

“KIRIM TİTAN”
ÖZEL ANONİM ŞİRKETİ
Severnaya Promzona, Armyansk şehri,
Kırım Özerk Cumhuriyeti, Ukrayna
96012 Tel. & Fax: (06567) 3-12-60, 3-74-44
Sicil Numarası: 32785994

03.06.2013 No: 18901

LİMTEKS İTHALAT İHRACAT DANIŞMANLIK
MÜMESSİLLİK TİC.LTD.ŞTİ.

İşbu yazımızla, Limteks İthalat İhracat Danışmanlık Mümessillik Tic. Ltd. Şirketinin 27Mayıs 2013 tarihinde, Armyansk şehri, Kırım Özerk Cumhuriyeti, Ukrayna’da bulunan “KIRIM TİTAN” Özel Anonim Şirketi ile işbirliği Sözleşmesi imzaladığını teyit ederiz.

LİMTEKS şirketine, Türkiye ve Orta Doğu bölgesinde “KIRIM TİTAN” fabrikası tarafından üretilen ürünlerin dağıtım yapma hakkı verilmiştir.

“KIRIM TİTAN” fabrikası adına LİMTEKS şirketi, aşağıda listesi bulunan ürünlere ilişkin yıllık kontrat teklif etmektedir:

- ALÜMİNYUM SÜLFAT TEKNİK, SAF (GRANÜL HALİNDE)
- DEMİR SÜLFAT HEPTAHİDRAT, SANAYİ KULLANIMI İÇİN
- SÜLFÜRİK ASİT, TEKNİK KULLANIMI İÇİN

İlgilendiğiniz ürünün hacmi ve fiyatı, LİMTEKS tarafından söz konusu bölge için rezerve edilen yıllık hacimlerine bağlı olarak LİMTEKS tarafından belirlenecektir.

“KIRIM TİTAN” fabrikası, LİMTEKS tarafından talep edilen ürün hacminin üretimini, kalitesini ve sevkiyatın zamanında yapılacağını garanti eder.

Dış Ticaret Departmanı
Baş Mütchassısı:

/imza,kaşe/

Nimatullayev A.Y.

Minakov Ruslan

Çelik Özbilek

O. Cenk Ataman

REACH Registration Certificate



This document certifies that the non-EU manufacturer

CRIMEA TITAN PJSC

Severnaya Promzona * 96012 ARMYANSK * UKRAINE

Has successfully completed the registration of the following substance in accordance with the REACH Regulation (EC) № 1907/ 2006

Aluminium Sulphate; EC: 233-135-0 CAS: 10043-01-3

Registration Number	01-2119531538-36-0065
Tonnage Band	100 - 1.000 mt
Type of Registration	Full Registration
Only Representative	OSTCHEM Germany GmbH Erdmannstr. 10 22765 Hamburg Germany

Date of issue: 01 July 2013

Issued by: OSTCHEM Germany GmbH

Authorized Signature:

A handwritten signature in black ink, appearing to be "U. Romy", is written over the circular stamp.



№ 5615

IRON (II) SULFATE TECHNICAL

ЖЕЛЕЗА (II) СУЛЬФАТ ТЕХНИЧЕСКИЙ

TU U 24.1-32785994-007:2008 Марка А
TU U 24.1-32785994-007:2008 Mark A
Пожаро-взрывобезопасен / FireProof and explosion-proof.

Масса нетто 22 Номер партии 00063 Дата изготовления 06.05.2013
Net weight Number of lot Date of manufacture
Количество единиц упаковок в партии - Контейнер 1000 кг "биг-бег" - 22
Quantity of units sacked in lot
Вид транспорта авт.- ВС 5851 А1 прицеп- ВС 4351 XX
Type of crate
Контрактодержатель
Contract holder
Грузополучатель
Consignee

Наименование показателей Name of index	Норма по ТУ У Norms on TU U	Результат испытаний Results of test
1. Внешний вид. (Appearance.)	Кристаллы серого цвета с желто-зеленым оттенком	Соответствует
2. Массовая доля сульфата железа (FeSO ₄), %, не менее (Mass fraction of iron sulfate (FeSO ₄), %, min)	54	63
в пересчете на Fe, %	20	23
3. Массовая доля свободной серной кислоты в пересчете на H ₂ SO ₄ , %, не более (Mass fraction of free sulfuric acid as H ₂ SO ₄ , %, max)	0,3	отсут
4. Массовая доля нерастворимых в воде веществ, %, не более (Mass fraction of water-insoluble residue, %, max)	0,5	0,1
5. Массовая доля частиц размером больше 0,5 мм, %, не более (Mass fraction of particles sized more than 0,5 mm, %, max)	12	5

