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

1.1 Product identifier

Product Name	Toluene
Product Description	V4054a–TOLUENE- Toluene
Trade Name	TOLUENE
Product code	TOL
CAS No.	108-88-3
EC No.	203-625-9
REACH Registration No.	-

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

Identified Use(s)

No.	Exposure Scenario	Page:
1	Distribution of Toluene	**10**
2	Formulation of Toluene	**13**

Uses Advised Against: Anything other than the above.

1.3 Details of the supplier of the safety data sheet

Company Identification:

Vitol SA
Place des Bergues 3
P.O. Box 2056
1211 Geneva 1
Switzerland

Telephone	+31 10 498 7200
Fax	+31 10 452 9545
E-Mail (competent person)	xreach@vitol.com

1.4 Emergency telephone number

Emergency Phone No.	+44 (0) 1235 239 670, 24/7
Languages spoken	All official European languages.

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

2.1.1 Regulation (EC) No. 1272/2008 (CLP)

Flam. Liq. 2; H225
Asp. Tox. 1; H304
Skin Irrit. 2; H315
Muta. 1B; H340
Carc. 1A; H350
Repr. 2; H361fd
STOT SE 3; H336 (Central nervous system, Inhalation)
STOT RE 2; H373 (Central nervous system)

2.1.2 Directive 67/548/EEC & Directive 1999/45/EC

F; R11: Highly flammable.
Xi; R38: Irritating to skin.
Xn; R48/20: Harmful: danger of serious damage to health by prolonged exposure through inhalation.
Carc. Cat. 2; R45: May cause cancer.
Muta. Cat. 2; R46: May cause heritable genetic damage.
Repr. Cat. 3; R63: Possible risk of harm to the unborn child.
Xn; R65: Harmful: may cause lung damage if swallowed.
R67: Vapours may cause drowsiness and dizziness.

2.2 Label elements

According to Regulation (EC) No. 1272/2008 (CLP)

Product Description: V4054a–TOLUENE- Toluene

Hazard Pictogram(s)	
Signal Word(s)	Danger
Hazard Statement(s)	H225: Highly flammable liquid and vapour. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H340: May cause genetic defects. H350: May cause cancer. H361fd: Suspected of damaging fertility. Suspected of damaging the unborn child. H336: May cause drowsiness or dizziness. (Central nervous system, Inhalation) H373: May cause damage to organs through prolonged or repeated exposure: Central nervous system
Precautionary Statement(s)	P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P260: Do not breathe mist/vapours/spray. P280: Wear protective gloves/protective clothing/eye protection/face protection. P301+P310: IF SWALLOWED: Immediately call a POISON CENTER/doctor. P331: Do NOT induce vomiting. P304+P341: IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.

2.3 Other hazards

May form explosive mixture with air. The vapour is heavier than air; beware of pits and confined spaces. May cause irritation to eyes and air passages.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

SUBSTANCE	CAS No.	EC No.	%W/W
Toluene	108-88-3	203-625-9	100

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Self-protection of the first aider	Eliminate sources of ignition. If it is suspected that fumes are still present, the responder should wear an appropriate mask or self-contained breathing apparatus.
Inhalation	IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical advice/attention if you feel unwell.
Skin Contact	IF ON SKIN (or hair): Remove contaminated clothing immediately and wash affected skin with plenty of water or soap and water. If irritation (redness, rash, blistering) develops, get medical attention.
Eye Contact	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.
Ingestion	IF SWALLOWED: Do not induce vomiting because of risk of aspiration into the lungs. If vomiting occurs spontaneously, keep head below hips to prevent

		aspiration into the lungs. If unconscious, place in recovery position and get medical attention immediately. Do not give anything by mouth to an unconscious person. Get medical attention immediately. Do not wait for symptoms to appear.
4.2	**Most important symptoms and effects, both acute and delayed**	Inhalation: Irritation of the respiratory tract. Skin Contact: Repeated exposure may cause skin dryness or cracking. Eye Contact: May cause eye irritation. Ingestion: Aspiration into the lungs may cause chemical pneumonitis, which can be fatal. Ingestion may cause irritation of the gastrointestinal tract. Nausea, Vomiting and Diarrhoea.
4.3	**Indication of any immediate medical attention and special treatment needed**	IF SWALLOWED: Do NOT induce vomiting, if vomiting does occur, have victim lean forward to reduce risk of aspiration.

