

**ANNEX II**

**EXPOSURE SCENARIOS**

**BUTYL ACRYLATE**

**EC #: 205-480-7      CAS #: 141-32-2**

**VERSION: 1.0**

## Table of Contents

EXPOSURE ASSESSMENT.....	4
1.1. Manufacture and distribution of the substance .....	9
1.1.1. Exposure Scenario.....	9
1.1.2. Exposure Estimation.....	16
1.2. Polymerization at production sites .....	19
1.2.1. Exposure Scenario.....	19
1.2.2. Exposure Estimation.....	24
1.3. Polymerization at downstream user sites.....	26
1.3.1. Exposure Scenario.....	26
1.3.2. Exposure Estimation.....	30
1.4. Manufacture of intermediates at downstream user sites .....	31
1.4.1. Exposure Scenario.....	31
1.4.2. Exposure Estimation.....	35
1.5. Use as laboratory reagent .....	36
1.5.1. Exposure Scenario.....	36
1.5.2. Exposure Estimation.....	37
2. RISK CHARACTERISATION .....	38
2.1. Manufacture and distribution of the substance .....	39
2.1.1. Human Health .....	39
2.1.1.1. Workers.....	39
2.1.1.2. Consumers.....	41
2.1.1.3. Indirect exposure to humans via the environment.....	41
2.1.2.1. Aquatic compartment (incl. sediment) .....	42
2.1.2.2. Terrestrial compartment .....	42
2.1.2.3. Atmospheric compartment .....	42
2.1.2.4. Microbiological activity in Sewage Treatment Systems .....	43
2.2. Polymerization at production sites .....	44
2.2.1. Human Health .....	44
2.2.1.1. Workers.....	44
2.2.1.2. Consumers.....	44
2.2.1.3. Indirect exposure to humans via the environment.....	45
2.2.2. Environment.....	46
2.2.2.1. Aquatic compartment (incl. sediment) .....	46
2.2.2.2. Terrestrial compartment .....	46
2.2.2.3. Atmospheric compartment .....	46
2.2.2.4. Microbiological activity in Sewage Treatment Systems .....	47
2.3. Polymerization at downstream user sites.....	48
2.3.1. Human Health .....	48
2.3.1.1. Workers.....	48
2.3.1.2. Consumers.....	48
2.3.1.3. Indirect exposure to humans via the environment.....	48
2.3.2. Environment.....	49
2.3.2.1. Aquatic compartment (incl. sediment) .....	49
2.3.2.2. Terrestrial compartment .....	49
2.3.2.3. Atmospheric compartment .....	50
2.3.2.4. Microbiological activity in Sewage Treatment Systems .....	50
2.4. Manufacture of intermediates at downstream user sites .....	51
2.4.1. Human Health .....	51
2.4.1.1. Workers.....	51
2.4.1.2. Consumers.....	51
2.4.1.3. Indirect exposure to humans via the environment.....	52
2.4.2. Environment.....	52
2.4.2.1. Aquatic compartment (incl. sediment) .....	53
2.4.2.2. Terrestrial compartment .....	53
2.4.2.3. Atmospheric compartment .....	53
2.4.2.4. Microbiological activity in Sewage Treatment Systems .....	53

2.5. Use as laboratory reagent .....	54
2.5.1. Human Health .....	54
2.5.1.1. Workers.....	54
2.5.1.2. Consumers.....	54
2.5.1.3. Indirect exposure to humans via the environment.....	54
2.5.2. Environment.....	54
2.6. Overall exposure (combined for all relevant emission/release sources) .....	55
2.6.1. Human health (combined for all exposure routes).....	55
2.6.2. Environment (combined for all emission sources) .....	55

## EXPOSURE ASSESSMENT

### General remarks

n-Butyl acrylate is manufactured as a chemical intermediate in a closed system. Its major use is in the production of homo- and co-polymers with other monomers (i.e. acrylic acid and its salts, esters, amides, etc.) to produce emulsion polymers. The three major uses of polymers of acrylate esters are: surface coatings, adhesives/sealants and textiles.

#### Remarks

Description of ECETOC TRA details can be found in the Technical Report 93 (2004) or at <https://www.ecetoc-tra.org/>. (version used: ECETOC TRA v2.0)

The assessment of environmental exposure was carried out by means of EUSES v2.1. Documentation concerning EUSES 2.1 can be found at <http://ecb.jrc.ec.europa.eu/euses/>.

#### Human health – Worker

- Long-term exposure:

Butyl acrylate is a chemical intermediate, manufactured and processed within closed systems. The primary routes of industrial exposure to butyl acrylate are skin contact and inhalation. In an industrial setting, ingestion is not an anticipated route of exposure.

Long-term exposure systemic DNELs were not calculated due to the lack of long-term systemic effects. Dose-level selection for long-term studies was limited by severity of local effects on the upper respiratory tract.

- Short-term exposure:

In addition, an induction-specific DNEL was derived for skin sensitization.

#### Human health – Worker and Consumer

The exposure assessment covers the life cycle of the substance (monomer) until the trans-esterification or polymerization reaction. The unreacted residual monomer in a polymer is to be regarded as impurity (< 1000 ppm) that need not to be critically addressed in the exposure assessment.

All use descriptors relevant for the pure substance are addressed in this chapter of the CSR. All other relevant use descriptors are considered valid only for preparations containing the residual monomer at < 1000 ppm.

#### Environment

Releases of n-butyl acrylate into the environment are to be expected during production and processing (polymerization, transesterification) mainly via wastewater and lesser amounts via exhaust gases.

The exposure assessment covers the life cycle of the substance (monomer) up to the polymerization reaction. The residual monomer in a polymer is to be regarded as impurity (< 1000 ppm) therefore, development of exposure scenarios covering downstream uses (i.e., professional use, consumer use, etc) are not required and have not been conducted for this assessment.

Analytical monitoring of the plant site effluent to and from the STP at all 5 production sites of nBA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg/L in the effluent from the STP.

Based on those analytical measurements an overestimating value of 0.01 mg.L<sup>-1</sup> [10 µg.L<sup>-1</sup>] was input into EUSES as the STP effluent concentration for the production sites and the internal and external DU process sites. Thus the assumption of 10 µg.L<sup>-1</sup> would be considered

Water emission samples were analyzed in February, 2010, and April, 2010, for a total of at least six samples per site taken on different work days. Values in the following table represent averages of the influent to and effluent from the wastewater treatment plant at each site. The five sites represent major producers and downstream users in Europe.

N-BUTYL ACRYLATE										
µg/l	Site 1		Site 2		Site 3		Site 4		Site 5	
Industrial Use	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent
Manufacture and Distribution of Substance	17.46	<1	1184	<1	202	<1	33.6	<1	<1	<1
Polymerization at Production Site			1184	<1			33.6	<1		
Polymerization at Downstream User Sites										
Manufacture of Intermediates at Production and Downstream User Sites							33.6	<1		
Use as Laboratory Reagent			1184	<1	202	<1				
Use of Preparations Containing Up to 21% Monomer										
Other Uses of Substance as Intermediate										

Sampling in this manner encompasses production (see Exposure Scenario 1) and [internal] downstream uses including wet polymerization (see Exposure Scenario 2).

Calculations have been made on the basis of general accessible market information on the overall production volume of n-butyl acrylate, i.e. TECNON Report (Tecnon OrbiChem, November 2009).

**Table 1.1: Production and Life Cycle Steps**

<b>Production</b>	<b>Fraction</b>	<b>mt/a</b>	<b>IndCat</b>	<b>UseCat</b>
Site 1	0.55	2.80E05	[3] Chemical Industry: chemicals used in synthesis	[33] Intermediates
Site 2	0.2	1.0E05	[3] Chemical Industry: chemicals used in synthesis	[33] Intermediates
Site 3	0.1	5.1E04	[3] Chemical Industry: chemicals used in synthesis	[33] Intermediates
Site 4	0.1	5.1E04	[3] Chemical Industry: chemicals used in synthesis	[33] Intermediates
Site 5	0.05	2.55E04	[3] Chemical Industry: chemicals used in synthesis	[33] Intermediates
<b>Other Life Cycle Steps (DU)</b>	<b>Fraction</b>	<b>mt/a</b>	<b>IndCat</b>	<b>UseCat</b>
Wet Polymerization [Internal]	0.42	2.58E05	[11] Polymers Industry	[33] Intermediates / [43] Process regulator
Wet Polymerization [External]	0.53	3.26E05	[11] Polymers Industry	[33] Intermediates / [43] Process regulator
Intermediate Manufacture [External]	0.05	3.08E04	[3] Chemical Industry: chemicals used in synthesis	[33] Intermediates

mt/a = metric tons per year

## Short description of all exposure scenarios

**Table 1.2: Short description of all exposure scenarios with their use descriptors and life cycle stage**

Number (ES)	Short description of exposure scenario	Product Category (PC)	Life cycle stage covered by ES						Sector of use (SU)	Process category (PROC)	Article Category (AC)	Environmental release category (ERC)
			Manufacture	Formulation	End use			Service Life				
					Industrial	Professional	Consumer					
1	Manufacture and distribution of the substance	19	X	-	X	-	-	-	8, 9	1, 2, 3, 8a, 8b,9	-	1
2	Polymerization at production sites	19, 32	-	-	X	-	-	-	8, 9, 12	1, 2, 3, 4, 5, 8a, 8b, 9	-	6c + 6d
3	Polymerization at downstream user sites	19, 32	-	-	X	-	-	-	8, 9, 12	1, 2, 3, 4, 5, 8a, 8b, 9	-	6c + 6d
4	Manufacture of intermediates at downstream user sites	19, 32	-	-	X	-	-	-	8, 9	1, 2, 3, 4, 5, 8a, 8b, 9	-	6a
5	Use as a laboratory agent	19, 21	-	-	X	-	-	-	8, 9, 24	15	-	1*

\*The substance is used and handled as a laboratory agent in small-scale analytical laboratories associated with the production sites. Any residues are treated together with residues from manufacture at the production sites. Thus, this use (PROC 15) is linked with ERC 1 for manufacture.

