in fuels: industrial (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene)) .....	48
12b - Use in fuels: Professional (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene)) .....	55
12c - Use in fuels: consumers (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene)) .....	63

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### 01 - Manufacture of substance (classified; includes H340 and/or H350 and/or H361; (containing from 0% to 1% benzene))

Section 1	
<b>Title</b>	
01 - Manufacturing of the substance; Closed systems; Level I	
<b>Use descriptors</b>	
Sector of use	
Process categories	1, 2, 3, 8a, 8b, 15, 28
Environmental release categories	1
Specific environmental release category	ESVOC SpERC 1.1.v1
<b>Processes, tasks, activities covered</b>	
Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. It includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance, and loading (including on marine vessels/barges, road/rail cars, and bulk containers).	
<b>Evaluation Method</b>	
See section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state of product	Liquid
Vapour pressure	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless otherwise indicated) Covers percentage benzene in the substance up to < 1%
Frequency and duration of use/exposure	Covers daily exposure up to 8 hours (unless otherwise indicated)
Other operating conditions affecting exposure	Requires implementation of a good basic occupational hygiene standard Covers use at ambient temperature. (unless otherwise indicated)
Contributing Scenarios	
Specific risk management measures and operational conditions	
General measures (skin irritants)	Ensure that direct contact with the skin is avoided. Identify potential areas of indirect contact with skin. Wear suitable gloves tested to EN374. Collect spills immediately. Wash contaminated skin immediately. Refer to section 8 of the SDS for more information.
General measures (carcinogens)	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure by using measures such as closed systems, dedicated facilities, and suitable general/local exhaust ventilation. Drain and rinse the system prior to equipment break-in or maintenance. Ensure that only authorised persons have access to the work area. Wear chemical-resistant gloves (tested to EN374) in conjunction with "basic" employee training. Wear suitable overalls to avoid skin exposure. Wear respiratory protection when its use is recommended for certain exposure scenarios. Refer to section 8 of the SDS for more information. Collect spills immediately. Dispose of this material and its container at a hazardous or special waste collection point. Ensure that safe systems of work or equivalent arrangements are in place to manage risks. Ensure that control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.
General measures (flammability)	For measures to control risks arising from physical and chemical properties, refer to the main body of the SDS, section 7 and/or 8.

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General measures (aspiration hazard)	Do not ingest. If swallowed then seek immediate medical assistance.
General exposures; Closed systems (PROC_2, PROC_1)	Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure. Assumes a process temperature of up to 800.0 °C.
General exposures; Batch processes; Closed systems (PROC_3)	Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure. Assumes a process temperature of up to 800.0 °C.
Laboratory activities (PROC_15)	Handle inside a fume hood or implement suitable equivalent methods to minimise exposure. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Put lids on containers immediately after use</i> Covers use at ambient temperature (unless otherwise indicated)
Bulk transfers; Closed systems; Loading and unloading (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation. Covers use at ambient temperature (unless otherwise indicated)
Cleaning and maintenance of equipment (PROC_8a, PROC_28)	Drain and rinse the system prior to break-in or maintenance. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Wear suitable overalls to avoid skin exposure.</i> <i>Collect spills immediately.</i> Covers use at ambient temperature (unless otherwise indicated)
Storage (PROC_2, PROC_1)	Store substance within a closed system. Covers use at ambient temperature (unless otherwise indicated)
<b>Section 2.2 Environmental exposure control</b>	
<b>Product Characteristics</b>	
Substance is complex UVCB. [PrC3] Predominantly hydrophobic. [PrC4a]	
<b>Amounts used</b>	
Fraction of EU tonnage used in region:	0.4
Regional use tonnage (tonnes/year)	1.1E+06
Fraction of Regional tonnage used locally	1.0E+00
Annual site tonnage (tonnes/year)	1.1E+06
Maximum daily site tonnage (kg/day)	3.7E+06
<b>Frequency and duration of use</b>	
Continuous release. [FD2]	
Emission days (days/year)	300
<b>Environmental factors not influenced by risk management</b>	
Local freshwater dilution factor	10
Local marine water dilution factor	100
<b>Other given operating conditions affecting environmental exposure</b>	
Fraction released to air by process (initial release prior to RMM):	3.5E-03
Fraction released to wastewater by process (initial release prior to RMM)	1.5E-04
Fraction released to soil by process (initial release prior to RMM):	0.0001
<b>Technical measures and conditions at the process level (source) to prevent release</b>	
Common practices vary between sites, so conservative process release estimates are used. [TCS1]	
<b>On-site technical conditions and measures to reduce or minimise discharges, air emissions, and releases into the soil</b>	
Risk from environmental exposure is driven by freshwater sediment. [TCR1b]	

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Prevent discharge of undissolved substances to, or recover them from, on-site wastewater. [TCR14]			
If discharging to domestic sewage treatment plant, no on-site wastewater treatment is required [TCR9]			
Treat air emissions to provide a typical removal efficiency of (%)	9.0E+01		
Treat wastewater on site (prior to receiving water discharge) to provide the required removal efficiency of $\geq$ (%)	93.9		
If discharging to domestic sewage treatment plant, provide the required on-site wastewater removal efficiency of $\geq$ (%)	0.0		
<b>Organisation measures to prevent/limit release from site</b>			
Do not apply industrial sludge to natural soils. [OMS2] Sludge should be incinerated, contained, or reclaimed. [OMS3]			
<b>Conditions and measures related to municipal sewage treatment plant</b>			
Not applicable as there is no release to wastewater. [STP1]			
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.2		
Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs (%)	95.2		
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day)	4.4E+06		
Assumed flow rate of the domestic sewage treatment plant (m <sup>3</sup> /day)	1.0E+04		
<b>Conditions and measures related to external treatment of waste for disposal</b>			
During manufacturing no waste of the substance is generated. [ETW4]			
<b>Conditions and measures related to external recovery of waste</b>			
During manufacturing no waste of the substance is generated. [ERW2]			
<b>Section 3 Exposure estimate</b>			
<b>3.1. Health</b>			
The ECETOC TRA tool has been used to estimate workplace exposure unless otherwise indicated.			
<b>3.2. Environment</b>			
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model. [EE2]			
<b>Section 4 Guidance to check compliance with the exposure scenario</b>			
<b>4.1. Health</b>			
<p>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. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not enable the derivation of a DNEL for aspiration effects. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk management measures are based on qualitative risk characterisation.</p>			
RCR Workers CS 1: General exposures; Closed systems (PROC 2, PROC 1)			
Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124