SECTION 5: FIREFIGHTING MEASURES

5.1	**Extinguishing media**	
	Suitable Extinguishing media	Extinguish with sand or dry chemical. Foam, Carbon dioxide, Water fog or dry powder
	Unsuitable extinguishing media	Do not use water jet. Direct water jet may spread the fire.
5.2	**Special hazards arising from the substance or mixture**	Decomposes in a fire giving off toxic fumes: A mixture of solid and liquid particulates and gases including unidentified organic and inorganic compounds. May form explosive mixture with air. Prevent liquid entering sewers, basements and any watercourses. Vapours are heavier than air and may travel considerable distances to a source of ignition and flashback.
5.3	**Advice for fire-fighters**	Fight fire with normal precautions from a reasonable distance. Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Keep containers cool by spraying with water if exposed to fire. Avoid release to the environment. Dike fire control water for later disposal.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1	**Personal precautions, protective equipment and emergency procedures**	Caution - spillages may be slippery. Eliminate sources of ignition. Stop leak if safe to do so. Ensure suitable personal protection during removal of spillages. Avoid all contact. Keep upwind.
6.2	**Environmental precautions**	Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be alerted to the Environment Agency or other appropriate regulatory body.
6.3	**Methods and material for containment and cleaning up**	Use non-sparking equipment when picking up flammable spill. Adsorb spillages onto sand, earth or any suitable adsorbent material. Sweep up and shovel into waste drums or plastic bags. Transfer to a lidded container for disposal or recovery.
6.4	**Reference to other sections**	See Section: 8,13

SECTION 7: HANDLING AND STORAGE

7.1	**Precautions for safe handling**	Keep away from sources of ignition - No smoking. Use only outdoors or in a well-ventilated area. Prevent vapour build up by providing adequate ventilation during and after use. Take precautionary measures against static discharge. Use only non-sparking tools. The vapour is heavier than air; beware of pits and confined spaces. Avoid contact with skin and eyes. Do not ingest. Avoid breathing vapours. Use personal protective equipment as required. See Section: 8. Keep good industrial hygiene. Wash hands thoroughly after handling. Contaminated clothing should be thoroughly cleaned.
7.2	**Conditions for safe storage, including any incompatibilities**	Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazards. Bund storage facilities to prevent soil and water pollution in the event of spillage. Keep only in original container. Keep containers properly sealed when not in use. Protect from sunlight. Containers of this material may be hazardous when empty since they retain product residue.
	Storage temperature	Stable at ambient temperatures.

	Storage measures	Suitable containers: Stainless steel, Mild steel
	Incompatible materials	Keep away from oxidising agents.
7.3	**Specific end use(s)**	See Section: 1.2 and/or Exposure Scenario.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

SUBSTANCE	CAS No.	LTEL (8 hr TWA ppm)	LTEL (8 hr TWA mg/m³)	STEL (ppm)	STEL (mg/m³)	Note:
Toluene	108-88-3	50	191	100	384	WEL

WEL: Workplace Exposure Limit (UK HSE EH40)

8.1.2 Biological limit value Not established.

8.1.3 PNECs and DNELs

DNEL	Oral (mg/kg bw/day)	Inhalation (mg/m³)	Dermal (mg/kg bw/day)
Worker - Systemic effects - Long Term	-	192	384
Worker - Systemic effects - Short term	-	384	-
Worker - Local effects - Long Term	-	192	-
Worker - Local effects - Short term	-	384	-
Consumer - Systemic effects - Long Term	8.13	56.5	226
Consumer -Systemic effects - Short term	-	226	-
Consumer - Local effects - Long Term	-	56.5	-
Consumer - Local effects -Short term	-	226	-

Toulene	PNEC
Aquatic Compartment	PNEC aqua (freshwater) 0.68 mg/l PNEC aqua (marine water) 0.68 mg/l PNEC aqua Intermittent 0.68 mg/l PNEC STP 13.61 mg/l PNEC freshwater sediment 16.39 mg/kg dry weight PNEC marine sediment 16.39 mg/kg dry weight Soil 2.89 mg/kg dry weight

8.2 Exposure controls

8.2.1 Appropriate engineering controls Ensure adequate ventilation. Guarantee that the eye flushing systems and safety showers are located close to the working place.