Based on the physico-chemical properties of the substance and the overall release into the environment described in the five exposure scenarios, regional PECs for the various environmental compartments were calculated by means of EUSES v2.1.

**Regional PECs:****Table 1.3**      **PECs Regional**

Compartment	PEC	Unit
Surface water	1.19E-03	mg L-1
Seawater	9.58E-05	mg L-1
Air	2.3E-04	mg m-3
Agricultural soil	6.07E-04	mg kgwwt-1
Pore water of agricultural soil	3.62E-04	mg L-1
Natural soil	3.53E-05	mg kgwwt-1
Industrial soil	6.22E-03	mg kgwwt-1
Sediment	3.01E-03	mg kgwwt-1
Seawater sediment	2.34E-04	mg kgwwt-1

Total daily intake (regional) for humans was estimated to be 1.42E-04 mg/kg bw/d.

Taking into account the divergent process conditions (technical and otherwise) at the different producer and downstream user facilities, all PROCs with the exception of PROC 1 and 15 were calculated using three different scenarios, hereafter named Scenario A, B, and C. In these scenarios operational measures, the use of personal protection equipment and strict time limits for exposure respectively were applied to make sure that use of the substance in the intended processes is safe.



## 1.1. Manufacture and distribution of the substance

### 1.1.1. Exposure Scenario

Table 1.4 Description of the ES

<b>1.1.1.1. Title</b>	
<b>Reference number</b>	1
<b>Free short title</b>	Manufacture and distribution of the substance
<b>Systematic title based on use descriptor</b>	SU 8 and 9; PROC 1, 2, 3, 8a, 8b, and 9; ERC 1
<b>Processes, tasks, activities covered</b>	PROC1: Use in closed process, no likelihood of exposure; Industrial setting. PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting. PROC3: Use in closed batch process (synthesis or formulation); Industrial setting. PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities; Industrial setting. PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial setting. PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.
<b>Environment characteristic covered</b>	ERC1: Production of chemicals.
<b>1.1.1.2. Operational conditions and risk management measures</b>	
Production in closed systems. Manufacture of the substance is limited to 5 production sites in Europe.	
<b>1.1.1.2.1 Control of workers exposure for PROC 1</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure.
<b>Use descriptor covered</b>	PROC 1
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>Product characteristic</b>	
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
This information is not needed for assessment of worker's exposure.	
<b>Frequency and duration of use/exposure</b>	
Duration of exposure	> 4 hours/day
Frequency of exposure	≤ 240 days/year
<b>Human factors not influenced by risk management</b>	
Exposed skin surface	Palm of one hand (240 cm <sup>2</sup> )
<b>Other given operational conditions affecting workers exposure</b>	

Location	Inside		
Domain	Industrial		
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not applicable – closed system			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Not applicable – closed system			
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not applicable – closed system			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Not applicable – closed system			
<b>1.1.1.2.2 Control of workers exposure for PROC 2</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling).		
<b>Use descriptor covered</b>	PROC 2		
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional exposure will arise e.g. through maintenance, sampling and equipment brakings.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid
Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
This information is not needed for assessment of worker's exposure.			
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	> 4 hours/day	> 4 hours/day	15 min - 1 hour/day
Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )
<b>Other given operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not applicable – closed system			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation <sup>3</sup>	yes Effectiveness: 90%	no	no
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not applicable – closed system			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			

EC number:  
205-480-7

butyl acrylate

CAS number:  
141-32-2

Suitable respiratory protection	no	90%	no
Gloves <sup>4</sup>	yes	yes	yes
Chemical goggles	yes	yes	yes
<b>1.1.1.2.3 Control of workers exposure for PROC 3</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting.		
<b>Use descriptor covered</b>	PROC 3		
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, but where some opportunity for contact with chemicals occurs (e.g. through sampling).		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid
Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
This information is not needed for assessment of worker's exposure.			
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	1 - 4 hours/day	> 4 hours/day	< 15 min/day
Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Palm of one hand (240 cm <sup>2</sup> )	Palm of one hand (240 cm <sup>2</sup> )	Palm of one hand (240 cm <sup>2</sup> )
<b>Other given operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not relevant			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation <sup>3</sup>	yes Effectiveness: 90%	no	no
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not relevant			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Suitable respiratory protection	no	95%	60% <sup>1</sup>
Gloves <sup>4</sup>	yes	yes	yes
Chemical goggles	yes	yes	yes
<b>1.1.1.2.4 Control of workers exposure for PROC 8a</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities; Industrial or non-industrial setting.		

<b>Use descriptor covered</b>	PROC 8a		
<b>Processes, tasks, activities covered</b>	PROC 8a: Sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid
Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
Not relevant			
<b>Operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	15 min - 1 hour/day	15 min - 1 hour/day	< 15 min/day
Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Both hands (960 cm <sup>2</sup> )	Both hands (960 cm <sup>2</sup> )	Both hands (960 cm <sup>2</sup> )
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not relevant.			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation <sup>3</sup>	yes Effectiveness: 90%	no	no
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not relevant.			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Suitable respiratory protection	no	90%	60% <sup>1</sup>
Gloves <sup>4</sup>	yes	yes	yes
Chemical goggles	yes	yes	yes
<b>1.1.1.2.5 Control of workers exposure for PROC 8b</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial or non-industrial setting.		
<b>Use descriptor covered</b>	PROC 8b		
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid

EC number:  
205-480-7

butyl acrylate

CAS number:  
141-32-2

Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
Not relevant			
<b>Operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	> 4 hours/day	1 – 4 hours/day	< 15 min/day
Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not relevant.			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation <sup>3</sup>	yes Effectiveness: 97%	no	no
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not relevant.			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Suitable respiratory protection	no	95%	60% <sup>1</sup>
Gloves <sup>4</sup>	yes	yes	yes
Chemical goggles	yes	yes	yes
<b>1.1.1.2.6 Control of workers exposure for PROC 9</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.		
<b>Use descriptor covered</b>	PROC 9		
<b>Processes, tasks, activities covered</b>	PROC 9: Filling lines specifically designed for both, capturing vapour and aerosol emissions and minimise spillage.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid
Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
Not relevant			
<b>Operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	15 min – 1 hour/day	1 – 4 hours/day	< 15 min/day

EC number:  
205-480-7

butyl acrylate

CAS number:  
141-32-2

Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
Human factors not influenced by risk management			
Exposed skin surface	Palm of both hands (480 cm²)	Palm of both hands (480 cm²)	Palm of both hands (480 cm²)
Technical conditions and measures at process level (source) to prevent release			
Not relevant.			
Technical conditions and measures to control dispersion from source towards the worker			
Local exhaust ventilation <sup>3</sup>	yes Effectiveness: 90%	no	no
Organisational measures to prevent /limit releases, dispersion and exposure			
Not relevant.			
Conditions and measures related to personal protection, hygiene and health evaluation			
Suitable respiratory protection	no	95%	60% <sup>1</sup>
Gloves <sup>4</sup>	yes	yes	yes
Chemical goggles	yes	yes	yes
1.1.1.2.7 Control of environmental exposure for ERC 1			
Free short title	Production of chemical.		
Use descriptor covered	ERC 1		
Description	Production of organic and inorganic substances in chemical, petrochemical, primary metals and minerals industry including intermediates, monomers using continuous processes or batch processes applying dedicated or multi-purpose equipment, either technically controlled or operated by manual interventions.		
Assessment Method	EUSES v2.1		
Product characteristics			
Physical state	liquid		
Concentration of substance	100%		
Amounts used			
Maximum daily use at a site	≤ 933 tons/day		
Maximum annual use at a site	≤ 280000 tons/year		
Fraction of the main local source	1		
Frequency and duration of use	300 days (no. of emission days/year)		
Pattern of release to the environment	Continuous		
Environment factors not influenced by risk management			
Receiving surface water flow rate	≥ 1.8E+04 m3/d (default)		
Other given operational conditions affecting environmental exposure			
Industry category	3: Chemical industry: chemicals used in synthesis		
Use category	33: Intermediates		
Main category production	Ib: Intermed. stored on-site/continuous prod.		
Main category industrial use	Ib: Continuous production process		
Extra details on use category	Wet process		
Emission tables	Production: A1.2, B1.6; Industrial use: A3.3, B3.2		
Indoor use.			

	Production	Industrial use
Release fraction to air from process	1E-04 (default)	1E-05 (default)
Release fraction to wastewater from process	3E-03 (default)	5E-04 (default)
Release fraction to soil from process	1E-05 (default)	1E-04 (default)
Technical conditions and measures at process level (source) to prevent release		
Fraction connected to sewer system	100%	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		
Dry sludge application on agricultural soil	no	
Organizational measures to prevent/limit release from site		
Fraction of EU tonnage for region (private use)	0%	
Conditions and measures related to municipal sewage treatment plant		
Municipal Sewage Treatment Plant (STP)	Yes (freshwater and marine assessment)	
Discharge rate of the Municipal STP	≥ 2000 m3/d (default)	
Incineration of the sludge of the Municipal STP	No (default)	
Concentration of chemical in untreated wastewater <sup>2</sup>	1.64E+06 µg/L (EUSES output)	
Concentration of chemical (total) in the STP effluent <sup>2</sup>	10 µg/L	
Conditions and measures related to external treatment of waste for disposal		
Not relevant.		
Conditions and measures related to external recovery of waste		
Not relevant.		