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Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

RCR Workers CS 2: General exposures; Batch processes; Closed systems (PROC 3)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.627 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.848	Exposure/DNEL = 0.848
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	6.9E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2.01E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2.01E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

RCR Workers CS 3: Laboratory activities (PROC 15)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification

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Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (Measured data: Concawe (without LEV)) Exposure/DNEL = 0.424 <b>Support exposure (not used for CR):</b>	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	3.4E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 4: Bulk transfers; Closed systems; Loading and unloading (PROC 8b)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.5 mg/m <sup>3</sup> (Measured data: Concawe Report no. 13/18) Exposure/DNEL = 0.26 <b>Support exposure (not used for CR):</b> 0.244 mg/m <sup>3</sup> (TRA Workers) 0.06 mg/m <sup>3</sup> (Measured data: Concawe Report no. 13/18)	Exposure/DNEL = 0.26
Inhalation, systemic, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.097	Exposure/DNEL = 0.097
	Benzene	0.976 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	31.25 mg/m <sup>3</sup> (TRA Workers) RCR = 0.037	Final RCR = 0.037
Inhalation, local, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.117	Final RCR = 0.117
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	

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	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure,			Final RCR = 0.097

### RCR Workers CS 5: Cleaning and maintenance of equipment (PROC 8, PROC 28)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.3 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) Exposure/DNEL = 0.156 <b>Support exposure (not used for CR):</b> 0.814 mg/m <sup>3</sup> (TRA Workers)	Exposure/DNEL = 0.156
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure,			Final RCR = 0.324

### RCR Workers CS 6: Storage (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124

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Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### 4.2. Environment

Guidance is based on assumed operating conditions that may not be applicable to all sites; therefore, scalability may be required to define appropriate site-specific risk management measures. [DSU1]  
 Required removal efficiency for wastewater can be achieved using on-site/off-site technologies, either alone or in combination. [DSU2] Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. [DSU3] Further details on scaling and control technologies can be found in the SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>). [DSU4]

Maximum risk characterisation ratio for air emissions RCR <sub>air</sub>	7.6E-01
Maximum risk characterisation ratio for wastewater emissions RCR <sub>water</sub>	7.9E-01

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### 02 - Formulation and (re)packing of substances and mixtures (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))

Section 1	
<b>Title</b>	
02 - Formulation and (re)packing of substances and mixtures; Closed systems; Level I	
<b>Use descriptors</b>	
Sector of use	
Process categories	1, 2, 3, 8a, 8b, 15, 28
Environmental release categories	2
Specific environmental release category	ESVOC SpERC 2.2.v1
<b>Processes, tasks, activities covered</b>	
Formulation of the substance and its mixtures in batch or continuous operations within closed or contained systems, including incidental exposures during storage, materials transfers, mixing, maintenance, sampling, and associated laboratory activities.	
<b>Evaluation Method</b>	
See section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state of product	Liquid
Vapour pressure	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless otherwise indicated) Covers percentage benzene in the substance up to < 1%
Frequency and duration of use/exposure	Covers daily exposure up to 8 hours (unless otherwise indicated)
Other operating conditions affecting exposure	Requires implementation of a good basic occupational hygiene standard Covers use at ambient temperature. (unless otherwise indicated)
Contributing Scenarios	
Specific risk management measures and operational conditions	
General measures (skin irritants)	Ensure that direct contact with the skin is avoided. Identify potential areas of indirect contact with skin. Wear suitable gloves tested to EN374. Collect spills immediately. Wash contaminated skin immediately. Refer to section 8 of the SDS for more information.
General measures (carcinogens)	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure by using measures such as closed systems, dedicated facilities, and suitable general/local exhaust ventilation. Drain and rinse the system prior to break-in or maintenance. Ensure that only authorised persons have access to the work area. Wear chemical-resistant gloves (tested to EN374) in conjunction with "basic" employee training. Wear suitable overalls to avoid skin exposure. Wear respiratory protection when its use is recommended for certain exposure scenarios. Refer to section 8 of the SDS for more information. Collect spills immediately. Dispose of this material and its container at a hazardous or special waste collection point. Ensure that safe systems of work or equivalent arrangements are

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	in place to manage risks. Ensure that control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.
General measures (flammability)	For measures to control risks arising from physical and chemical properties, refer to the main body of the SDS, section 7 and/or 8.
General measures (aspiration hazard)	Do not ingest. If swallowed then seek immediate medical assistance.
General exposures; Closed systems (PROC_2, PROC_1)	Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.
General exposures; Batch processes; Closed systems (PROC_3)	Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.
Laboratory activities (PROC_15)	Handle inside a fume hood or implement suitable equivalent methods to minimise exposure. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Put lids on containers immediately after use.</i>
Bulk transfers; Drum/batch transfers; Closed systems (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation.
Cleaning and maintenance of equipment (PROC_8a, PROC_28)	Drain and rinse the system prior to break-in or maintenance. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Wear suitable overalls to avoid skin exposure.</i> <i>Collect spills immediately.</i>
Storage (PROC_2, PROC_1)	Store substance within a closed system.
<b>Section 2.2 Environmental exposure control</b>	
<b>Product Characteristics</b>	
Substance is complex UVCB. [PrC3] Predominantly hydrophobic. [PrC4a]	
<b>Amounts used</b>	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year)	4.0E+04
Fraction of Regional tonnage used locally	7.5E-01
Annual site tonnage (tonnes/year)	3.0E+04
Maximum daily site tonnage (kg/day)	1.0E+05
<b>Frequency and duration of use</b>	
Continuous release. [FD2]	
Emission days (days/year)	300
<b>Environmental factors not influenced by risk management</b>	
Local freshwater dilution factor	10
Local marine water dilution factor	100
<b>Other given operating conditions affecting environmental exposure</b>	
Fraction released to air by process (after typical on-site RMMs, in line with the requirements of the EU Solvents Emissions Directive)	1.4E-02