Продукт соответствует ТУ У 24.1-32785994-007:2008 Марка А
The product conforms to TU U 24.1-32785994-007:2008 Mark A

Начальник ОТК
Head of Technical Department

А.А.Станишевская
A.A.Stanishevskaya
Мастер смены ОТК

10.06.2013

№ 5614

IRON SULFATE HEPTAHYDRATE

КУПОРОС ЖЕЛЕЗНЫЙ НЕОСУШЕННЫЙ

TU U 24.1-32785994-008:2010

TU U 24.1-32785994-008:2010

Пожаро-взрывобезопасен / FireProof and explosion-proof.

Масса нетто 60

Номер партии 00104

Дата изготовления 31.05.2013

Net weight

Number of lot

Date of manufacture

Количество единиц упаковок в партии - Контейнер 600 кг "биг-бег" - 78

Quantity of units sacked in lot

Вид транспорта Жд. - 65772386

Type of crate

Контрактодержатель

Contract holder

Грузополучатель

Consignee

Наименование показателей Name of index	Норма по ТУ У Norms on TU U	Результат испытаний Results of test
1. Внешний вид (Appearance.)	Кристаллы от зеленовато-голу бого до желто-коричне вого цвета	соответствует
2. Массовая доля сульфата железа (II), %, не менее (Mass portion of sulfuric iron (FeSO ₄), %, min)	49	51
3. Массовая доля свободной серной кислоты в пересчете на H ₂ SO ₄ , %, не более (Mass portion of available sulfuric acid H ₂ SO ₄ , %, max)	3	0,3
4. Массовая доля нерастворимых в воде веществ, %, не более (Mass portion of insoluble residue, %, max)	0,2	0,1
5. Массовая доля гигроскопической (свободной) воды, %, не более (Mass fraction of hygroscopic (free) water, %, max)	5	3

Продукт соответствует ТУ У 24.1-32785994-008:2010

The product corresponds to TU U 24.1-32785994-008:2010

Начальник ОТК
Head of Technical Department

А.А. Станишевская
A.A. Stanishevskaya

Мастер смены ОТК

10.06.2013

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006 (REACH)
and Commission Regulation (EU) No 453/2010

Iron (II) sulphate technical



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1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY

1.1 Product identifier

Substance name	Iron Sulphate
Trade name	Iron(II) sulfate technical types: Iron Sulphate Heptahydrate, Green vitriol technical, Green vitriol non-dried; Iron Sulphate Tetrahydrate, Iron(II) Sulphate technical, Iron (II) Sulfate technical
IUPAC name	Iron(2+) sulfate
ES#	231-753-5
CAS#	7720-78-7
Molecular formula	Fe.H2O4S • nH2O
<i>This substance is classified according to the Annex I of Directive 67/548/EEC and Annex VI of Regulation (EC) No 1272/2008</i>	
REACH registration No	01-2119513203-57-0012

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

Identified uses	<p>Treatment of raw water in the supply of either potable water or industrial process water.</p> <p>Treating waste water and in sludge treatment at waste water treatment plants (WWTPs).</p> <p>In biogas production.</p> <p>Reactive products/precursors e.g. in manufacture of pigments and other iron compounds, also including use as a catalyst.</p> <p>Reducing Cr (VI) content in cement.</p> <p>Land remediation applications</p> <p>Laboratory chemical</p> <p>Agrochemicals</p> <p>In adhesives and sealants</p> <p>In machine-building industry – for neutralization of sulphuric acid in electrolyte production.</p> <p>7-hydrate of iron sulfate is planned to be used for iron sulfate (III) production.</p>
Uses advised against	none

1.3 Details of the supplier of the safety data sheet

Manufacturer	<p>Crimea Titan PJSC</p> <p>Address: Severnaya Promzona, Armyansk, AR Crimea, Ukraine, 96012</p>
Only representative	<p>OSTCHEM Germany GmbH»</p> <p>Hamburg, Erdmannstr. 10, Germany, 22765</p> <p>Irene Nasdala</p> <p>tel. +49 40 5 300 300 (working time only)</p>