<sup>1</sup> Respiratory protection: another effectiveness value was applied

<sup>2</sup> Analytical monitoring of the plant site effluent to and from the STP at all 5 production sites of nBA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg.L<sup>-1</sup> in the effluent from the STP.

Based on those analytical measurements an overestimating value of 0.01 mg.L<sup>-1</sup> [10 µg.L<sup>-1</sup>] was input into EUSES as the STP effluent concentration for the production sites and the internal and external DU process sites. Thus the assumption of 10 µg.L<sup>-1</sup> would be considered conservative since measured values were below the LOD of 1 µg.L<sup>-1</sup>.

<sup>3</sup> The LEV exposure modifying factors for dermal exposure implemented in the ECETOC TRA v2.0 are not considered.

<sup>4</sup> Gloves were implemented as an additional RMM. The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

### 1.1.2. Exposure Estimation

**Table 1.5** Estimated exposure for workers / PROC 1

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	100.0	NA	NA	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	0.0534	NA	NA	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	100.0	NA	NA	µg/cm <sup>2</sup>

NA = Not applicable

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

**Table 1.6** Estimated exposure for workers / PROC 2

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	40.0	40.0	40.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	0.0534	0.0534	10.683	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	40.0	40.0	40.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.



**Table 1.7 Estimated exposure for workers / PROC 3**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	20.0	20.0	20.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	8.0125	6.677	5.342	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	20.0	20.0	20.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

**Table 1.8 Estimated exposure for workers / PROC 8a**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	200.0	200.0	200.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	5.342	5.342	10.683	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	200.0	200.0	200.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

**Table 1.9 Estimated exposure for workers / PROC 8b**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	200.0	200.0	200.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	8.0125	8.0125	10.683	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	200.0	200.0	200.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

**Table 1.10 Estimated exposure for workers / PROC 9**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	200.0	200.0	200.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	5.342	8.0125	10.683	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	200.0	200.0	200.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

**Table 1.11 Estimated exposure for the environment / Production (ERC 1)**

Compartment	PEC / TDI	Unit	Remark
STP	1E-02	mg L-1	Production site 1 is bigger than the other four production sites. Only results from the largest producer are reported.
Freshwater	2.19E-03	mg L-1	
Freshwater sediment	5.93E-03	mg kgwwt-1	
Soil (agricultural)	7.9E-03	mg kgwwt-1	
Marine water	1.96E-04	mg L-1	
Marine water sediment	5.3E-04	mg kgwwt-1	
Total daily intake man via the environment	0.0129	mg.kgbw-1.d-1	
Compartment	PEC	Unit	Remark
Air (annual average)	0.0432	mgc.m-3	Production site 1 is bigger than the other four production sites. Only results from the largest producer are reported.

## 1.2. Polymerization at production sites

### 1.2.1. Exposure Scenario

**Table 1.12 Description of the ES**

<b>1.2.1.1. Title</b>	
<b>Reference number</b>	2
<b>Free short title</b>	Polymerization at production sites.
<b>Systematic title based on use descriptor</b>	SU 8, 9 and 12; PROC 1, 2, 3, 4, 5, 8a, 8b, and 9; ERC 6c + 6d
<b>Processes, tasks, activities covered</b>	<p>PROC1: Use in closed process, no likelihood of exposure; Industrial setting.</p> <p>PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.</p> <p>PROC3: Use in closed batch process (synthesis or formulation); Industrial setting.</p> <p>PROC4: Use in batch and other processes (synthesis) where opportunity for exposure arises; Industrial setting.</p> <p>PROC5: Mixing and blending in batch processes for formulation of preparations and articles (multistage and/or significant contact); Industrial setting.</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities; Industrial setting.</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial setting.</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.</p>
<b>Environment characteristic covered</b>	<p>ERC 6c: Industrial use of monomers for manufacture of thermoplastics.</p> <p>ERC 6d: Production of resins/rubbers.</p>
<b>1.2.1.2. Operational conditions and risk management measures</b>	
Polymerization, processes limited to the 5 production sites.	
<b>1.2.1.2.1 Control of workers exposure for PROC 1</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure.
<b>Use descriptor covered</b>	PROC 1
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
For further information see Table 1.4	
<b>1.2.1.2.2 Control of workers exposure for PROC 2</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling).
<b>Use descriptor covered</b>	PROC 2
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions.

	It is not high integrity and occasional exposure will arise e.g. through maintenance, sampling and equipment brakings.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>For further information see Table 1.4</b>			
<b>1.2.1.2.3 Control of workers exposure for PROC 3</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting.		
<b>Use descriptor covered</b>	PROC 3		
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, but where some opportunity for contact with chemicals occurs (e.g. through sampling).		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>For further information see Table 1.4</b>			
<b>1.2.1.2.4 Control of workers exposure for PROC 4</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Use in batch and other process (synthesis) where opportunity for exposure arises; Industrial setting.		
<b>Use descriptor covered</b>	PROC 4		
<b>Processes, tasks, activities covered</b>	Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during the charging, the sampling or discharge of material, and when the nature of the design is likely to result in exposure.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid
Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
Not relevant			
<b>Operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	> 4 hours/day	> 4 hours/day	< 15 min/day
Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not relevant.			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation <sup>3</sup>	yes Effectiveness: 90%	no	no
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not relevant.			

<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Suitable respiratory protection	no	90%	no
Gloves <sup>4</sup>	yes	yes	yes
Chemical goggles	yes	yes	yes
<b>1.2.1.2.5 Control of workers exposure for PROC 5</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Mixing and blending in batch processes for formulation of preparations and articles (multistage and/or significant contact); Industrial setting.		
<b>Use descriptor covered</b>	PROC 5		
<b>Processes, tasks, activities covered</b>	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.		
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications		
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Product characteristic</b>			
Physical state	liquid	liquid	liquid
Concentration of substance	100%	100%	100%
<b>Amounts used</b>			
Not relevant			
<b>Operational conditions affecting workers exposure</b>			
Location	Inside	Inside	Inside
Domain	Industrial	Industrial	Industrial
<b>Frequency and duration of use/exposure</b>			
Duration of exposure	15 min – 1 hour/day	15 min – 1 hour/day	< 15 min/day
Frequency of exposure	≤ 240 days/year	≤ 240 days/year	≤ 240 days/year
<b>Human factors not influenced by risk management</b>			
Exposed skin surface	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )	Palm of both hands (480 cm <sup>2</sup> )
<b>Technical conditions and measures at process level (source) to prevent release</b>			
Not relevant.			
<b>Technical conditions and measures to control dispersion from source towards the worker</b>			
Local exhaust ventilation	yes Effectiveness: 90%	no	no
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>			
Not relevant.			
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>			
Suitable respiratory protection	no	90%	60% <sup>1</sup>
Gloves <sup>4</sup>	yes + basic training	yes + basic training	yes + basic training
Chemical goggles	yes	yes	yes
<b>1.2.1.2.6 Control of workers exposure for PROC 8a</b>			
<b>Title information related to contributing scenario</b>			
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities; Industrial or non-industrial setting.		

<b>Use descriptor covered</b>	PROC 8a
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.2.1.2.7 Control of workers exposure for PROC 8b</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial or non-industrial setting.
<b>Use descriptor covered</b>	PROC 8b
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.2.1.2.8 Control of workers exposure for PROC 9</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.
<b>Use descriptor covered</b>	PROC 9
<b>Processes, tasks, activities covered</b>	Filling lines specifically designed to for both, capturing vapour and aerosol emissions and minimise spillage.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.2.1.2.9 Control of environmental exposure for ERC 6c + 6d</b>	
<b>Free short title</b>	Industrial use of monomers for manufacture of thermoplastics and Production of resins/rubbers.
<b>Use descriptor covered</b>	ERC 6c + 6d
<b>Description</b>	Industrial use of monomers in the production of polymers, plastics (thermoplastics), polymerization processes. Industrial use of chemicals (cross-linking agents, curing agents) in the production of thermosets and rubbers, polymerization processes.
<b>Assessment Method</b>	EUSES v2.1
<b>Product characteristics</b>	
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
<b>Maximum daily use at a site</b>	≤ 43 tons/day
<b>Maximum annual use at a site</b>	≤ 12900 tons/year
<b>Fraction of the main local source</b>	0.2
<b>Frequency and duration of use</b>	300 days (no. of emission days/year)
<b>Pattern of release to the environment</b>	Continuous
<b>Environment factors not influenced by risk management</b>	

<b>Receiving surface water flow rate</b>	≥ 18000 m <sup>3</sup> /d (default)
<b>Other given operational conditions affecting environmental exposure</b>	
Industry category	11: Polymers industry
Use category	33: Intermediates + 43: Process regulators
Main category industrial use	III: Non-dispersive use
Extra details on use category	Wet: monomers
Emission tables	Industrial use: A3.10, B3.9
Indoor use.	
Release fraction to air from process	1E-02 (default)
Release fraction to wastewater from process	1E-02 (default)
Release fraction to soil from process	0 (default)
<b>Technical conditions and measures at process level (source) to prevent release</b>	
Fraction connected to sewer system	100 %
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	
Dry sludge application on agricultural soil	no
<b>Organizational measures to prevent/limit release from site</b>	
Fraction of EU tonnage for region (private use)	0 %
<b>Conditions and measures related to municipal sewage treatment plant</b>	
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m <sup>3</sup> /d (default)
<b>Incineration of the sludge of the Municipal STP</b>	No (default)
<b>Concentration of chemical in untreated wastewater<sup>2</sup></b>	8.61E+05 µg/L (EUSES output)
<b>Concentration of chemical (total) in the STP effluent<sup>2</sup></b>	10 µg/L
<b>Conditions and measures related to external treatment of waste for disposal</b>	
Not relevant	
<b>Conditions and measures related to external recovery of waste</b>	
Not relevant	

<sup>1</sup> Respiratory protection: another effectiveness value was applied

<sup>2</sup> Analytical monitoring of the plant site effluent to and from the STP at all 5 production sites of nBA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg.L-1 in the effluent from the STP.