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Fraction released to wastewater by process (initial release prior to RMM)	1.3E-03
Fraction released to soil by process (initial release prior to RMM):	0.0001
<b>Technical measures and conditions at the process level (source) to prevent release</b>	
Common practices vary between sites, so conservative process release estimates are used. [TCS1]	
<b>On-site technical conditions and measures to reduce or minimise discharges, air emissions, and releases into the soil</b>	
Risk from environmental exposure is driven by freshwater sediment. [TCR1b]	
Prevent discharge of undissolved substances to, or recover them from, on-site wastewater. [TCR14]	
If discharging to domestic sewage treatment plant, no on-site wastewater treatment is required [TCR9]	
Treat air emissions to provide a typical removal efficiency of (%)	0.0E+00
Treat wastewater on site (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%)	94.7
If discharging to domestic sewage treatment plant, provide the required on-site wastewater removal efficiency of ≥ (%)	0.0
<b>Organisation measures to prevent/limit release from site</b>	
Do not apply industrial sludge to natural soils. [OMS2] Sludge should be incinerated, contained, or reclaimed. [OMS3]	
<b>Conditions and measures related to municipal sewage treatment plant</b>	
Not applicable as there is no release to wastewater. [STP1]	
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.2
Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs (%)	95.2
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day)	1.1E+05
Assumed flow rate of the domestic sewage treatment plant (m3/day)	2.0E+03
<b>Conditions and measures related to external treatment of waste for disposal</b>	
External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW3]	
<b>Conditions and measures related to external recovery of waste</b>	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [ERW1]	
<b>Section 3 Exposure estimate</b>	
<b>3.1. Health</b>	
The ECETOC TRA tool has been used to estimate workplace exposure unless otherwise indicated.	
<b>3.2. Environment</b>	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model. [EE2]	
<b>Section 4 Guidance to check compliance with the exposure scenario</b>	
<b>4.1. Health</b>	

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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. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not enable the derivation of a DNEL for aspiration effects. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk management measures are based on qualitative risk characterisation.

### RCR Workers CS 1: General exposures; Closed systems (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 2: General exposures; Batch processes; Closed systems (PROC 3)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.627 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.848	Exposure/DNEL = 0.848
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	6.9E-4 mg/kg bw/day (TRA Workers)	

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Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2.01E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2.01E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 3: Laboratory activities (PROC 15)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (Measured data: Concawe (without LEV)) Exposure/DNEL = 0.424 <b>Support exposure (not used for CR):</b> 1.627 mg/m <sup>3</sup> (TRA Workers) 0.215 mg/m <sup>3</sup> (Measured data: Concawe (with LEV))	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	3.4E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 4: Bulk transfers; Drum/batch transfers; Closed systems (PROC 8b)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification

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Inhalation, systemic, long term	Benzene	0.5 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) Exposure/DNEL = 0.26 <b>Support exposure (not used for CR):</b> 0.244 mg/m <sup>3</sup> (TRA Workers) 0.06 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18)	Exposure/DNEL = 0.26
Inhalation, systemic, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.097	Exposure/DNEL = 0.097
	Benzene	0.976 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	31.25 mg/m <sup>3</sup> (TRA Workers) RCR = 0.037	Final RCR = 0.037
Inhalation, local, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.117	Final RCR = 0.117
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.097

### RCR Workers CS 5: Cleaning and maintenance of equipment (PROC 8a, PROC 28)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	

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Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 6: Storage (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### 4.2. Environment

Guidance is based on assumed operating conditions that may not be applicable to all sites; therefore, scalability may be required to define appropriate site-specific risk management measures. [DSU1] Required removal efficiency for wastewater can be achieved using on-site/off-site technologies, either alone or in combination. [DSU2] Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. [DSU3] Further details on scaling and control technologies can be found in the SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>). . [DSU4]

Maximum risk characterisation ratio for air emissions RCRair	8.2E-01
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Maximum risk characterisation ratio for wastewater emissions RCRwater	9.0E-01
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### 01b - Use as an intermediate (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))

Section 1	
<b>Title</b>	
01b - Use as an intermediate; Closed systems; Level I	
<b>Use descriptors</b>	
Sector of use	8, 9
Process categories	1, 2, 3, 8a, 8b, 15, 28
Environmental release categories	6a
Specific environmental release category	ESVOC SpERC 6.1a.v1
<b>Processes, tasks, activities covered</b>	
Use of substance as an intermediate within closed or contained systems (not related to strictly controlled conditions). It includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance, and loading (including on marine vessels/barges, road/rail cars, and bulk containers).	
<b>Evaluation Method</b>	
See section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state of product	Liquid
Vapour pressure	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless otherwise indicated)
Frequency and duration of use/exposure	Covers daily exposure up to 8 hours (unless otherwise indicated)
Other operating conditions affecting exposure	Requires implementation of a good basic occupational hygiene standard Covers use at ambient temperature. (unless otherwise indicated)
Contributing Scenarios	Specific risk management measures and operational conditions
General measures (skin irritants)	Ensure that direct contact with the skin is avoided. Identify potential areas of indirect contact with skin. Wear suitable gloves tested to EN374. Collect spills immediately. Wash contaminated skin immediately. Refer to section 8 of the SDS for more information.
General measures (carcinogens)	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure by using measures such as closed systems, dedicated facilities, and suitable general/local exhaust ventilation. Drain and rinse the system prior to break-in or maintenance. Ensure that only authorised persons have access to the work area. Wear chemical-resistant gloves (tested to EN374) in conjunction with "basic" employee training. Wear suitable overalls to avoid skin exposure. Wear respiratory protection when its use is recommended for certain exposure scenarios. Refer to section 8 of the SDS for more information. Collect spills immediately. Dispose of this material and its container at a hazardous or special waste collection point. Ensure that safe systems of work or equivalent arrangements are in place to manage risks. Ensure that control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