8.2.2 Individual protection measures, such as personal protective equipment (PPE) Fuels are typically used, transferred and transported in closed systems. If exposure is likely (i.e. during sampling) the following advice may be appropriate.

Eye/ face protection

Wear eye protection with side protection (EN166).

Skin protection

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

Body protection: Wear suitable protective clothing.

Respiratory protection

When the product is heated /In case of inadequate ventilation wear respiratory protection. The use of a high efficiency filter (EN143) is recommended. Filter type A1

Closed system(s): Not normally required.

Thermal hazards — Not applicable.

8.2.3 Environmental Exposure Controls — Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Liquid, Colourless
Odour	Benzene-like
Odour threshold	Not established.
pH	Not established.
Melting point/freezing point	- 95 °C
Initial boiling point and boiling range	110.6 °C
Flash point	4.4 °C
Evaporation rate	Not established.
Flammability (solid, gas)	Not applicable - Liquid
Upper/lower flammability or explosive limits	Flammable Limits (Lower) (%v/v) 1.2 Flammable Limits (Upper) (%v/v) 7.1
Vapour pressure	3088.9 mm Hg @ 21.1 °C
Vapour density	Not established.
Relative density	0.87 g/cm³ @ 15 °C
Solubility(ies)	Partly soluble in water. (100 – 1000 mg/l)
Partition coefficient: n-octanol/water	2.73 @ 25 °C
Auto-ignition temperature	480 °C
Decomposition Temperature	Not established.
Viscosity	0.56 mm²/s @ 20 °C
Explosive properties	Not explosive.(Vapour may create explosive atmosphere.)
Oxidising properties	Not oxidising.

9.2 Other information — None known.

SECTION 10: STABILITY AND REACTIVITY

10.1	**Stability and reactivity**	Stable under normal conditions. Reacts with - Strong oxidising agents
10.2	**Chemical stability**	Stable under normal conditions.
10.3	**Possibility of hazardous reactions**	Flammable liquid.
10.4	**Conditions to avoid**	Keep away from heat, sources of ignition and direct sunlight.
10.5	**Incompatible materials**	Keep away from oxidising agents. Strong Acids and Alkalis.
10.6	**Hazardous decomposition product(s)**	A mixture of solid and liquid particulates and gases including unidentified organic and inorganic compounds. Decomposes in a fire giving off toxic fumes: COx,

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Ingestion	Not classified. LD50 > 5500 mg/kg bw/day (rat) EU Method B.1
Inhalation	Not classified. LC50 Vapour > 20 mg/l (rat) OECD 403
Skin Contact	Not classified. LD50 > 5000 mg/kg bw/day (rabbit)
Skin corrosion/irritation	Skin Irrit. 2; EU Method B.4 (rabbit) Mean erythema score 1.81 @ 24, 48 & 72 hours Mean edema score 1.10 @ 24, 48 & 72 hours
Serious eye damage/irritation	Based upon the available data, the classification criteria are not met. Mean eye Irritiation score : 0 (rabbit) OECD 405
Respiratory or skin sensitization	Based upon the available data, the classification criteria are not met.
Germ cell mutagenicity	Muta. 1B; May cause genetic defects.
Carcinogenicity	Carc. 1A: mouse OECD 451

	Reproductive toxicity	Repr. 2; Suspected of damaging fertility or the unborn child.
	STOT - single exposure	STOT SE 3; May cause drowsiness or dizziness.
	STOT - repeated exposure	STOT RE 2; Oral: NOAEL 625 mg/kg (rat) EU Method B.26 Inhalation: NOAEC 1131 mg/m³ (rat) OECD 453 Dermal: NOAEL < 200 mg/kg bw/day (rat) OECD 410
	Aspiration hazard	Asp. Tox. 1; Aspiration into the lungs may cause chemical pneumonitis, which can be fatal. Viscosity: 0.56 mPa•s @ 25 °C
11.2	**Other information**	None.