Based on those analytical measurements an overestimating value of 0.01 mg.L-1 [10 µg.L-1] was input into EUSES as the STP effluent concentration for the production sites and the internal and external DU process sites. Thus the assumption of 10 µg.L-1 would be considered conservative since measured values were below the LOD of 1 µg.L-1.

<sup>3</sup> The LEV exposure modifying factors for dermal exposure implemented in the ECETOC TRA v2.0 are not considered.

<sup>4</sup> Gloves were implemented as an additional RMM. The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

### 1.2.2. Exposure Estimation

For the estimated exposure for workers / PROC 1 see Table 1.5

For the estimated exposure for workers / PROC 2 see Table 1.6

For the estimated exposure for workers / PROC 3 see Table 1.7

For the estimated exposure for workers / PROC 8a see Table 1.8

For the estimated exposure for workers / PROC 8b see Table 1.9

For the estimated exposure for workers / PROC 9 see Table 1.10

**Table 1.13 Estimated exposure for workers / PROC 4**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	200.0	200.0	200.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	10.683	10.683	10.683	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	200.0	200.0	200.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

**Table 1.14 Estimated exposure for workers / PROC 5**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	200.0	200.0	200.0	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	5.342	5.342	10.683	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	200.0	200.0	200.0	µg/cm <sup>2</sup>

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.



EC number:  
205-480-7

butyl acrylate

CAS number:  
141-32-2

**Table 1.15**      **Estimated exposure for the environment / Polymerization at production sites**  
**(ERC 6c + 6d)**

Compartment	PEC / TDI	Unit	Remark
STP	1E-02	mg L-1	NA
Freshwater	2.19E-03	mg L-1	
Freshwater sediment	5.93E-03	mg kgwwt-1	
Soil (agricultural)	0.0493	mg kgwwt-1	
Marine water	1.96E-04	mg L-1	
Marine water sediment	5.3E-04	mg kgwwt-1	
Total daily intake man via the environment	0.0293	mg.kgbw-1.d-1	

Compartment	PEC	Unit	Remark
Air (annual average)	0.0986	mgc.m-3	NA

NA = Not applicable

## 1.3. Polymerization at downstream user sites

### 1.3.1. Exposure Scenario

**Table 1.16 Description of the ES**

<b>1.3.1.1. Title</b>	
<b>Reference number</b>	3
<b>Free short title</b>	Polymerization at downstream user sites.
<b>Systematic title based on use descriptor</b>	SU 8, 9 and 12; PROC 1, 2, 3, 4, 5, 8a, 8b, and 9; ERC 6c + 6d
<b>Processes, tasks, activities covered</b>	<p>PROC1: Use in closed process, no likelihood of exposure; Industrial setting.</p> <p>PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.</p> <p>PROC3: Use in closed batch process (synthesis or formulation); Industrial setting.</p> <p>PROC4: Use in batch and other processes (synthesis) where opportunity for exposure arises; Industrial setting.</p> <p>PROC5: Mixing and blending in batch processes for formulation of preparations and articles (multistage and/or significant contact); Industrial setting.</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities; Industrial setting.</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial setting.</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.</p>
<b>Environment characteristic covered</b>	<p>ERC 6c: Industrial use of monomers for manufacture of thermoplastics.</p> <p>ERC 6d: Production of resins/rubbers.</p>
<b>1.3.1.2. Operational conditions and risk management measures</b>	
Polymerization processes at various downstream user sites.	
<b>1.3.1.2.1 Control of workers exposure for PROC 1</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure.
<b>Use descriptor covered</b>	PROC 1
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
For further information see Table 1.4	
<b>1.3.1.2.2 Control of workers exposure for PROC 2</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling).
<b>Use descriptor covered</b>	PROC 2
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not

	specifically aimed at minimizing emissions. It is not high integrity and occasional exposure will arise e.g. through maintenance, sampling and equipment brakings.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.3.1.2.3 Control of workers exposure for PROC 3</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting.
<b>Use descriptor covered</b>	PROC 3
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, but where some opportunity for contact with chemicals occurs (e.g. through sampling).
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.3.1.2.4 Control of workers exposure for PROC 4</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in batch and other process (synthesis) where opportunity for exposure arises; Industrial setting.
<b>Use descriptor covered</b>	PROC 4
<b>Processes, tasks, activities covered</b>	Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during the charging, the sampling or discharge of material, and when the nature of the design is likely to result in exposure.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.12</b>	
<b>1.3.1.2.5 Control of workers exposure for PROC 5</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Mixing and blending in batch processes for formulation of preparations and articles (multistage and/or significant contact); Industrial setting.
<b>Use descriptor covered</b>	PROC 5
<b>Processes, tasks, activities covered</b>	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.12</b>	
<b>1.3.1.2.6 Control of workers exposure for PROC 8a</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities; Industrial or non-industrial setting.
<b>Use descriptor covered</b>	PROC 8a
<b>Processes, tasks, activities covered</b>	PROC 8a: Sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.

<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.3.1.2.7 Control of workers exposure for PROC 8b</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial or non-industrial setting.
<b>Use descriptor covered</b>	PROC 8b
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.3.1.2.8 Control of workers exposure for PROC 9</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting
<b>Use descriptor covered</b>	PROC 9
<b>Processes, tasks, activities covered</b>	PROC 9: Filling lines specifically designed for both, capturing vapour and aerosol emissions and minimise spillage.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.3.1.2.9 Control of environmental exposure for ERC 6c + 6d</b>	
<b>Free short title</b>	Industrial use of monomers for manufacture of thermoplastics and Production of resins/rubbers.
<b>Use descriptor covered</b>	ERC 6c + 6d
<b>Description</b>	Industrial use of monomers in the production of polymers, plastics (thermoplastics), polymerization processes. Industrial use of chemicals (cross-linking agents, curing agents) in the production of thermosets and rubbers, polymerization processes.
<b>Assessment Method</b>	EUSES v2.1
<b>Product characteristics</b>	
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
<b>Maximum daily use at a site</b>	≤ 54 tons/day
<b>Maximum annual use at a site</b>	≤ 16300 tons/year
Fraction of the main local source	0.05 (default)
<b>Frequency and duration of use</b>	300 days (no. of emission days/year)
<b>Pattern of release to the environment</b>	Continuous
<b>Environment factors not influenced by risk management</b>	
<b>Receiving surface water flow rate</b>	≥ 18000 m3/d (default)

<b>Other given operational conditions affecting environmental exposure</b>	
Industry category	11: Polymers industry
Use category	33: Intermediates + 43: Process regulators
Main category industrial use	III: Non-dispersive use (default)
Extra details on use category	Polymerization processes
Extra details on use category	Wet: monomers
Emission tables	Industrial use: A3.10, B3.9
Indoor use.	
Release fraction to air from process	1E-02 (default)
Release fraction to wastewater from process	1E-02 (default)
Release fraction to soil from process	0.0 (default)
<b>Technical conditions and measures at process level (source) to prevent release</b>	
Fraction connected to sewer system	100 %
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil</b>	
Dry sludge application on agricultural soil	no
<b>Organizational measures to prevent/limit release from site</b>	
Fraction of EU tonnage for region (private use)	0 %
<b>Conditions and measures related to municipal sewage treatment plant</b>	
<b>Municipal Sewage Treatment Plant (STP)</b>	Yes (freshwater and marine assessment)
<b>Discharge rate of the Municipal STP</b>	≥ 2000 m <sup>3</sup> /d (default)
<b>Incineration of the sludge of the Municipal STP</b>	No (default)
<b>Concentration of chemical in untreated wastewater<sup>2</sup></b>	2.72E+05 µg/L (default)
<b>Concentration of chemical (total) in the STP effluent<sup>2</sup></b>	10 µg/L
<b>Conditions and measures related to external treatment of waste for disposal</b>	
Not relevant	
<b>Conditions and measures related to external recovery of waste</b>	
Not relevant	

<sup>1</sup> Respiratory protection: another effectiveness value was applied

<sup>2</sup> Analytical monitoring of the plant site effluent to and from the STP at all 5 production sites of nBA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg.L-1 in the effluent from the STP.

Based on those analytical measurements an overestimating value of 0.01 mg.L-1 [10 µg.L-1] was input into EUSES as the STP effluent concentration for the production sites and the internal and external DU process sites. Thus the assumption of 10 µg.L-1 would be considered conservative since measured values were below the LOD of 1 µg.L-1.

<sup>3</sup> The LEV exposure modifying factors for dermal exposure implemented in the ECETOC TRA v2.0 are not considered.