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General measures (flammability)	For measures to control risks arising from physical and chemical properties, refer to the main body of the SDS, section 7 and/or 8.
General measures (aspiration hazard)	Do not ingest. If swallowed then seek immediate medical assistance.
General exposures; Closed systems (PROC_2, PROC_1)	aaaz < 1% Handle the substance within a closed system. Sample via a closed loop or other system to avoid exposure.
General exposures; Batch processes; Closed systems (PROC_3)	Covers percentage benzene in the final product up to < 1% Handle the substance within a closed system. Sample via a closed loop or other system to avoid exposure.
Laboratory activities (PROC_15)	Covers percentage benzene in the final product up to < 0.1%, < 1%, < 5%, < 20%, < 79% Handle inside a fume hood or implement suitable equivalent methods to minimise exposure. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Put lids on containers immediately after use.</i>
Bulk transfers; Closed systems; Loading and unloading (PROC_8b)	Covers percentage benzene in the final product up to < 1% Ensure that material transfers are carried out under containment or extract ventilation.
Cleaning and maintenance of equipment (PROC_8a, PROC_28)	Covers percentage benzene in the final product up to < 1% Drain and rinse the system prior to break-in or maintenance. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Wear suitable overalls to avoid skin exposure.</i> <i>Collect spills immediately.</i>
Storage (PROC_2, PROC_1)	Covers percentage benzene in the final product up to < 1% Store the substance within a closed system.
<b>Section 2.2 Environmental exposure control</b>	
<b>Product Characteristics</b>	
Substance is complex UVCB. [PrC3] Predominantly hydrophobic. [PrC4a]	
<b>Amounts used</b>	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year)	3.1E+05
Fraction of Regional tonnage used locally	4.8E-02
Annual site tonnage (tonnes/year)	1.5E+04
Maximum daily site tonnage (kg/day)	5.0E+04
<b>Frequency and duration of use</b>	
Continuous release. [FD2]	
Emission days (days/year)	300
<b>Environmental factors not influenced by risk management</b>	
Local freshwater dilution factor	10
Local marine water dilution factor	100
<b>Other given operating conditions affecting environmental exposure</b>	
Fraction released to air by process (initial release prior to RMM)	2.5E-02
Fraction released to wastewater by process (initial release prior to RMM)	2.5E-03
Fraction released to soil by process (initial release prior to RMM):	0.001
<b>Technical measures and conditions at the process level (source) to prevent release</b>	
Common practices vary between sites, so conservative process release estimates are used. [TCS1]	

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<b>On-site technical conditions and measures to reduce or minimise discharges, air emissions, and releases into the soil</b>			
Risk from environmental exposure is driven by freshwater sediment. [TCR1b]			
Prevent discharge of undissolved substances to, or recover them from, on-site wastewater. [TCR14]			
If discharging to domestic sewage treatment plant, no on-site wastewater treatment is required [TCR9]			
Treat air emissions to provide a typical removal efficiency of (%)			8.0E+01
Treat wastewater on site (prior to receiving water discharge) to provide the required removal efficiency of $\geq$ (%)			94.7
If discharging to domestic sewage treatment plant, provide the required on-site wastewater removal efficiency of $\geq$ (%)			0.0
<b>Organisation measures to prevent/limit release from site</b>			
Do not apply industrial sludge to natural soils. [OMS2] Sludge should be incinerated, contained, or reclaimed. [OMS3]			
<b>Conditions and measures related to municipal sewage treatment plant</b>			
Not applicable as there is no release to wastewater. [STP1]			
Estimated substance removal from wastewater via domestic sewage treatment (%)			95.2
Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs (%)			95.2
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day)			5.6E+04
Assumed flow rate of the domestic sewage treatment plant (m <sup>3</sup> /day)			2.0E+03
<b>Conditions and measures related to external treatment of waste for disposal</b>			
This substance is consumed during use and no waste of the substance is generated. [ETW5]			
<b>Conditions and measures related to external recovery of waste</b>			
This substance is consumed during use and no waste of the substance is generated. [ERW3]			
<b>Section 3 Exposure estimate</b>			
<b>3.1. Health</b>			
The ECETOC TRA tool has been used to estimate workplace exposure unless otherwise indicated.			
<b>3.2. Environment</b>			
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model. [EE2]			
<b>Section 4 Guidance to check compliance with the exposure scenario</b>			
<b>4.1. Health</b>			
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. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not enable the derivation of a DNEL for aspiration effects. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk management measures are based on qualitative risk characterisation.			
RCR Workers CS 1: General exposures; Closed systems (PROC 2, PROC 1)			
Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124

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Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 2: General exposures; Batch processes; Closed systems (PROC 3)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.627 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.848	Exposure/DNEL = 0.848
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	6.9E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2.01E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2.01E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 3: Laboratory activities (PROC 15)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
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Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (Measured data: Concawe (without LEV)) Exposure/DNEL = 0.424 <b>Support exposure (not used for CR):</b> 1.627 mg/m <sup>3</sup> (TRA Workers) 0.215 mg/m <sup>3</sup> (Measured data: Concawe (with LEV))	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	3.4E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 4: Bulk transfers; Closed systems; Loading and unloading (PROC 8b)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.244 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.127	Exposure/DNEL = 0.127
Inhalation, systemic, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.097	Exposure/DNEL = 0.097
	Benzene	0.976 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	31.25 mg/m <sup>3</sup> (TRA Workers) RCR = 0.037	Final RCR = 0.037
Inhalation, local, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.117	Final RCR = 0.117
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	

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Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.097

### RCR Workers CS 5: Cleaning and maintenance of equipment (PROC 8a, PROC 28)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 6: Storage (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391

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Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### 4.2. Environment

Guidance is based on assumed operating conditions that may not be applicable to all sites; therefore, scalability may be required to define appropriate site-specific risk management measures. [DSU1] Required removal efficiency for wastewater can be achieved using on-site/off-site technologies, either alone or in combination. [DSU2] Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. [DSU3] Further details on scaling and control technologies can be found in the SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>). . [DSU4]

Maximum risk characterisation ratio for air emissions RCR <sub>air</sub>	1.7E-01
Maximum risk characterisation ratio for wastewater emissions RCR <sub>water</sub>	9.0E-01

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### 12a - Use in fuels: industrial (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))

Section 1	
<b>Title</b>	
12a - Use in fuels: industrial; Closed systems; Level I	
<b>Use descriptors</b>	
Sector of use	
Process categories	1, 2, 8a, 8b, 16, 28
Environmental release categories	7
Specific environmental release category	ESVOC SpERC 7.12a.v1
<b>Processes, tasks, activities covered</b>	
Covers the use as a fuel (or fuel additive or additive component) within closed or contained systems, including incidental exposures during activities associated with its transfer, use, equipment maintenance, and waste management.	
<b>Evaluation Method</b>	
See section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state of product	Liquid
Vapour pressure	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless otherwise indicated) Covers percentage benzene in the final product up to < 1%
Frequency and duration of use/exposure	Covers daily exposure up to 8 hours (unless otherwise indicated)
Other operating conditions affecting exposure	Requires implementation of a good basic occupational hygiene standard Covers use at ambient temperature. (unless otherwise indicated)
Contributing Scenarios	Specific risk management measures and operational conditions
General measures (skin irritants)	Ensure that direct contact with the skin is avoided. Identify potential areas of indirect contact with skin. Wear suitable gloves tested to EN374. Collect spills immediately. Wash contaminated skin immediately. Refer to section 8 of the SDS for more information.
General measures (carcinogens)	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure by using measures such as closed systems, dedicated facilities, and suitable general/local exhaust ventilation. Drain and rinse the system prior to break-in or maintenance. Ensure that only authorised persons have access to the work area. Wear chemical-resistant gloves (tested to EN374) in conjunction with "basic" employee training. Wear suitable overalls to avoid skin exposure. Wear respiratory protection when its use is recommended for certain exposure scenarios. Refer to section 8 of the SDS for more information. Collect spills immediately. Dispose of this material and its container at a hazardous or special waste collection point. Ensure that safe systems of work or equivalent arrangements are in place to manage risks. Ensure that control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.