SECTION 12: ECOLOGICAL INFORMATION

12.1	**Toxicity**	Toxic to aquatic life with long lasting effects. Aquatic Chronic 2; Classified as a Marine Pollutant. Aquatic Compartment LC50 1-10 mg/l
12.2	**Persistence and degradibility**	Readily biodegradable. APHA method no 219.
12.3	**Bioaccumulative potential**	The product has low potential for bioaccumulation. Bioconcentration factor (BCF): 90
12.4	**Mobility in soil**	The product is predicted to have moderate mobility in soil. Partly soluble in water.
12.5	**Results of PBT and vPvB assessment**	Not classified as PBT or vPvB.
12.6	**Other adverse effects**	None known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1	**Waste treatment methods**	Dispose of this material and its container as hazardous waste (2008/98/EEC). Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point. Disposal should be in accordance with local, state or national legislation. Containers of this material may be hazardous when empty since they retain product residue. Containers must not be punctured or destroyed by burning, even when empty. Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company. Waste code: 14 06 03

SECTION 14: TRANSPORT INFORMATION

		ADR/RID	**IMDG/ADN**
14.1	**UN number**	UN1294	UN1294
14.2	**Proper Shipping Name**	TOLUENE	TOLUENE
14.3	**Transport hazard class(es)**	3	3+N3
14.4	**Packing group**	II	II
14.5	**Environmental hazards**	Not classified as a Marine Pollutant.	
14.6	**Special precautions for user**	See Section: 2	
14.7	**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**	This product is being carried under the scope of MARPOL Annex 1. Special Precautions: Refer to Chapter 7 'Handling and Storage' for special precautions which a user needs to be aware of, or needs to comply with, in connection with transport.	
14.8	**Additional Information**	ADR HIN: 33 Tunnel Restriction Code: 2 (D/E) Limited Quantity: 1L	EmS: F-E, S-D Limited Quantity: 1L

SECTION 15: REGULATORY INFORMATION

15.1	**Safety, health and environmental regulations/legislation specific for the substance or mixture**	
15.1.1	**EU regulations**	
	CoRAP Substance Evaluation	Substance evaluated in 2012; Evaluating Member State has concluded that no additional information is required.
	Seveso	Upper Tier: 50000 tonnes Lower Tier: 5000 tonnes
	Annex XVII (Restrictions)	In accordance with REACH Annex XVII entry 30 (c) this substance is exempt

from Entry 28 and 29 of REACH Annex XVII as it is to be sold as a fuel in a closed system.

15.1.2 National regulations

Germany — Wassergefährdungsklasse (Germany). WGK number: 2 (Toluol)

15.2 Chemical Safety Assessment — This safety data sheet contains more than one ES in an integrated form. Contents of the exposure scenarios have been included into sections 1.2, 8, 9, 12, 15 and 16 of this safety data sheet.

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements:
Header and Section 1.3

References:
Existing ECHA registration(s) for Toluene (CAS No. 108-88-3) and Chemical Safety Report.

This Safety Data Sheet was prepared in accordance with EC Regulation (EC) 1907/2006 (REACH), 1272/2008 (CLP) & 453/2010.

LEGEND

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

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

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Toluene

CAS No. 108-88-3
EC No. 203-625-9

Summary of Parameters

Physical parameters			
Vapour pressure (hPa)			3089
Partition Coefficient (log K_{OW})			2.73
Aqueous solubility (mg/l)			573
Molecular weight			92.14
Biodegradability			Readily biodegradable.
Human Health (DNEL)			
Workers	Short term	Inhalation (mg/m³)	Not defined
		Dermal (mg/kg bw/day)	Not defined
	Long Term	Inhalation (mg/m³)	192 (51 ppm)
		Dermal (mg/kg bw/day)	384
Consumer		Inhalation (mg m^{-3})	56.5
		Dermal (mg kg^{-1} bw day^{-1})	226
		Oral (mg kg^{-1} bw day^{-1})	8.13
Environmental Parameters (PNECs)			
STP (mg/l)			13.61
freshwater (mg/l)			0.68
marine water (mg/l)			0.68
freshwater sediment (mg/kg dry weight)			16.39
marine sediment (mg/kg dry weight)			16.39
Soil (mg/kg dry weight)			2.89