<sup>4</sup> Gloves were implemented as an additional RMM. The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

### 1.3.2. Exposure Estimation

For the estimated exposure for workers / PROC 1 see Table 1.5

For the estimated exposure for workers / PROC 2 see Table 1.6

For the estimated exposure for workers / PROC 3 see Table 1.7

For the estimated exposure for workers / PROC 4 see Table 1.13

For the estimated exposure for workers / PROC 5 see Table 1.14

For the estimated exposure for workers / PROC 8a see Table 1.8

For the estimated exposure for workers / PROC 8b see Table 1.9

For the estimated exposure for workers / PROC 9 see Table 1.10

**Table 1.17 Estimated exposure for the environment / Polymerization at DU sites (ERC 6c + 6d)**

Compartment	PEC / TDI	Unit	Remark
STP	1E-02	mg L-1	NA
Freshwater	2.19E-03	mg L-1	
Freshwater sediment	5.93E-03	mg kgwwt-1	
Soil (agricultural)	0.0156	mg kgwwt-1	
Marine water	1.96E-04	mg L-1	
Marine water sediment	5.3E-04	mg kgwwt-1	
Total daily intake man via the environment	0.0369	mg.kgbw-1.d-1	

Compartment	PEC	Unit	Remark
Air (annual average)	0.124	mgc.m-3	NA

NA = Not applicable

## 1.4. Manufacture of intermediates at downstream user sites

### 1.4.1. Exposure Scenario

Table 1.18 Description of the ES

<b>1.4.1.1. Title</b>	
<b>Reference number</b>	4
<b>Free short title</b>	Manufacture of intermediates at downstream user sites.
<b>Systematic title based on use descriptor</b>	SU 8 and 9; PROC 1, 2, 3, 4, 5, 8a, 8b, and 9; ERC 6a
<b>Processes, tasks, activities covered</b>	<p>PROC1: Use in closed process, no likelihood of exposure; Industrial setting.</p> <p>PROC2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling); Industrial setting.</p> <p>PROC3: Use in closed batch process (synthesis or formulation); Industrial setting.</p> <p>PROC4: Use in batch and other processes (synthesis) where opportunity for exposure arises; Industrial setting.</p> <p>PROC5: Mixing and blending in batch processes for formulation of preparations and articles (multistage and/or significant contact); Industrial setting.</p> <p>PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities; Industrial setting.</p> <p>PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial setting.</p> <p>PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.</p>
<b>Environment characteristic covered</b>	ERC 6a: Industrial use of intermediates.
<b>1.4.1.2. Operational conditions and risk management measures</b>	
Manufacture of intermediates at various downstream user sites.	
<b>1.4.1.2.1 Control of workers exposure for PROC 1</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed process, no likelihood of exposure.
<b>Use descriptor covered</b>	PROC 1
<b>Processes, tasks, activities covered</b>	Use of the substance in high integrity contained system where little potential exists for exposures, e.g. any sampling via closed loop systems.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
For further information see Table 1.4	
<b>1.4.1.2.2 Control of workers exposure for PROC 2</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed, continuous process with occasional controlled exposure (e.g. sampling).
<b>Use descriptor covered</b>	PROC 2
<b>Processes, tasks, activities covered</b>	Continuous process but where the design philosophy is not specifically aimed at minimizing emissions.

	It is not high integrity and occasional exposure will arise e.g. through maintenance, sampling and equipment brakings.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.4.1.2.3 Control of workers exposure for PROC 3</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in closed batch process (synthesis or formulation); Industrial setting.
<b>Use descriptor covered</b>	PROC 3
<b>Processes, tasks, activities covered</b>	Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, but where some opportunity for contact with chemicals occurs (e.g. through sampling).
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.4.1.2.4 Control of workers exposure for PROC 4</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use in batch and other process (synthesis) where opportunity for exposure arises; Industrial setting.
<b>Use descriptor covered</b>	PROC 4
<b>Processes, tasks, activities covered</b>	Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during the charging, the sampling or discharge of material, and when the nature of the design is likely to result in exposure.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.12</b>	
<b>1.4.1.2.5 Control of workers exposure for PROC 5</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Mixing and blending in batch processes for formulation of preparations and articles (multistage and/or significant contact); Industrial setting.
<b>Use descriptor covered</b>	PROC 5
<b>Processes, tasks, activities covered</b>	Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.12</b>	
<b>1.4.1.2.6 Control of workers exposure for PROC 8a</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities; Industrial or non-industrial setting.
<b>Use descriptor covered</b>	PROC 8a
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in non dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications



<b>For further information see Table 1.4</b>	
<b>1.4.1.2.7 Control of workers exposure for PROC 8b</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities; Industrial or non-industrial setting.
<b>Use descriptor covered</b>	PROC 8b
<b>Processes, tasks, activities covered</b>	Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.4.1.2.8 Control of workers exposure for PROC 9</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Transfer of substance or preparation into small containers (dedicated filling line, including weighing); Industrial setting.
<b>Use descriptor covered</b>	PROC 9
<b>Processes, tasks, activities covered</b>	Filling lines specifically designed to for both, capturing vapour and aerosol emissions and minimise spillage.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>For further information see Table 1.4</b>	
<b>1.4.1.2.9 Control of environmental exposure for ERC 6a</b>	
<b>Free short title</b>	Industrial use of intermediates.
<b>Use descriptor covered</b>	ERC 6a
<b>Description</b>	Use of intermediates in primarily the chemical industry using continuous processes or batch processes applying dedicated or multi-purpose equipment, either technically controlled or operated by manual interventions, for the synthesis (manufacture) of other substances.
<b>Assessment Method</b>	EUSES v2.1
<b>Product characteristics</b>	
Physical state	liquid
Concentration of substance	100%
<b>Amounts used</b>	
<b>Maximum daily use at a site</b>	≤ 20.5 tons/day
<b>Maximum annual use at a site</b>	≤ 6160 tons/year
<b>Fraction of the main local source</b>	0.2 (default)
<b>Frequency and duration of use</b>	300 days (no. of emission days/year)
<b>Pattern of release to the environment</b>	Continuous
<b>Environment factors not influenced by risk management</b>	
<b>Receiving surface water flow rate</b>	≥ 18000 m3/d (default)
<b>Other given operational conditions affecting environmental exposure</b>	
Industry category	3: Chemical industry: chemicals used in synthesis
Use category	33: Intermediates

Main category industrial use	III: Multi-purpose equipment	
Extra details on use category	Wet process	
Emission tables	Industrial use: A3.3, B3.2	
Indoor use.		
Release fraction to air from process	1E-02 (default)	
Release fraction to wastewater from process	7E-03 (default)	
Release fraction to soil from process	1E-04 (default)	
Technical conditions and measures at process level (source) to prevent release		
Fraction connected to sewer system	100 %	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		
Dry sludge application on agricultural soil	no	
Organizational measures to prevent/limit release from site		
Fraction of EU tonnage for region (private use)	0 %	
Conditions and measures related to municipal sewage treatment plant		
Municipal Sewage Treatment Plant (STP)	Yes (freshwater and marine assessment)	
Discharge rate of the Municipal STP	≥ 2000 m3/d (default)	
Incineration of the sludge of the Municipal STP	No (default)	
Concentration of chemical in untreated wastewater <sup>2</sup>	7.18E+04 µg/L (EUSES output)	
Concentration of chemical (total) in the STP effluent <sup>2</sup>	10 µg/L	
Conditions and measures related to external treatment of waste for disposal		
Not relevant		
Conditions and measures related to external recovery of waste		
Not relevant		

<sup>1</sup> Respiratory protection: another effectiveness value was applied

<sup>2</sup> Analytical monitoring of the plant site effluent to and from the STP at all 5 production sites of nBA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg.L-1 in the effluent from the STP.

Based on those analytical measurements an overestimating value of 0.01 mg.L-1 [10 µg.L-1] was input into EUSES as the STP effluent concentration for the production sites and the internal and external DU process sites. Thus the assumption of 10 µg.L-1 would be considered conservative since measured values were below the LOD of 1 µg.L-1.

<sup>3</sup> The LEV exposure modifying factors for dermal exposure implemented in the ECETOC TRA v2.0 are not considered.

<sup>4</sup> Gloves were implemented as an additional RMM. The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

### 1.4.2. Exposure Estimation

For the estimated exposure for workers / PROC 1 see Table 1.5

For the estimated exposure for workers / PROC 2 see Table 1.6

For the estimated exposure for workers / PROC 3 see Table 1.7

For the estimated exposure for workers / PROC 4 see Table 1.13

For the estimated exposure for workers / PROC 5 see Table 1.14

For the estimated exposure for workers / PROC 8a see Table 1.8

For the estimated exposure for workers / PROC 8b see Table 1.9

For the estimated exposure for workers / PROC 9 see Table 1.10

**Table 1.19**      **Estimated exposure for the environment / Manufacture of intermediates at DU sites (ERC 6a)**

Compartment	PEC / TDI	Unit	Remark
STP	1E-02	mg L-1	NA
Freshwater	2.19E-03	mg L-1	
Freshwater sediment	5.93E-03	mg kgwwt-1	
Soil (agricultural)	5.8E-03	mg kgwwt-1	
Marine water	1.96E-04	mg L-1	
Marine water sediment	5.3E-04	mg kgwwt-1	
Total daily intake man via the environment	0.014	mg.kgbw-1.d-1	

Compartment	PEC	Unit	Remark
Air (annual average)	0.0471	mgc.m-3	NA

NA = Not applicable

## 1.5. Use as laboratory reagent

### 1.5.1. Exposure Scenario

**Table 1.20 Description of the ES**

<b>1.5.1.1. Title</b>	
<b>Reference number</b>	5
<b>Free short title</b>	Use as laboratory reagent
<b>Systematic title based on use descriptor</b>	SU 8, 9 and 24; PROC 15; ERC 1
<b>Processes, tasks, activities covered</b>	PROC15: Use a laboratory reagent; Non-industrial setting.
<b>Environment characteristic covered</b>	ERC1: Production of chemicals.
<b>1.5.1.2. Operational conditions and risk management measures</b>	
Use as laboratory agent at the 5 production sites in Europe.	
<b>1.5.1.2.1 Control of workers exposure for PROC 15</b>	
<b>Title information related to contributing scenario</b>	
<b>Workers related free short title</b>	Use a laboratory reagent; Non-industrial setting.
<b>Use descriptor covered</b>	PROC 15
<b>Processes, tasks, activities covered</b>	Use of substances at small scale laboratory (< 1 L or 1 kg). Larger laboratories and R+D installations should be treated as industrial processes.
<b>Assessment Method</b>	ECETOC TRA Worker v2.0 with modifications
<b>Product characteristic</b>	Industrial
<b>Physical state</b>	liquid
<b>Concentration of substance</b>	100%
<b>Amounts used</b>	
This information is not needed for assessment of worker's exposure.	
<b>Operational conditions affecting workers exposure</b>	
<b>Location</b>	Inside
<b>Domain</b>	Industrial
<b>Frequency and duration of use/exposure</b>	
<b>Duration of exposure</b>	> 4 hours/day
<b>Frequency of exposure</b>	≤ 240 days/year
<b>Human factors not influenced by risk management</b>	
<b>Exposed skin surface</b>	Palm of one hand (240 cm <sup>2</sup> )
<b>Technical conditions and measures at process level (source) to prevent release</b>	
Not relevant.	
<b>Technical conditions and measures to control dispersion from source towards the worker</b>	
<b>Local exhaust ventilation</b>	yes Effectiveness: 90%
<b>Organisational measures to prevent /limit releases, dispersion and exposure</b>	
Not relevant.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<b>Suitable respiratory protection</b>	no