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	fax: + 49 40 5 300 30 33 e-mail: nasdala@afkem.com
Responsible person	Andriy Gonchar – Head of R&D Department Address: Severnaya Promzona, Armyansk, AR Crimea, Ukraine, 96012 Tel: +38 06567 3 73 79 (working time only) E-mail: unauka3@titanexport.com
1.4 Emergency telephone number	
+38 06567 3 75 35 (twenty-four-hour)	

2. HAZARDS IDENTIFICATION


2.1. Classification of the substance	
Iron Sulphate, Iron Sulphate technical (Iron Sulphate Tetrahydrate, Iron (II) Sulphate technical, Iron Sulphate Heptahydrate, Green vitriol technical)	
Substance classification according to Regulation (EC) No 1272/2008 [CLP/GHS]	
Hazard Class and Category Code	Acute Tox. 4 Eye Irrit. 2 Skin Irrit. 2
Hazard Statement	H302 H315 H319
Substance classification according to Directive 67/548/EEC	
Hazard symbol	Xn Xi
Risk phrases	R22, R36/38
Safety advice appearing	S26, S37/39, S46, S60 S26, S28, S36/37/39, S46, S60 (only for Iron Sulphate Heptahydrate or Green vitriol technical)
Additional information	
Full text of R- H-phrases see section 16	
Human Health effects	
Inhalation	High concentration of dust in the air may cause cough and irritation of nose and respiratory tract.
Eyes effect	Irritation of the eyes felt for long time is likely to appear.

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Skin effect	Slight irritation of the skin is likely to appear.
Swallowing	Swallowing of small amount is do not cause toxic effect. Swallowing a large amount leads to nausea, vomiting, diarrhea, drop of blood pressure. Upon absorption of large doses cardiovascular disturbances and toxic action towards liver and kidneys follow.

2.2 Label elements	
Product identifier	Iron Sulphate Tetrahydrate (Iron (II) Sulphate technical) Index # none Iron Sulphate Heptahydrate (Green vitriol technical) Index # 026-003-00-7
Hazard pictograms	 GHS07: exclamation mark
Signal word	Warning
Hazard statements	H302: Harmful if swallowed. H315: Causes skin irritation. H319: Causes serious eye irritation
Precautionary statements	P280: Wear protective gloves/protective clothing/eye protection/face protection. P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. P302+P352: IF ON SKIN: Wash with plenty of soap and water. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310: Immediately call a POISON CENTER or doctor/physician. P501: Dispose of contents/container to an approved waste disposal plant.

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2.3 Other hazards

Iron sulphate is neither a PBT nor a vPvB substance.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Chemical name	EINECS #	CAS #	Concentration, range % (w/w)
Iron Sulphate Tetrahydrate (Iron (II) Sulphate technical)			
Iron sulphate tetrahydrate	231-753-5	20908-72-9	85 - <100
Magnesium sulphate	231-298-2	7487-88-9	0 - 5
Calcium sulfate	231-900-3	7778-18-9	0 - 5
Iron Sulphate Heptahydrate (Green vitriol technical)			
Iron sulphate heptahydrate	231-753-5	7782-63-0	85 - <100
Magnesium sulphate	231-298-2	7487-88-9	0 - 5
Free sulphuric acid	231-639-5	7664-93-9	0 - 2
Free water	231-791-2	7732-18-5	0 - 5

4. FIRST AID MEASURES

4.1. Description of first aid measures

General informations	Provide rest, warm conditions, comfort position, fresh air availability.
4.2. Most important symptoms and effects, both acute and delayed	
In case of inhalation	Take out to fresh air. If breathing is difficult, provide oxygen; if not breathing, give artificial respiration.
In case of eye contact	Flush eyes with running water until irritation ceases. If irritation continues, get medical attention.
In case of skin contact	Remove contaminated clothing, shoes and outfit. Flush the contaminated skin with plenty of water using soft soap until the skin is cleaned.
In case of ingestion	Do not induce vomiting. Give to drink plenty of water, give charcoal. Get medical aid immediately.
Information to physician	Treat symptomatically and supportively.
First aid arsenal	Universal medical kit with a set of drugs (in consultation with the medical department of the enterprise).
4.3 Indication of any immediate medical attention and special treatment needed	
Immediate first aid attention is not expected	

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5. FIREFIGHTING MEASURES

5.1. Extinguishing media	
Suitable extinguishing media	Use any means suitable for extinguishing surrounding fire.
Unsuitable extinguishing media	None
5.2. Special hazards arising from the substance or mixture	
Hazardous combustion products	Sulphur and iron oxides
Special protective equipment for fire-fighters	As in any fire, wear a self-contained breathing apparatus in pressure demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Flammable properties	Non-flammable, non-explosive, see section 9.
5.3 Advice for fire-fighters	
Use extinguishing media appropriate for surrounding fire.	