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General measures (flammability)	For measures to control risks arising from physical and chemical properties, refer to the main body of the SDS, section 7 and/or 8.
General measures (aspiration hazard)	Do not ingest. If swallowed then seek immediate medical assistance.
Bulk transfers; Dedicated facility (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation.
Drum/batch transfers; Dedicated facility (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation.
General exposures; Closed systems (PROC_2, PROC_1)	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.
Use of fuels; Closed systems (PROC_16)	Handle substance within a closed system.
Cleaning and maintenance of equipment (PROC_8a, PROC_28)	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Drain and rinse the system prior to break-in or maintenance. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Wear suitable overalls to avoid skin exposure.</i> <i>Collect spills immediately.</i>
Storage (PROC_2, PROC_1)	Store substance within a closed system.
<b>Section 2.2 Environmental exposure control</b>	
<b>Product Characteristics</b>	
Substance is complex UVCB. [PrC3] Predominantly hydrophobic. [PrC4a]	
<b>Amounts used</b>	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year)	4.7E+03
Fraction of Regional tonnage used locally	1.0E+00
Annual site tonnage (tonnes/year)	4.7E+03
Maximum daily site tonnage (kg/day)	4.7E+04
<b>Frequency and duration of use</b>	
Continuous release. [FD2]	
Emission days (days/year)	100
<b>Environmental factors not influenced by risk management</b>	
Local freshwater dilution factor	10
Local marine water dilution factor	100
<b>Other given operating conditions affecting environmental exposure</b>	
Fraction released to air by process (initial release prior to RMM)	5.0E-02
Fraction released to wastewater by process (initial release prior to RMM)	1.0E-05
Fraction released to soil by process (initial release prior to RMM):	0
<b>Technical measures and conditions at the process level (source) to prevent release</b>	
Common practices vary between sites, so conservative process release estimates are used. [TCS1]	
<b>On-site technical conditions and measures to reduce or minimise discharges, air emissions, and releases into the soil</b>	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). [TCR1k]	
No wastewater treatment required [TCR6]	
Treat air emissions to provide a typical removal efficiency of (%)	9.5E+01
Treat wastewater on site (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%)	0.0

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If discharging to domestic sewage treatment plant, provide the required on-site wastewater removal efficiency of $\geq$ (%)	0.0		
<b>Organisation measures to prevent/limit release from site</b>			
Do not apply industrial sludge to natural soils. [OMS2] Sludge should be incinerated, contained, or reclaimed. [OMS3]			
<b>Conditions and measures related to municipal sewage treatment plant</b>			
Not applicable as there is no release to wastewater. [STP1]			
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.2		
Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs (%)	95.2		
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day)	2.1E+06		
Assumed flow rate of the domestic sewage treatment plant (m3/day)	2.0E+03		
<b>Conditions and measures related to external treatment of waste for disposal</b>			
Combustion emissions limited by mandatory exhaust emission testing. [ETW1] Combustion emissions considered in regional exposure assessment. [ETW2] External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW3]			
<b>Conditions and measures related to external recovery of waste</b>			
This substance is consumed during use and no waste of the substance is generated. [ERW3]			
<b>Section 3 Exposure estimate</b>			
<b>3.1. Health</b>			
The ECETOC TRA tool has been used to estimate workplace exposure unless otherwise indicated.			
<b>3.2. Environment</b>			
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model. [EE2]			
<b>Section 4 Guidance to check compliance with the exposure scenario</b>			
<b>4.1. Health</b>			
<p>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. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not enable the derivation of a DNEL for aspiration effects. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk management measures are based on qualitative risk characterisation.</p> <p>RCR Workers CS 1: Bulk transfers; Dedicated facility (PROC 8b)</p>			
Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.4 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) Exposure/DNEL = 0.208 <b>Support exposure (not used for CR):</b> 0.244 mg/m <sup>3</sup> (TRA Workers) 1.6 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18)	Exposure/DNEL = 0.208
Inhalation, systemic, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.097	Exposure/DNEL = 0.097
	Benzene	0.976 mg/m <sup>3</sup> (TRA Workers)	

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Inhalation, local, long term	Substance registered as such	31.25 mg/m <sup>3</sup> (TRA Workers) RCR = 0.037	Final RCR = 0.037
Inhalation, local, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.117	Final RCR = 0.117
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.097

### RCR Workers CS 2: Drum/batch transfers; Dedicated facility (PROC 8b)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.244 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.127	Exposure/DNEL = 0.127
Inhalation, systemic, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.097	Exposure/DNEL = 0.097
	Benzene	0.976 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	31.25 mg/m <sup>3</sup> (TRA Workers) RCR = 0.037	Final RCR = 0.037
Inhalation, local, acute	Substance registered as such	125 mg/m <sup>3</sup> (TRA Workers) RCR = 0.117	Final RCR = 0.117
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.097

### RCR Workers CS 3: General exposures; Closed systems (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification

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Inhalation, systemic, long term	Benzene	0.57 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.297	Exposure/DNEL = 0.297
Inhalation, systemic, acute	Substance registered as such	291.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.227	Exposure/DNEL = 0.227
	Benzene	2.278 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	72.92 mg/m <sup>3</sup> (TRA Workers) RCR = 0.087	Final RCR = 0.087
Inhalation, local, acute	Substance registered as such	291.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.273	Final RCR = 0.273
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.227

### RCR Workers CS 4: Use of fuels; Closed systems (PROC 16)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	3.4E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	

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Combined routes of exposure, systemic, acute			Final RCR = 0.324
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### RCR Workers CS 5: Cleaning and maintenance of equipment (PROC 8a, PROC 28)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.3 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) Exposure/DNEL = 0.156 <b>Support exposure (not used for CR):</b> 0.57 mg/m <sup>3</sup> (TRA Workers)	Exposure/DNEL = 0.156
Inhalation, systemic, acute	Substance registered as such	291.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.227	Exposure/DNEL = 0.227
	Benzene	2.278 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	72.92 mg/m <sup>3</sup> (TRA Workers) RCR = 0.087	Final RCR = 0.087
Inhalation, local, acute	Substance registered as such	291.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.273	Final RCR = 0.273
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.227