Gloves <sup>4</sup>	yes		
Chemical goggles	yes	yes	yes
1.5.1.2.2 Control of environmental exposure for ERC 1			
Free short title	Production of chemical.		
Use descriptor covered	ERC 1		
Description	Production of organic and inorganic substances in chemical, petrochemical, primary metals and minerals industry including intermediates, monomers using continuous processes or batch processes applying dedicated or multi-purpose equipment, either technically controlled or operated by manual interventions.		
Assessment Method	EUSES v2.1		
For further information see Table 1.4			

<sup>1</sup> Respiratory protection: another effectiveness value was applied

<sup>2</sup> Analytical monitoring of the plant site effluent to and from the STP at all 5 production sites of nBA in Europe were performed, revealing no concentrations above the limit of quantification of 1 µg.L-1 in the effluent from the STP.

Based on those analytical measurements an overestimating value of 0.01 mg.L-1 [10 µg.L-1] was input into EUSES as the STP effluent concentration for the production sites and the internal and external DU process sites. Thus the assumption of 10 µg.L-1 would be considered conservative since measured values were below the LOD of 1 µg.L-1.

<sup>3</sup> The LEV exposure modifying factors for dermal exposure implemented in the ECETOC TRA v2.0 are not considered.

<sup>4</sup> Gloves were implemented as an additional RMM. The following effectiveness values are assumed: Use of suitable gloves: 80%; Use of suitable gloves in combination with basic employee training: 90%; Use of suitable gloves in combination with specific activity training: 95%; Use of suitable gloves in combination with intensive management supervision controls: 98%

## 1.5.2. Exposure Estimation

**Table 1.21 Estimated exposure for workers / PROC 15**

Route of exposure	Concentrations			
Scenario	A	B	C	
	Value			Unit
Long-term exposure, local, dermal	20.0	NA	NA	µg/cm <sup>2</sup>
Long-term exposure, local, inhalative	5.342	NA	NA	mg/m <sup>3</sup>
Short-term exposure, local, dermal <sup>1</sup>	20.0	NA	NA	µg/cm <sup>2</sup>

NA = Not applicable

<sup>1</sup> As dermal exposure generally is considered to accumulate during the period of exposure the full shift dermal exposure estimates will also be used for short-term dermal exposure.

For the estimated exposure for the environment / ERC 1 see Table 1.11

## 2. RISK CHARACTERISATION

### General remarks

#### Human health – Worker and Consumer

- Risk characterization for systemic inhalative effects:

As discussed in the hazard assessment, n-butyl acrylate does not exert long-term systemic toxicity at doses below local irritation effects on the upper respiratory tract and the proposed local DNEL for inhalation is considered to be protective also from systemic toxicity. Thus the exposure scenarios for which a RCR < 1 can be demonstrated comparing the exposure valued with the local inhalative DNEL also cover systemic effects.

Since the risk characterization is solely based on local effects, no RCR combined which does only apply to systemic effects, was calculated.

- Risk characterization for short-term effects:

For risk characterization of short-term effects, only the dermal route was taken into consideration. As stated before, local irritation effects on the upper respiratory tract are the most critical effects observed after short-term or long-term exposure via inhalation determining the DNEL. Long-term exposure scenarios for which a RCR < 1 can be demonstrated comparing the exposure valued with the local inhalative DNEL also cover short-term exposure.

- The risk assessment covers the life cycle of the substance (monomer) until the polymerization reaction. The unreacted residual monomer in a polymer is to be regarded as impurity (< 1000 ppm) that need not to be critically addressed in the risk assessment.

#### Environment

Releases of n-Butyl acrylate into the environment are to be expected during production and processing (polymerization, transesterification) mainly via wastewater and lesser amounts via exhaust gases.

The risk assessment covers the life cycle of the substance (monomer) until the polymerization reaction. The unreacted residual monomer in a polymer is to be regarded as impurity (< 1000 ppm) that need not to be critically addressed in the risk assessment.

## **2.1. Manufacture and distribution of the substance**

### **2.1.1. Human Health**

#### **2.1.1.1. Workers**

**Table 2.1: Risk characterisation – Worker / PROC 1**

<b>Exposure</b>	<b>RCR per route</b>			<b>Safe use</b>
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	
Long-term exposure, local, inhalative	0.00486	NA	NA	yes
Long-term exposure, local, dermal	0.3571	NA	NA	yes
Short-term exposure, local, dermal	0.3571	NA	NA	yes

NA = Not applicable

**Table 2.2: Risk characterisation – Worker / PROC 2**

<b>Exposure</b>	<b>RCR per route</b>			<b>Safe use</b>
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	
Long-term exposure, local, inhalative	0.4856	0.4856	0.9712	yes
Long-term exposure, local, dermal	0.1429	0.1429	0.1429	yes
Short-term exposure, local, dermal	0.1429	0.1429	0.1429	yes

**Table 2.3: Risk characterisation – Worker / PROC 3**

<b>Exposure</b>	<b>RCR per route</b>			<b>Safe use</b>
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	
Long-term exposure, local, inhalative	0.7284	0.607	0.4856	yes
Long-term exposure, local, dermal	0.0714	0.0714	0.0714	yes
Short-term exposure, local, dermal	0.0714	0.0714	0.0714	yes

**Table 2.4: Risk characterization – Worker / PROC 8a**

Exposure	RCR per route			Safe use
Scenario	A	B	C	
Long-term exposure, local, inhalative	0.4856	0.4856	0.9712	yes
Long-term exposure, local, dermal	0.7143	0.7143	0.7143	yes
Short-term exposure, local, dermal	0.7143	0.7143	0.7143	yes

**Table 2.5: Risk characterization – Worker / PROC 8b**

Exposure	RCR per route			Safe use
Scenario	A	B	C	
Long-term exposure, local, inhalative	0.7284	0.7284	0.9712	yes
Long-term exposure, local, dermal	0.7143	0.7143	0.7143	yes
Short-term exposure, local, dermal	0.7143	0.7143	0.7143	yes

**Table 2.6: Risk characterization – Worker / PROC 9**

Exposure	RCR per route			Safe use
Scenario	A	B	C	
Long-term exposure, local, inhalative	0.4856	0.7284	0.9712	yes
Long-term exposure, local, dermal	0.7143	0.7143	0.7143	yes
Short-term exposure, local, dermal	0.7143	0.7143	0.7143	yes



### **2.1.1.2. Consumers**

Not relevant.

### **2.1.1.3. Indirect exposure to humans via the environment**

Indirect exposure to humans via the environment was calculated on a local scale and on a regional scale.

Input data for estimating the RCR:

DNEL (consumer) = 1.27 mg/m<sup>3</sup> (corresponding to approx. 0.363 mg/kg bw/d)

The DNEL (consumer) was converted according to the equation:

DNEL (mg/kg bw/d) = DNEL (mg/m<sup>3</sup>) x 20 m<sup>3</sup> air/person / 70 kg bw

**Table 2.7: Risk characterization – Humans via the environment / Production (ERC 1)**

<b>TDI local [mg/kg bw/d]</b>	<b>TDI regional [mg/kg bw/d]</b>	<b>DNEL [mg/kg bw/d]</b>	<b>MOS local</b>	<b>MOS regional</b>	<b>RCR local</b>	<b>RCR regional</b>	<b>Safe use</b>
0.0129	1.42E-04	0.363	6.50E+03	5.9E+05	0.0355	3.912E-04	yes

TDI: Total daily intake

MOS: margin of safety

RCR: TDI / DNEL

The risk characterisation was performed by calculating the MOS, i.e. the ratio between the total daily intake and the relevant exposure parameter, which is the oral N(L)OAEL from repeated dose toxicity studies. It is assumed that man is exposed throughout his or her lifetime. Additionally, the air concentration to which man is estimated to be exposed can be compared to the inhalatory N(L)OAEL for these endpoints.

The margin of safety (MOS) estimated by EUSES 2.1 was high confirming a safe use on a local and regional scale.

According to the Guidance on information requirements and chemical safety assessment, Chapter R.16 (ECHA 2008), the total daily human doses (local and regional) are to be compared with the DNEL value for external exposure. The resulting RCR (TDI:DNEL-ratio) is < 1, indicating safe use.

Based on the calculated exposure estimates as compared to the respective NOAELs and DNEL, the total daily intake for humans via the environment does not present a potential risk.