Contents

Contributing Scenarios

Contributing Scenarios
PROC1 Use in closed process, no likelihood of exposure
PROC2 Use in closed, continuous process with occasional controlled exposure
(Storage) Use in closed, continuous process with occasional controlled exposure, bulk Storage
PROC3 Use in closed batch process (synthesis or formulation)
(Sampling) Use in closed batch process (synthesis or formulation). Sample collection at ventilation at ventilated sample points.
(elevated) Batch process at elevated temperature with sampling.
PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a (maintenance) Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities.
Clean down and maintenance of vessels and containers.
(bulk) Bulk open loading and unloading.
(manual) Manual pouring from large containers.
PROC8b (bulk) Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities Bulk transfers (closed systems).
(Drum)
PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC14 Production of preparations or articles by tabletting, compression, extrusion, pelletisation
PROC15 Use as laboratory reagent

Exposure Scenario 1 – Distribution of Toluene

1.0 Contributing Scenarios	
Sector of uses SU	SU8 Manufacture of bulk, large scale chemicals (including petroleum products) SU9 Manufacture of fine chemicals SU0 Other
Process category [PROC]	1 2 2 (Storage) 3 3 (Sampling) 4 8a (maintenance) 8a (bulk) 8b (bulk) 9 15
Chemical product category [PC]	not applicable
Article Categories [AC]	not applicable
Environmental release categories [ERC]	ERC1 Manufacture of substances ERC2 Formulation of preparations
Specific Environmental Release Categories SPERC	ESVOC SpERC 1.1b.v1

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid with moderate volatility.	
Concentration of substance in product	Covers concentrations up to 100%	
Human factors not influenced by risk management		
Potential exposure area	Not defined	
Frequency and duration of use		
Exposure duration per day	Covers daily exposures up to 8 hours (unless stated differently).	
Exposure duration per year	300 days per year	
Other operational conditions affecting worker exposure		
Area of use	Not defined	
Characteristics of the surroundings	Not defined	
General measures applicable to all activities Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented. Users are advised to consider national Occupational Exposure Limits or other equivalent values.		
Technical conditions of use		
PROC8a (bulk), PROC9	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Efficiency of at least 30%	
Organisational measures		
PROC8a (maintenance)	Drain down and flush system prior to equipment break-in or maintenance. Efficiency of at least 90%	
Risk management measures related to human health		
Respiratory protection	PROC8b (bulk), PROC8a (bulk), PROC9	If technical measures not practical: Wear a respirator conforming to EN140 with Type A filter or better.
Hand and/or Skin protection	PROC8b (bulk), PROC8a (bulk), PROC9	If technical measures not practical: Wear suitable gloves tested to EN374.
Eye Protection	No special measures are required.	
Other operational conditions affecting worker exposure Wear suitable gloves tested to EN374. Clear lines prior to de-coupling. <u>PROC3</u> Avoid dip sampling. <u>PROC8a (maintenance)</u> Transfer via enclosed lines, Apply vessel entry procedures including use of forced supplied air. Retain drain downs in sealed storage pending disposal or for subsequent recycle.		

PROC9

Provide a good standard of controlled ventilation (10 to 15 air changes per hour). Keep container tightly closed. Clear spills immediately.

PROC15

Use fume cupboard.

2.2 Control of environmental exposure	
Amounts used	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tons/year):	3.0E+05
Fraction of Regional tonnage used locally: tons/year	1
Annual site tonnage (tons/year):	3.0E+05
Average daily use (kg/day)	1.0E+07
Environment factors not influenced by risk management	
Flow rate of receiving surface water (m^3/d):	Not defined (default = 18,000)
Local freshwater dilution factor:	10
Local marine water dilution factor:	100
Operational conditions	
Emission days (days/year):	300
Release fraction to air from process (initial release prior to RMM):	1.0E-03
Release fraction to wastewater from process (initial release prior to RMM):	1.0E-05
Release fraction to soil from process (initial release prior to RMM):	1.0E-05
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emission to provide a typical removal efficiency of (%):	> 90
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):	93.3
Treat soil emission to provide a typical removal efficiency of (%):	not applicable - no direct release to soil
Common practices vary across sites thus conservative process release estimates used.	
Organisational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils.	
Conditions and measures related to municipal sewage treatment plant	
Size of municipal sewage system/treatment plant (m^3/d)	2000
Degradation effectiveness (%)	93.3
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations.	
Substance release quantities after risk management measures	
Release to waste water from process (mg/l)	3.49E-02
Maximum allowable site tonnage (MSafe) (kg/d):	1.36E+07