6. ACCIDENTAL RELEASE MEASURES.

6.1. Personal precautions, protective equipment and emergency procedures	
Personal precautions	Avoid direct contact with the substance and inhalation of aerosol particles. Use personal protection means as stated in the section 8.
Emergency procedures	If spilled, immediately contain the spilled substance. Ventilate area and wash spill site after material pickup is complete.
6.2. Environmental precautions	
As a matter of good practice, minimize contamination of sewage water, soil, groundwater, drainage systems, or bodies of water.	
6.3. Methods and material for containment and cleaning up	
Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.	
6.4. Reference to other sections	
Information about personal precautions - see Section 8. Information about waste disposal - see Section 13.	

7. HANDLING AND STORAGE

7.1. Precautions for safe handling	
Precautions for safe handling	Avoid contact with skin and eyes. If exposed, wash to avoid mechanical irritation and soiling. Use scrubbers for collecting and purifying acid gases.

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Fire preventions	None, as product has no flammable properties. See section 5.
Aerosol and dust generation preventions	Use local exhaust ventilation or other appropriate engineering controls to maintain exposures below occupational exposure limit
Electrostatics prevention	As a matter of good practice take measures to prevent the build up of electrostatic charge, such as ensuring all equipment is electrically grounded.
Safe transporting	Adhere to the rules on the transport of goods, which operate for the appropriate type of transport. Not violate the integrity of container. During loading works execute instructions and rules for the appropriate works.
Advice on general occupational hygiene	Do not eat, drink and smoke in work areas, wash hands after use, remove contaminated clothing and protective equipment before entering eating areas.
7.2. Conditions for safe storage, including any incompatibilities	
Technical measures and storage conditions	Store in manufacturer's package in cool and dry area where it is safe from contamination and exposure to rain, snow and subsoil water.
Packaging materials	Package should exclude moisture penetration and guarantee the safety of the product during transportation and storage.
Requirements for storage rooms and vessels	Special requirements for storage structures are not established. The product is to be stored at room temperature and normal humidity environment.
7.3. Specific end use(s)	
none	

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control parameters					
Occupational exposure limits					
Chemical Name		Country		OEL	
Iron (II) sulphate		European Union		TLV = 6 mg/m ³ TWA = 2 mg/m ³	
DNEL/DMEL values:					
DNEL/DMEL					
Worker		Consumer	Exposure route	Exposure frequency	Remark
Industry	Professional				
		0.29 mg/kg bw/day	oral	long-term	

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	0.57 mg/kg bw/day	0.29 mg/kg bw/day	dermal	long-term	
	2.01 mg/m ³	0.50 mg/m ³	inhalation	long-term	

PNEC values:

PNEC		Consumer	Exposure route	Exposure frequency	Remark
Worker	Professional				
Industry	PNEC = 55 mg/kg dw		soil		
	PNEC = 49.5mg Fe/kg dw		sediment		

8.2 Exposure controls

Occupational exposure controls	
Appropriate engineering controls	The running drinkable water must be supplied to the production facilities. Storage of foodstuff and eating in the substance processing area are forbidden.
Respiratory protection	Use dust respirator according to the EN149 equipped with the dust recovery filter according to the EN 143.
Eye/face protection	Wear dust-proof glasses according to the EN166.
Skin protection	It is recommended to use impermeable protective clothing including boots, gloves, lab coat, apron and union suit.
General hygiene considerations	Emergency eyewash and safety shower should be in close proximity as a matter of good practice. Wash hands and face thoroughly with mild soap before eating and drinking.
Environmental exposure controls	
Measures to prevent exposure	The main pollutant is the iron sulfate (II) aerosol. Prevent the entering of the substance into water sources, wastewaters and the soil. The substance half-life – 7-1 days (stable).
Consumer exposure controls	
Measures related to consumer uses of the substance	Additional measures are not required.