### RCR Workers CS 6: Storage (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391

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Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### 4.2. Environment

Guidance is based on assumed operating conditions that may not be applicable to all sites; therefore, scalability may be required to define appropriate site-specific risk management measures. [DSU1] Required removal efficiency for wastewater can be achieved using on-site/off-site technologies, either alone or in combination. [DSU2] Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. [DSU3] Further details on scaling and control technologies can be found in the SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>). . [DSU4]

Maximum risk characterisation ratio for air emissions RCRair	2.2E-02
Maximum risk characterisation ratio for wastewater emissions RCRwater	3.3E-03

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### 12b - Use in fuels: Professional (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))

Section 1	
<b>Title</b>	
12b - Use in fuels: Professional; Closed systems	
<b>Use descriptors</b>	
Sector of use	
Process categories	1, 2, 8a, 8b, 16, 28
Environmental release categories	9a, 9b
Specific environmental release category	ESVOC SpERC 9.12b.v1
<b>Processes, tasks, activities covered</b>	
Covers the use as a fuel (or fuel additive or additive component) within closed or contained systems, including incidental exposures during activities associated with its transfer, use, equipment maintenance, and waste management.	
<b>Evaluation Method</b>	
See section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state of product	Liquid
Vapour pressure	Liquid, vapour pressure > 10 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 %. (unless otherwise indicated) Covers percentage benzene in the final product up to < 1%
Frequency and duration of use/exposure	Covers daily exposure up to 8 hours (unless otherwise indicated)
Other operating conditions affecting exposure	Requires implementation of a good basic occupational hygiene standard Covers use at ambient temperature. (unless otherwise indicated)
Contributing Scenarios	Specific risk management measures and operational conditions
General measures (skin irritants)	Ensure that direct contact with the skin is avoided. Identify potential areas of indirect contact with skin. Wear suitable gloves tested to EN374. Collect spills immediately. Wash contaminated skin immediately. Refer to section 8 of the SDS for more information.
General measures (carcinogens)	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure by using measures such as closed systems, dedicated facilities, and suitable general/local exhaust ventilation. Drain and rinse the system prior to break-in or maintenance. Ensure that only authorised persons have access to the work area. Wear chemical-resistant gloves (tested to EN374) in conjunction with "basic" employee training. Wear suitable overalls to avoid skin exposure. Wear respiratory protection when its use is recommended for certain exposure scenarios. Refer to section 8 of the SDS for more information. Collect spills immediately. Dispose of this material and its container at a hazardous or special waste collection point. Ensure that safe systems of work or equivalent arrangements are in place to manage risks. Ensure that control measures are regularly inspected and maintained. Consider the need for risk-based health surveillance.
General measures (flammability)	For measures to control risks arising from physical and chemical properties, refer to the main body of the SDS, section 7 and/or 8.

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General measures (aspiration hazard)	Do not ingest. If swallowed then seek immediate medical assistance.
Bulk transfers; Dedicated facility (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation.
Drum/batch transfers; Dedicated facility (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation.
Refuelling (PROC_8b)	Ensure that material transfers are carried out under containment or extract ventilation.
General exposures; Closed systems (PROC_2, PROC_1)	Handle substance within a closed system. Sample via a closed loop or other system to avoid exposure.
Use of fuels; Closed systems (PROC_16)	Handle substance within a closed system.
Cleaning and maintenance of equipment (PROC_8a, PROC_28)	Covers use up to 4.0 h/day Drain and rinse the system prior to break-in or maintenance. Wear a respirator that complies with EN140. <b>Further advice on good practice. The obligations under Article 37(4) of REACH shall not apply.</b> <i>Wear suitable overalls to avoid skin exposure.</i> <i>Collect spills immediately.</i>
Storage (PROC_2, PROC_1)	Store substance within a closed system.
<b>Section 2.2 Environmental exposure control</b>	
<b>Product Characteristics</b>	
Substance is complex UVCB. [PrC3] Predominantly hydrophobic. [PrC4a]	
<b>Amounts used</b>	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year)	1.2E+04
Fraction of Regional tonnage used locally	5.0E-04
Annual site tonnage (tonnes/year)	6.2E+00
Maximum daily site tonnage (kg/day)	1.7E+01
<b>Frequency and duration of use</b>	
Continuous release. [FD2]	
Emission days (days/year)	365
<b>Environmental factors not influenced by risk management</b>	
Local freshwater dilution factor	10
Local marine water dilution factor	100
<b>Other given operating conditions affecting environmental exposure</b>	
Fraction released to air by wide dispersive use (regional use only)	1.0E-02
Fraction released to wastewater by wide dispersive use	1.0E-05
Fraction released to soil by wide dispersive use (regional use only)	0.00001
<b>Technical measures and conditions at the process level (source) to prevent release</b>	
Common practices vary between sites, so conservative process release estimates are used. [TCS1]	
<b>On-site technical conditions and measures to reduce or minimise discharges, air emissions, and releases into the soil</b>	
Risk from environmental exposure is driven by freshwater. [TCR1a]	
No wastewater treatment required [TCR6]	
Treat air emissions to provide a typical removal efficiency of (%)	N/A
Treat wastewater on site (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%)	0.0
If discharging to domestic sewage treatment plant, provide the required on-site wastewater removal efficiency of ≥ (%)	0.0