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA v2.0 Worker

	Inhalation		Dermal		General Comment Regarding All Tables
Process category [PROC]	**inhalation exposure (mg/m^3)**	**Risk characterisation ratio (RCR)**	**dermal exposure (mg/kg bw/day)**	**Risk characterisation ratio (RCR)**	**Risk characterisation ratio (RCR)**
PROC1	0.01	0.00	0.34	0.00	0.00
PROC2	10.0	0.20	1.37	0.00	0.20
PROC2 (Storage)	10.0	0.20	1.37	0.00	0.20
PROC3	25.0	0.49	0.34	0.00	0.49
PROC3 (Sampling)	25.0	0.49	0.34	0.00	0.49
PROC4	20.0	0.39	6.86	0.02	0.41
PROC8a (bulk)	35.0	0.69	6.86	0.02	0.70
PROC8a (maintenance)	5.00	0.10	13.71	0.04	0.13
PROC8b (bulk)	35.0	0.69	6.86	0.02	0.70
PROC9	35.0	0.69	6.86	0.02	0.70
PROC15	10.0	0.20	0.34	0.00	0.20

3.2 Environmental exposure prediction	
Exposure assessment (method/calculation model)	EUSES v2.1

Storage

environmental exposure	STP	freshwater	marine water	soil	freshwater sediment	marine sediment
PEC Environment	3.35E-01	3.49E-02	3.48E-03	1.66E-01	1.83E-01	1.82E-02
RCR	2.46E-02	5.14E-02	5.11E-03	7.37E-02	5.14E-02	5.11E-03

4. Evaluation guidance to downstream user		
For scaling see	Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Workers	ECETOC TRA v.2
	environmental exposure	EUSES 2.1.1

Exposure Scenario 2 – Formulation of Toluene

1.0 Contributing Scenarios	
Sector of uses SU	SU8 Manufacture of bulk, large scale chemicals (including petroleum products) SU9 Manufacture of fine chemicals SU0 Other
Process category [PROC]	1 2 3 3 (elevated) 4 5 8a (manual) 8a (maintenance) 8b (bulk) 8b (Drum) 9 14 15
Chemical product category [PC]	not applicable
Article Categories [AC]	not applicable
Environmental release categories [ERC]	ERC2 Formulation of preparations
Specific Environmental Release Categories SPERC	ESVOC SpERC 2.2.v1

2.0 Operational conditions and risk management measures		
2.1 Control of worker exposure		
Product characteristics		
Physical form of product	Liquid with moderate volatility.	
Concentration of substance in product	Covers concentrations up to 100%	
Human factors not influenced by risk management		
Potential exposure area	Not defined	
Frequency and duration of use		
Exposure duration per day	Covers daily exposures up to 8 hours (unless stated differently).	
Exposure duration per year	300 days per year	
Other operational conditions affecting worker exposure		
Area of use	Not defined	
Characteristics of the surroundings	Not defined	
General measures applicable to all activities Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented. Users are advised to consider national Occupational Exposure Limits or other equivalent values.		
Technical conditions of use		
PROC3 (elevated),	Provide extract ventilation to points where emissions occur. Ensure material transfers are under containment or extract ventilation. Efficiency of at least 90%	
PROC5, PROC8a (manual), PROC8b (bulk), PROC8b (Drum), PROC9, PROC14	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Efficiency of at least 30%	
Organisational measures		
PROC8a (maintenance)	Drain down and flush system prior to equipment break-in or maintenance. Efficiency of at least 90%	
Risk management measures related to human health		
Respiratory protection	PROC3	If technical measures not practical: Wear a full face respirator conforming to EN140 with Type A filter or better.
Hand and/or Skin protection	PROC3	If technical measures not practical: Wear suitable gloves tested to EN374.
Eye Protection	No special measures are required.	
Other operational conditions affecting worker exposure Wear suitable gloves tested to EN374. Provide extract ventilation to points where emissions occur. <u>PROC2 (Storage)</u> Use in closed systems.		