## 2.1.2. Environment

The  $M_{safe}$  was calculated manually according to the equation:

$$M_{safe} = M_{used} \times PNEC / PEC_{local}$$

(with  $M_{used}$  = use rate of the substance as defined in the exposure scenario in kg/d)

### 2.1.2.1. Aquatic compartment (incl. sediment)

**Table 2.8: Risk characterisation – Aquatic Environment / Production (ERC 1)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
Freshwater	2.19E-03	0.00272	mg L-1	0.806	1.158E+06	yes
Freshwater sediment	5.93E-03	0.00736	mg kgwwt-1	0.806	1.158E+06	yes
Marine water	1.96E-04	0.000272	mg L-1	0.72	1.296E+06	yes
Marine water sediment	5.3E-04	0.000736	mg kgwwt-1	0.72	1.296E+06	yes

\*Rounded values reported.

### 2.1.2.2. Terrestrial compartment

**Table 2.9: Risk characterisation – Soil / Production (ERC 1)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
Soil	7.9E-03	0.882	mg kgwwt-1	8.95E-03	1.042E+08	yes

\*Rounded values reported.

### 2.1.2.3. Atmospheric compartment

The PEC local for air (annual average) was calculated using default values to be 0.0432 mg/m<sup>3</sup>. Compared to the DNEL (consumer) of 1.27 mg/m<sup>3</sup>, human inhalatory exposure at the estimated local air concentrations does not present a potential risk. The PEC local for air cannot be compared with the PNEC for air (e.g. plant PNEC) since the latter is not available.

The continental concentration of n-Butyl acrylate in the atmosphere was estimated to be 2.63E-06 mg/m<sup>3</sup> and the regional concentration was estimated to be 2.3E-04 mg/m<sup>3</sup>.

According to Q(SAR) data using SRC AOP v1.92, n-Butyl acrylate will be slowly degraded by photochemical processes after exposure to the air reacting with the photochemically produced hydroxyl radicals and with ozone (calculated half-life for a 24-hour day and 0.5E06 OH/cm<sup>3</sup>: 27.96 hours; for a 24-hour day and 7E11 O<sub>3</sub>/cm<sup>3</sup>: 6.55 days).

n-Butyl acrylate is thought to make no contribution to global warming due to lack of Cl, Br or F substituents. The test substance does not belong to the green house gases listed in P Foster, PV Ramaswamy et al. Changes in

EC number:  
205-480-7

butyl acrylate

CAS number:  
141-32-2

Atmospheric Constituents and in Radiative Forcing. In: Climate Change 2007: The Physical Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

Since the substance has an atmospheric lifetime of far less than a year, no potential for stratospheric ozone depletion is expected. The test substance is not listed in Annex I of Regulation (EC) 2037/2000 on substances that deplete the ozone layer. It also does not belong to the substances listed in Annex I of Directive 67/548/EEC which are classified with R59.

It is not likely to make a significant contribution to photochemical ozone formation in the troposphere. There are no indications that n-butyl acrylate will play a role in acidification due to lack of Cl, F, N or S substituents.

#### 2.1.2.4. Microbiological activity in Sewage Treatment Systems

**Table 2.10: Risk characterisation – STP / Production (ERC 1)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
STP	1E-02	3.5	mg L <sup>-1</sup>	2.86E-03	3.262E+08	yes

\*Rounded values reported.

## **2.2. Polymerization at production sites**

### **2.2.1. Human Health**

#### **2.2.1.1. Workers**

For the RCRs Worker / PROC 1 see Table 2.1

For the RCRs Worker / PROC 2 see Table 2.2

For the RCRs Worker / PROC 3 see Table 2.3

For the RCRs Worker / PROC 8a see Table 2.4

For the RCRs Worker / PROC 8b see Table 2.5

For the RCRs Worker / PROC 9 see Table 2.6

**Table 2.11: RCRs Worker / PROC 4**

<b>Exposure</b>	<b>RCR per route</b>			<b>Safe use</b>
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	
Long-term exposure, local, inhalative	0.9712	0.9712	0.9712	yes
Long-term exposure, local, dermal	0.7143	0.7143	0.7143	yes
Short-term exposure, local, dermal	0.7143	0.7143	0.7143	yes

**Table 2.12: RCRs Worker / PROC 5**

<b>Exposure</b>	<b>RCR per route</b>			<b>Safe use</b>
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	
Long-term exposure, local, inhalative	0.4856	0.4856	0.9712	yes
Long-term exposure, local, dermal	0.7143	0.7143	0.7143	yes
Short-term exposure, local, dermal	0.7143	0.7143	0.7143	yes

#### **2.2.1.2. Consumers**

Not relevant.

### 2.2.1.3. Indirect exposure to humans via the environment

Indirect exposure to humans via the environment was calculated on a local scale and on a regional scale.

Input data for estimating the RCR:

DNEL (consumer) = 1.27 mg/m<sup>3</sup> (corresponding to approx. 0.363 mg/kg bw/d)

The DNEL (consumer) was converted according to the equation:

$$\text{DNEL (mg/kg bw/d)} = \text{DNEL (mg/m}^3\text{)} \times 20 \text{ m}^3 \text{ air/person} / 70 \text{ kg bw}$$

**Table 2.13: Risk characterization – Humans via the environment / Polymerization at production sites (ERC 6c + 6d)**

<b>TDI local [mg/kg bw/d]</b>	<b>TDI regional [mg/kg bw/d]</b>	<b>DNEL [mg/kg bw/d]</b>	<b>MOS local</b>	<b>MOS regional</b>	<b>RCR local</b>	<b>RCR regional</b>	<b>Safe use</b>
0.0293	1.42E-04	0.363	144	5.9E+05	0.0807	3.912E-04	yes

TDI: Total daily intake

MOS: margin of safety

RCR: TDI / DNEL

The risk characterisation was performed by calculating the MOS, i.e. the ratio between the total daily intake and the relevant exposure parameter, which is the oral N(L)OAEL from repeated dose toxicity studies. It is assumed that man is exposed throughout his or her lifetime. Additionally, the air concentration to which man is estimated to be exposed can be compared to the inhalatory N(L)OAEL for these endpoints.

The margin of safety (MOS) estimated by EUSES 2.1 was high confirming a safe use on a local and regional scale.

According to the Guidance on information requirements and chemical safety assessment, Chapter R.16 (ECHA 2008), the total daily human doses (local and regional) are to be compared with the DNEL value for external exposure. The resulting RCR (TDI:DNEL-ratio) is < 1, indicating safe use.

Based on the calculated exposure estimates as compared to the respective NOAELs and DNEL, the total daily intake for humans via the environment does not present a potential risk.

### 2.2.2. Environment

The M<sub>safe</sub> was calculated manually according to the equation:

$$M_{\text{safe}} = M_{\text{used}} \times \text{PNEC} / \text{PEC}_{\text{local}}$$

(with M<sub>used</sub> = use rate of the substance as defined in the exposure scenario in kg/d)

#### 2.2.2.1. Aquatic compartment (incl. sediment)

**Table 2.14: Risk characterisation – Aquatic Environment / Polymerization at production sites (ERC 6c + 6d)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
Freshwater	2.19E-03	0.00272	mg L <sup>-1</sup>	0.806	5.335E+04	yes
Freshwater sediment	5.93E-03	0.00736	mg kg <sub>wwt</sub> -1	0.806	5.335E+04	yes
Marine water	1.96E-04	0.000272	mg L <sup>-1</sup>	0.72	5.972E+04	yes
Marine water sediment	5.3E-04	0.000736	mg kg <sub>wwt</sub> -1	0.72	5.972E+04	yes

\*Rounded values reported.

#### 2.2.2.2. Terrestrial compartment

**Table 2.15: Risk characterisation – Soil / Polymerization at production sites (ERC 6c + 6d)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
Soil	0.0493	0.882	mg kg <sub>wwt</sub> -1	0.0559	3.071E+06	yes

\*Rounded values reported.

#### 2.2.2.3. Atmospheric compartment

The PEC local for air (annual average) was calculated using default values to be 0.0986 mg/m<sup>3</sup>. Compared to the DNEL (consumer) of 1.27 mg/m<sup>3</sup>, human inhalatory exposure at the estimated local air concentrations does not present a potential risk.

For further details see 2.1.2.3.

#### 2.2.2.4. Microbiological activity in Sewage Treatment Systems

**Table 2.16: Risk characterisation – STP / Polymerization at production sites (ERC 6c + 6d)**

Compartment	Concentrations			RCR	Msafe*	Safe use
	PEC	PNEC	Unit			
STP	1E-02	3.5	mg L-1	2.86E-03	1.503E+07	yes

\*Rounded values reported.

## **2.3. Polymerization at downstream user sites**

### **2.3.1. Human Health**

#### **2.3.1.1. Workers**

For the RCRs Worker / PROC 1 see Table 2.1

For the RCRs Worker / PROC 2 see Table 2.2

For the RCRs Worker / PROC 3 see Table 2.3

For the RCRs Worker / PROC 4 see Table 2.11

For the RCRs Worker / PROC 5 see Table 2.12

For the RCRs Worker / PROC 8a see Table 2.4

For the RCRs Worker / PROC 8b see Table 2.5

For the RCRs Worker / PROC 9 see Table 2.6

#### **2.3.1.2. Consumers**

Not relevant.

#### **2.3.1.3. Indirect exposure to humans via the environment**

Indirect exposure to humans via the environment was calculated on a local scale and on a regional scale.