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<b>Organisation measures to prevent/limit release from site</b>			
Do not apply industrial sludge to natural soils. [OMS2] Sludge should be incinerated, contained, or reclaimed. [OMS3]			
<b>Conditions and measures related to municipal sewage treatment plant</b>			
Not applicable as there is no release to wastewater. [STP1]			
Estimated substance removal from wastewater via domestic sewage treatment (%)		95.2	
Total efficiency of removal from wastewater after on-site and off-site (domestic treatment plant) RMMs (%)		95.2	
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day)		1.5E+04	
Assumed flow rate of the domestic sewage treatment plant (m3/day)		2.0E+03	
<b>Conditions and measures related to external treatment of waste for disposal</b>			
Combustion emissions limited by mandatory exhaust emission testing. [ETW1] Combustion emissions considered in regional exposure assessment. [ETW2] External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW3]			
<b>Conditions and measures related to external recovery of waste</b>			
This substance is consumed during use and no waste of the substance is generated. [ERW3]			
<b>Section 3 Exposure estimate</b>			
<b>3.1. Health</b>			
The ECETOC TRA tool has been used to estimate workplace exposure unless otherwise indicated.			
<b>3.2. Environment</b>			
The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model. [EE2]			
<b>Section 4 Guidance to check compliance with the exposure scenario</b>			
<b>4.1. Health</b>			
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. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not enable the derivation of a DNEL for aspiration effects. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk management measures are based on qualitative risk characterisation.			
RCR Workers CS 1: Bulk transfers; Dedicated facility (PROC 8b)			
Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.6 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) Exposure/DNEL = 0.833 <b>Support exposure (not used for CR):</b> 0.814 mg/m <sup>3</sup> (TRA Workers)	Exposure/DNEL = 0.833
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391

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Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 2: Drum/batch transfers; Dedicated facility (PROC 8b)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
Inhalation, systemic, acute	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 3: Refuelling (PROC 8b)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
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Inhalation, systemic, long term	Benzene	0.814 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.424 <b>Support exposure (not used for CR):</b> 0.4 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) 51 µg/m <sup>3</sup> (Measured data: Karakitsios et al. (2007))	Exposure/DNEL = 0.424
Inhalation, systemic, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.324	Exposure/DNEL = 0.324
	Benzene	3.255 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	104.2 mg/m <sup>3</sup> (TRA Workers) RCR = 0.124	Final RCR = 0.124
Inhalation, local, acute	Substance registered as such	416.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.391	Final RCR = 0.391
Dermal, systemic, long term	Benzene	0.014 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.1 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	1E-3 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.324

### RCR Workers CS 4: General exposures; Closed systems (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.627 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.848	Exposure/DNEL = 0.848
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	

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Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 5: Use of fuels; Closed systems (PROC 16)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.627 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.848	Exposure/DNEL = 0.848
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	3.4E-4 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	9.92E-3 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	9.92E-5 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

### RCR Workers CS 6: Cleaning and maintenance of equipment (PROC 8a, PROC 28)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	0.195 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.102	Exposure/DNEL = 0.102
		<b>Support exposure (not used for CR):</b> 0.026 mg/m <sup>3</sup> (Measured data: Concawe report no. 13/18) 0.054 mg/m <sup>3</sup> (Measured data: Vainiotalo et al., (2006))	
Inhalation, systemic, acute	Substance registered as such	166.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.13	Exposure/DNEL = 0.13
	Benzene	1.302 mg/m <sup>3</sup> (TRA Workers)	

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Inhalation, local, long term	Substance registered as such	25 mg/m <sup>3</sup> (TRA Workers) RCR = 0.03	Final RCR = 0.03
Inhalation, local, acute	Substance registered as such	166.7 mg/m <sup>3</sup> (TRA Workers) RCR = 0.156	Final RCR = 0.156
Dermal, systemic, long term	Benzene	8.23E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.06 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	6E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.06 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	6E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.13

### RCR Workers CS 7: Storage (PROC 2, PROC 1)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	1.627 mg/m <sup>3</sup> (TRA Workers) Exposure/DNEL = 0.848	Exposure/DNEL = 0.848
Inhalation, systemic, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.648	Exposure/DNEL = 0.648
	Benzene	6.509 mg/m <sup>3</sup> (TRA Workers)	
Inhalation, local, long term	Substance registered as such	208.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.249	Final RCR = 0.249
Inhalation, local, acute	Substance registered as such	833.3 mg/m <sup>3</sup> (TRA Workers) RCR = 0.781	Final RCR = 0.781
Dermal, systemic, long term	Benzene	1.37E-3 mg/kg bw/day (TRA Workers)	
Dermal, local, long term	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Dermal, local, acute	Substance registered as such	0.02 mg/cm <sup>2</sup> (TRA Workers)	
	Benzene	2E-4 mg/cm <sup>2</sup> (TRA Workers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.648

Guidance is based on assumed operating conditions that may not be applicable to all sites; therefore, scalability may be required to define appropriate site-specific risk management measures. [DSU1] Required removal efficiency for wastewater can be achieved using on-site/off-site technologies, either alone or in combination. [DSU2] Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. [DSU3] Further details on

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scaling and control technologies can be found in the SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>). . [DSU4]

Maximum risk characterisation ratio for air emissions RCRair	4.0E-04
Maximum risk characterisation ratio for wastewater emissions RCRwater	1.1E-03

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### 12c - Use in fuels: consumers (classified; includes H340 and/or H350 and/or H361; (contains from 0% to 1% benzene))

Section 1	
<b>Title</b>	
12c - Use in fuels: consumers	
<b>Use descriptors</b>	
Sector of use	
Product Categories	13
Environmental release categories	9a, 9b
Specific environmental release category	ESVOC SpERC 9.12c.v1
<b>Processes, tasks, activities covered</b>	
Covers the consumer use of liquid fuels.	
<b>Evaluation Method</b>	
See section 3.	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of consumer exposure	
Product Characteristics	
Physical state of product	Liquid
Vapour pressure	-
Concentration of substance in product	-
Frequency and duration of use/exposure	Covers the use of up to 1.0 event per day
Other operating conditions affecting exposure	-
Product Category	Specific risk management measures and operational conditions
General measures (skin irritants)	Ensure that there is no direct skin contact with the product; Remove accidental skin contamination.
General measures (flammability)	For measures to control risks arising from physical and chemical properties, refer to the main body of the SDS, section 7 and/or 8.
General measures (aspiration hazard)	Do not ingest. If swallowed then seek immediate medical assistance.
Fuels; Liquid; Automotive refuelling; (Gasoline) (PC_13) Based on Concawe_SCED_13_1_a	Covers concentrations up to 100 %; Covers percentage benzene in the final product up to <1% For each use event, covers use amounts up to 37,500.0 g / event Exposure duration = 0.05 h / event Outdoor use Potential dermal contact is assumed to be limited to the palm of one hand

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Fuels; Liquid; Recreational vehicles; (Quads or similar) (PC_13) Based on Concawe_SCED_13_7_a	Covers concentrations up to 100 %; Covers percentage benzene in the final product up to <1% For each use event, covers use amounts up to 7500.0 g / event Exposure duration = 0.017 h / event Outdoor use Potential dermal contact is assumed to be limited to the palm of one hand
Fuels; Liquid; Garden equipment (PC_13) Based on Concawe_SCED_13_4_a	Covers concentrations up to 100 %; Covers percentage benzene in the final product up to <0.1%; Covers a percentage of n-hexane in the final product of up to < 3%; Covers a percentage of toluene in the final product of up to < 3% " For each use event, covers use amounts up to 750.0 g / event Exposure duration = 0.033 h / event Potential dermal contact is assumed to be limited to the inside of the hands / one hand / the palm of the hands.