PROC3 (Sampling)
Avoid dip sampling.
PROC8a (maintenance)
Transfer via enclosed lines, Apply vessel entry procedures including use of forced supplied air. Retain drain downs in sealed storage pending disposal or for subsequent recycle.
PROC8b (bulk)
Clear transfer lines prior to de-coupling.
PROC8b (Drum)
Use drum pumps or carefully pour from container. Avoid spillage when withdrawing pump.
PROC9
Keep container tightly closed. Clear spills immediately.
PROC15
Use fume cupboard.

2.2 Control of environmental exposure

Amounts used	
Fraction of EU tonnage used in region:	0.1
Regional use tonnage (tons/year):	1.5E+04
Fraction of Regional tonnage used locally: tons/year	1
Annual site tonnage (tons/year):	1.5E+04
Average daily use (kg/day)	5.0E+04
Environment factors not influenced by risk management	
Flow rate of receiving surface water (m^3/d):	Not defined (default = 18,000)
Local freshwater dilution factor:	10
Local marine water dilution factor:	100
Operational conditions	
Emission days (days/year):	300
Release fraction to air from process (initial release prior to RMM):	2.5E-02
Release fraction to wastewater from process (initial release prior to RMM):	2.0E-03
Release fraction to soil from process (initial release prior to RMM):	1.0E-04
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Treat air emission to provide a typical removal efficiency of (%):	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%):	93.3
Treat soil emission to provide a typical removal efficiency of (%):	not applicable - no direct release to soil
Common practices vary across sites thus conservative process release estimates used.	
Organisational measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils.	
Conditions and measures related to municipal sewage treatment plant	
Size of municipal sewage system/treatment plant (m^3/d)	2000
Degradation effectiveness (%)	93.3
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations.	
Substance release quantities after risk management measures	
Release to waste water from process (mg/l)	3.36E-01
Maximum allowable site tonnage (MSafe) (kg/d):	67,800

3. Exposure estimation and reference to its source

3.1 Human exposure prediction

Exposure assessment (method/calculation model)	ECETOC TRA v2.0 Worker

	Inhalation		Dermal		General Comment Regarding All Tables
Process category [PROC]	inhalation exposure (mg/m^3)	Risk characterisation ratio (RCR)	dermal exposure (mg/kg bw/day)	Risk characterisation ratio (RCR)	Risk characterisation ratio (RCR)
PROC1	0.01	0.00	0.34	0.00	0.00

PROC2	10.0	0.20	1.37	0.00	0.20
PROC2 (Storage)	10.0	0.20		0.00	0.20
PROC3	25.0	0.49	0.34	0.00	0.49
PROC3 (elevated)	10.0	0.20	0.03	0.00	0.20
PROC3 (Sampling)	25.0	0.49	0.34	0.00	0.49
PROC4	20.0	0.39	6.86	0.02	0.41
PROC5	35.0	0.69	13.71	0.04	0.72
PROC8a (manual)	35.0	0.69	13.71	0.04	0.72
PROC8a (maintenance)	5.00	0.10	1.37	0.00	0.10
PROC8b (bulk)	35.0	0.69	6.86	0.02	0.70
PROC8b (Drum)	35.0	0.69	6.86	0.02	0.70
PROC9	35.0	0.69	6.86	0.02	0.70
PROC14	35.0	0.69	3.43	0.01	0.70
PROC15	10.0	0.20	0.34	0.00	0.20

3.2 Environmental exposure prediction

Exposure assessment (method/calculation model)	EUSES 2.1.1

Storage

environmental exposure	STP	freshwater	marine water	soil	freshwater sediment	marine sediment
PEC Environment	3.35	3.36E-01	3.36E-02	1.67	1.76	1.76E-01
RCR	2.46E-01	4.95E-01	4.95E-02	7.38E-01	4.95E-01	4.94E-02

Human exposure prediction: : 1.61E-03 mg/kg/day

4. Evaluation guidance to downstream user

For scaling see	Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).	
Exposure assessment instrument/tool/method	Workers	ECETOC TRA v.2
	environmental exposure	EUSES 2.1.1