9. PHYSICAL AND CHEMICAL PROPERTIES.

9.1. Information on basic physical and chemical properties	
Appearance	Solid, grey with yellow-green hue crystalline powder
Odour	Odourless
Odour threshold	Not applicable
pH	3,7 (10 % water solution) - for anhydrous form
Melting point/range (°C)	480 (anhydrous, decomposes)
Initial boiling point/range (°C)	300 (hydrates decompose) heptahydrate
Flash point (°C)	not applicable
Evaporation rate	not applicable
Flammability	not applicable

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Upper/lower flammability or explosive limits	not applicable
Vapour pressure	does not need to be conducted, because the melting point is above 300°C.
Vapour density	not applicable
Relative density	3.65 D25 - anhydrous form 2.97- heptahydrate
Water solubility (20°C in g/l)	228 g/l at 25°C - anhydrous form 156.5 g/l (cold)- heptahydrate
Partition coefficient n-Octanol/Water (log Po/w)	In accordance with Column 2 of REACH Annex VII, does not need to be conducted as the substance is inorganic.
Auto-ignition temperature (°C)	not applicable
Decomposition temperature (°C)	not applicable
Viscosity	not applicable
Explosive properties	not applicable
Oxidising properties	Will oxidize in air especially in the presence of another acid substance
9.2 Other information	
No other information	

10. STABILITY AND REACTIVITY

10.1 Reactivity	Not reactive under regular storage and use conditions.
10.2 Chemical stability	The product appears to be stable under regular storage and use conditions.
10.3 Possibility of hazardous reactions	No hazardous reactions
10.4 Conditions to avoid	Light, dust, moisture, excess heat, continuous exposure to air.
10.5 Incompatible materials	Heptahydrate – strong acids, alkalies, organic compounds. Anhydrous form – strong acids, alkilies, soluble carbonates, gold and silver salts, lead acetate, limewater, potassium iodide, potassium and sodium tartrate, tannin, herbal astringent tinctures and decoctions.
10.6 Hazardous decomposition products	None

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects.	
Toxicokinetics, metabolism and distribution	
Non-human toxikological data	
Human toxikological data	Iron is an essential element, and plays an important role in

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biological processes, and iron homeostasis (biochemical mechanisms maintaining constant concentration in the cell) is under strict control.
 This water soluble inorganic iron salt do not undergo metabolism per se. As already mentioned iron is bound to transferring for transport to the bone marrow or contained within storage forms.
 About 1 mg of iron is lost each day through sloughing of cells from skin and mucosal surfaces, including the lining of the gastrointestinal tract.
 No physiological mechanism of iron excretion exists.
 Consequently, absorption alone regulates body iron stores

Acute toxicity

The overall pattern of acute oral toxicity for iron salts is that they are harmful if swallowed, with an oral lethal dose in rats of 500-2000 mg/kg bw and approximately 1000 mg/kg bw for humans. There is limited evidence that inhaled soluble iron salts do not impair lung function, and that the dermal lethal dose would be greater than 2000 mg/kg.

Exposure	Value	Exposure time period	Species	Method
oral	LD50 > 2000 mg/kg bw	acute	rat	OECD TG 401 and GLP
oral	LD50 = 1000 mg/kg bw	acute	human	according to EU Directive 93/21/EEC

Irritation	Skin	irritant
	Eye	irritant
	Respiratory tract	not irritant

Ferrous sulfate is skin irritant based on (2:1 animals majority) in rabbit test and is eye irritant.

Respiratory or skin sensitisation
 Not sensitizing
 Results of a reliable LLNA test were clearly negative for ferrous sulfate heptahydrate.

Germ cell mutagenicity
 Not genotoxic

Carcinogenicity
 Not classified as cancerogenic
 Epidemiological associations between high iron intake and/or stores and increased risk of chronic diseases such as cardiovascular disease, type II diabetes and cancer of the gastrointestinal tract are conflicting and do not provide convincing evidence of a causal relationship between iron intake or stores and such chronic diseases.