### Section 2.2 Environmental exposure control

#### Product Characteristics

Substance is complex UVCB. [PrC3] Predominantly hydrophobic. [PrC4a]

#### Amounts used

Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tonnes/year)	2.3E+04
Fraction of Regional tonnage used locally	5.0E-04
Annual site tonnage (tonnes/year)	1.2E+01
Maximum daily site tonnage (kg/day)	3.2E+01

#### Frequency and duration of use

Continuous release. [FD2]	
Emission days (days/year)	365

#### Environmental factors not influenced by risk management

Local freshwater dilution factor	10
Local marine water dilution factor	100

#### Other given operating conditions affecting environmental exposure

Fraction released to air by wide dispersive use (regional use only)	1.0E-02
Fraction released to wastewater by wide dispersive use	1.0E-05
Fraction released to soil by wide dispersive use (regional use only)	0.00001

#### Conditions and measures related to municipal sewage treatment plant

Not applicable as there is no release to wastewater. [STP1]	
Estimated substance removal from wastewater via domestic sewage treatment (%)	95.2
Maximum allowable site tonnage (MSafe) based on release following total wastewater treatment removal (kg/day)	2.9E+04
Assumed flow rate of the domestic sewage treatment plant (m3/day)	2.0E+03

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

Combustion emissions limited by mandatory exhaust emission testing. [ETW1] Combustion emissions considered in regional exposure assessment. [ETW2] External treatment and disposal of waste should comply with applicable local and/or national regulations. [ETW3]

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

This substance is consumed during use and no waste of the substance is generated. [ERW3]

### Section 3 Exposure estimate

#### 3.1. Health

The ECETOC TRA tool has been used to estimate consumer exposure unless otherwise indicated.

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### 3.2. Environment

The Hydrocarbon Block Method has been used to calculate environmental exposure with the PETRORISK model. [EE2]

### Section 4 Guidance to check compliance with the exposure scenario

#### 4.1. Health

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in Section 2 are implemented. Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. Available hazard data do not enable the derivation of a DNEL for aspiration effects. Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Risk management measures are based on qualitative risk characterisation.

RCR Cons CS 1: Fuels; Liquid; Automotive refuelling; (Gasoline;) (PC 13)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Benzene	6.98E-3 mg/m <sup>3</sup> (Measured data: Vainiotalo et al. (2006); Moneti et al. (2002); Minoia et al. (2002); Clayton et al. (1991)) Exposure/DNEL = 0.017 <b>Support exposure (not used for CR):</b> 0.014 mg/m <sup>3</sup> (TRA Consumers)	Exposure/DNEL = 0.017
Inhalation, systemic, acute	Substance registered as such	56.09 mg/m <sup>3</sup> (Measured data: Hakkola and Saarinen 2000) RCR = 0.049 <b>Support exposure (not used for CR):</b> 133.3 mg/m <sup>3</sup> (ECETOC TRA Consumers 3.1)	Exposure/DNEL = 0.049
Inhalation, local, long term	Substance registered as such	0.584 mg/m <sup>3</sup> (Measured data: Hakkola and Saarinen 2000) RCR = 3.27E-3 <b>Support exposure (not used for CR):</b> 1.389 mg/m <sup>3</sup> (TRA Consumers)	Final RCR < 0.01
Inhalation, local, acute	Substance registered as such	56.09 mg/m <sup>3</sup> (Measured data: Hakkola and Saarinen 2000) RCR = 0.088 <b>Support exposure (not used for CR):</b> 133.3 mg/m <sup>3</sup> (ECETOC TRA Consumers 3.1)	Final RCR = 0.088
Dermal, systemic, long term	Benzene	7E-4 mg/kg bw/day (TRA Consumers)	
Oral, systemic, long term	Benzene	0 mg/kg bw/day (TRA Consumers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.049

RCR Cons CS 2: fuels; Liquid; Recreational vehicles; (Quads or similar;) (PC 13)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification

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Inhalation, systemic, long term	Benzene	5E-3 mg/m <sup>3</sup> (TRA Consumers) Exposure/DNEL = 0.012	Exposure/DNEL = 0.012
Inhalation, systemic, acute	Substance registered as such	47.96 mg/m <sup>3</sup> (ECETOC TRA Consumers 3.1) RCR = 0.042	Exposure/DNEL = 0.042
Inhalation, local, long term	Substance registered as such	0.5 mg/m <sup>3</sup> (TRA Consumers) RCR = 2.8E-3	Final RCR < 0.01
Inhalation, local, acute	Substance registered as such	47.96 mg/m <sup>3</sup> (ECETOC TRA Consumers 3.1) RCR = 0.075	Final RCR = 0.075
Dermal, systemic, long term	Benzene	3.5E-3 mg/kg bw/day (TRA Consumers)	
Oral, systemic, long term	Benzene	0 mg/kg bw/day (TRA Consumers)	
Combined routes of exposure, systemic, acute			Final RCR = 0.042

RCR, Cons CS 3: fuels; Liquid; Garden equipment (PC 13)

Route of exposure and type of effect	Subject of evaluation	Exposure concentration	Risk quantification
Inhalation, systemic, acute	Substance registered as such	146.7 mg/m <sup>3</sup> (ECETOC TRA Consumers 3.1) RCR = 0.127	Final RCR = 0.127
Inhalation, local, long term	Substance registered as such	1.532 mg/m <sup>3</sup> (TRA Consumers) RCR = 8.58E-3	Final RCR < 0.01
Inhalation, local, acute	Substance registered as such	146.7 mg/m <sup>3</sup> (ECETOC TRA Consumers 3.1) RCR = 0.229	Final RCR = 0.229
Combined routes of exposure, systemic, acute			Final RCR = 0.127

### 4.2. Environment

Guidance is based on assumed operating conditions that may not be applicable to all sites; therefore, scalability may be required to define appropriate site-specific risk management measures. [DSU1]

Maximum risk characterisation ratio for air emissions RCRair	4.0E-04
Maximum risk characterisation ratio for wastewater emissions RCRwater	1.1E-03