Input data for estimating the RCR:

DNEL (consumer) = 1.27 mg/m<sup>3</sup> (corresponding to approx. 0.363 mg/kg bw/d)

The DNEL (consumer) was converted according to the equation:

DNEL (mg/kg bw/d) = DNEL (mg/m<sup>3</sup>) x 20 m<sup>3</sup> air/person / 70 kg bw

**Table 2.17: Risk characterization – Humans via the environment / Polymerization at DU sites (ERC 6c+ 6d)**

<b>TDI local [mg/kg bw/d]</b>	<b>TDI regional [mg/kg bw/d]</b>	<b>DNEL [mg/kg bw/d]</b>	<b>MOS local</b>	<b>MOS regional</b>	<b>RCR local</b>	<b>RCR regional</b>	<b>Safe use</b>
0.0369	1.42E-04	0.363	2.28E+03	5.9E+05	0.102	3.912E-04	yes

TDI: Total daily intake

MOS: margin of safety

RCR: TDI / DNEL

The risk characterisation was performed by calculating the MOS, i.e. the ratio between the total daily intake and the relevant exposure parameter, which is the oral N(L)OAEL from repeated dose toxicity studies. It is assumed that man is exposed throughout his or her lifetime. Additionally, the air concentration to which man is estimated to be exposed can be compared to the inhalatory N(L)OAEL for these endpoints.



The margin of safety (MOS) estimated by EUSES 2.1 was high confirming a safe use on a local and regional scale.

According to the Guidance on information requirements and chemical safety assessment, Chapter R.16 (ECHA 2008), the total daily human doses (local and regional) are to be compared with the DNEL value for external exposure. The resulting RCR (TDI:DNEL-ratio) is < 1, indicating safe use.

Based on the calculated exposure estimates as compared to the respective NOAELs and DNEL, the total daily intake for humans via the environment does not present a potential risk.

### 2.3.2. Environment

The M<sub>safe</sub> was calculated manually according to the equation:

$$M_{\text{safe}} = M_{\text{used}} \times \text{PNEC} / \text{PEC}_{\text{local}}$$

(with M<sub>used</sub> = use rate of the substance as defined in the exposure scenario in kg/d)

#### 2.3.2.1. Aquatic compartment (incl. sediment)

**Table 2.18: Risk characterisation – Aquatic Environment / Polymerization at DU sites (ERC 6c + 6d)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
Freshwater	2.19E-03	0.00272	mg L <sup>-1</sup>	0.806	6.700E+04	yes
Freshwater sediment	5.93E-03	0.00736	mg kg <sub>wwt</sub> -1	0.806	6.700E+04	yes
Marine water	1.96E-04	0.000272	mg L <sup>-1</sup>	0.72	7.5E+04	yes
Marine water sediment	5.3E-04	0.000736	mg kg <sub>wwt</sub> -1	0.72	7.5E+04	yes

\*Rounded values reported.

#### 2.3.2.2. Terrestrial compartment

**Table 2.19: Risk characterisation – Soil / Polymerization at DU sites (ERC 6c + 6d)**

Compartment	Concentrations			RCR	M <sub>safe</sub> *	Safe use
	PEC	PNEC	Unit			
Soil	0.0156	0.882	mg kg <sub>wwt</sub> -1	0.0176	3.068E+06	yes

\*Rounded values reported.

### 2.3.2.3. Atmospheric compartment

The PEC local for air (annual average) was calculated using default values to be 0.124 mg/m<sup>3</sup>. Compared to the DNEL (consumer) of 1.27 mg/m<sup>3</sup>, human inhalatory exposure at the estimated local air concentrations does not present a potential risk.

For further details see 2.1.2.3.

### 2.3.2.4. Microbiological activity in Sewage Treatment Systems

**Table 2.20: Risk characterisation – STP / Polymerization at DU sites (ERC 6c + 6d)**

Compartment	Concentrations			RCR	Msafe*	Safe use
	PEC	PNEC	Unit			
STP	1E-02	3.5	mg L-1	2.86E-03	1.89E+07	yes

\*Rounded values reported.

## **2.4. Manufacture of intermediates at downstream user sites**

### **2.4.1. Human Health**

#### **2.4.1.1. Workers**

For the RCRs Worker / PROC 1 see Table 2.1

For the RCRs Worker / PROC 2 see Table 2.2

For the RCRs Worker / PROC 3 see Table 2.3

For the RCRs Worker / PROC 4 see Table 2.11

For the RCRs Worker / PROC 5 see Table 2.12

For the RCRs Worker / PROC 8a see Table 2.4

For the RCRs Worker / PROC 8b see Table 2.5

For the RCRs Worker / PROC 9 see Table 2.6

#### **2.4.1.2. Consumers**

Not relevant.

### 2.4.1.3. Indirect exposure to humans via the environment

Indirect exposure to humans via the environment was calculated on a local scale and on a regional scale.

Input data for estimating the RCR:

DNEL (consumer) = 1.27 mg/m<sup>3</sup> (corresponding to approx. 0.363 mg/kg bw/d)

The DNEL (consumer) was converted according to the equation:

$$\text{DNEL (mg/kg bw/d)} = \text{DNEL (mg/m}^3\text{)} \times 20 \text{ m}^3 \text{ air/person} / 70 \text{ kg bw}$$

**Table 2.21: Risk characterization – Humans via the environment / Manufacture of intermediates at DU sites (ERC 6a)**

TDI local [mg/kg bw/d]	TDI regional [mg/kg bw/d]	DNEL [mg/kg bw/d]	MOS local	MOS regional	RCR local	RCR regional	Safe use
0.014	1.42E-04	0.363	6E+03	5.9E+05	0.0386	3.912E-04	yes

TDI: Total daily intake

MOS: margin of safety

RCR: TDI / DNEL

The risk characterisation was performed by calculating the MOS, i.e. the ratio between the total daily intake and the relevant exposure parameter, which is the oral N(L)OAEL from repeated dose toxicity studies. It is assumed that man is exposed throughout his or her lifetime. Additionally, the air concentration to which man is estimated to be exposed can be compared to the inhalatory N(L)OAEL for these endpoints.

The margin of safety (MOS) estimated by EUSES 2.1 was high confirming a safe use on a local and regional scale.

According to the Guidance on information requirements and chemical safety assessment, Chapter R.16 (ECHA 2008), the total daily human doses (local and regional) are to be compared with the DNEL value for external exposure. The resulting RCR (TDI:DNEL-ratio) is < 1, indicating safe use.

Based on the calculated exposure estimates as compared to the respective NOAELs and DNEL, the total daily intake for humans via the environment does not present a potential risk.

### 2.4.2. Environment

The M<sub>safe</sub> was calculated manually according to the equation:

$$M_{\text{safe}} = M_{\text{used}} \times \text{PNEC} / \text{PEC}_{\text{local}}$$

(with M<sub>used</sub> = use rate of the substance as defined in the exposure scenario in kg/d)

**2.4.2.1. Aquatic compartment (incl. sediment)****Table 2.22: Risk characterisation – Aquatic Environment / Manufacture of intermediates at DU sites (ERC 6a)**

Compartment	Concentrations			RCR	Msafe*	Safe use
	PEC	PNEC	Unit			
Freshwater	2.19E-03	0.00272	mg L-1	0.806	2.543E+04	yes
Freshwater sediment	5.93E-03	0.00736	mg kgwwt-1	0.806	2.543E+04	yes
Marine water	1.96E-04	0.000272	mg L-1	0.72	2.847E+04	yes
Marine water sediment	5.3E-04	0.000736	mg kgwwt-1	0.72	2.847E+04	yes

\*Rounded values reported.

**2.4.2.2. Terrestrial compartment****Table 2.23: Risk characterisation – Soil / Manufacture of intermediates at DU sites (ERC 6a)**

Compartment	Concentrations			RCR	Msafe*	Safe use
	PEC	PNEC	Unit			
Soil	5.8E-03	0.882	mg kgwwt-1	6.58E-03	3.116E+06	yes

\*Rounded values reported.

**2.4.2.3. Atmospheric compartment**

The PEC local for air (annual average) was calculated using default values to be 0.0471 mg/m<sup>3</sup>. Compared to the DNEL (consumer) of 1.27 mg/m<sup>3</sup>, human inhalatory exposure at the estimated local air concentrations does not present a potential risk.

For further details see 2.1.2.3.

**2.4.2.4. Microbiological activity in Sewage Treatment Systems****Table 2.24: Risk characterisation – STP / Manufacture of intermediates at DU sites (ERC 6a)**

Compartment	Concentrations			RCR	Msafe*	Safe use
	PEC	PNEC	Unit			
STP	1E-02	3.5	mg L-1	2.86E-03	7.168E+06	yes

\*Rounded values reported.

## **2.5. Use as laboratory reagent**

### **2.5.1. Human Health**

#### **2.5.1.1. Workers**

**Table 2.25: RCRs Worker / PROC 15**

<b>Exposure</b>	<b>RCR per route</b>			<b>Safe use</b>
<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	
Long-term exposure, local, inhalative	0.4856	NA	NA	yes
Long-term exposure, local, dermal	0.0714	NA	NA	yes
Short-term exposure, local, dermal	0.0714	NA	NA	yes

NA = Not applicable

#### **2.5.1.2. Consumers**

Not relevant.

#### **2.5.1.3. Indirect exposure to humans via the environment**

See 2.1.1.3. Indirect exposure to humans via the environment (ERC 1)

### **2.5.2. Environment**

See 2.1.2. Environment

## **2.6. Overall exposure (combined for all relevant emission/release sources)**

### **2.6.1. Human health (combined for all exposure routes)**

Based on the risk assessment, the substance n-butyl acrylate is considered as safe (no risk) for workers at any time of the production and processing (polymerization, transesterification) end use. The unreacted residual monomer in a polymer is to be regarded as impurity (< 1000 ppm) that need not to be critically addressed in the risk assessment.

### **2.6.2. Environment (combined for all emission sources)**

Based on the risk assessment, the substance n-butyl acrylate is considered as safe (no risk) for the environment at any time of the production and processing (polymerization, transesterification) end use. The unreacted residual monomer in a polymer is to be regarded as impurity (< 1000 ppm) that need not to be critically addressed in the risk assessment.