Toxicity for reproduction
 NOAEL = 1000 mg/kg body weight/day
 In humans, iron supplementation of about 5.8 to 11.7 mg/kg bw/day (for a 60kg individual) is routinely prescribed throughout pregnancy with no adverse effects on pregnancy outcome. Evidence of adverse

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		effects on male testes has only been observed at acutely toxic, overload doses, at which some of the experimental animals died.		
STOT-single exposure		No data available		
Repeated dose toxicity				
Exposure	Value	Exposure time period	Species	Method
oral	NOAEL >11.5 mg/kg/day	61 days	Rat	Appel et al., 2001
STOT-repeated exposure		No data available		

12. Ecological information

12.1. Toxicity				
Aquatic toxicity		Effect dose	Exposure time	Species
Acute toxicity to fish		LC50 = 46.6 mg/L	96 h	Oryzias latipes
Acute toxicity to aquatic invertebrates		EC50 = 19.0 mg/L	48 h	Daphnia magna
Acute toxicity to algae		EC50 = 6.9 mg/L	72 h	Selenastrum capricornutum
12.2 Persistence and degradability				
Abiotic Degradation				
Half-time	Method	Remark		
		In natural ecosystems the absence of oxygen or low pH can result in iron salts remaining in solution but under such conditions environmental effects would be strongly influenced by these parameters. The presence of other ions in solution, such as carbonates and humates, is expected to stabilize ferrous but this is not expected to be a sufficient effect to overcome the precipitation.		
Biodegradation		In effect, ferrous and ferric ions can be treated together, because the ferrous ion is rapidly transformed to ferric ion under the conditions found at typical points of release. Ferric ions released into (or generated in) water will rapidly precipitate as highly insoluble oxides and oxo-hydroxides. These stable compounds are exactly the forms in which iron is found naturally in the earth's crust.		
12.3 Bioaccumulative potential				
The available data on iron concentrations in the environment show the way that organisms display adaptation to the high background concentrations of iron.				
12.4 Mobility in soil				
In surface impoundments Fe ⁺⁺ may transit to Fe ⁺⁺⁺ , which is accompanied by absorption of the dissolved oxygen. Will transform in the environment into ferric salts (trivalent) (basic iron sulfate, iron sulfate, iron sulfate monohydrate, diiron trisulfate).				
12.5 Results of PBT and vPvB assessment				

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The substance is not PBT or vPvB.
12.6 Other adverse effects:
none

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods	
Appropriate disposal / Product	Waste disposal in strict correspondence with the state and local laws and regulations.
Waste codes / waste designations according to EWC / AVV	None, waste is not classified as hazardous according to the Commission Decision 2000/532/EC
Appropriate disposal /Packaging	Dispose of container and unused contents in accordance with federal, state and local requirements.

14. TRANSPORT INFORMATION

14.1. UN number	Not applicable
14.2. UN proper shipping name	Not applicable
14.3. Transport hazard class(es)	Not applicable
14.4. Packing group	Not applicable
14.5. Environmental hazards	Not applicable
14.6. Special precautions for user	Not applicable
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable
14.8 Additional information	The product is transported by railway (RID), road (ADR), and sea (IMDG) transport. The cargo is classified as non-hazardous in compliance with the international rules of carriage. Obligatory mark «Keep dry».

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance	
EU regulation	
This product is classified according to the: Directive 67/548/EEC Directive 1999/45/EC Regulation (EC) No 1272/2008	
15.2 Chemical Safety Assessment	
A chemical safety assessment has been carried out for the iron (II)sulphate	

16. OTHER INFORMATION

Relevant R- , H-, EUH-phrases	Hazard symbol:
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SAFETY DATA SHEET
 according to Regulation (EC) No. 1907/2006 (REACH)
 and Commission Regulation (EU) No 453/2010
Iron (II) sulphate technical



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	<p>Xn: Harmful Xi: Irritant R – phrases: R22: Harmful if swallowed R36/38: Irritating to eyes and skin S – phrases: S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice S28: After contact with skin, wash immediately with plenty of water S37/39: Wear suitable gloves and eye/face protection S36/37/39: Wear suitable protective clothing, gloves and eye/face protection S46: If swallowed, seek medical advice immediately and show this container or label S60: This material and its container must be disposed of as hazardous waste Hazard Statement: H302: Harmful if swallowed. H315: Causes skin irritation. H319: Causes serious eye irritation Precautionary Statement: P280: Wear protective gloves/protective clothing/eye protection/face protection. P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. P302+P352: IF ON SKIN: Wash with plenty of soap and water. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310: Immediately call a POISON CENTER or doctor/physician. P501: Dispose of contents/container to an approved waste disposal plant. Category Code: Acute Tox. 4 - Acute toxicity category 4 Eye Irrit. 2 - Eye irritation category 2 Skin Irrit. 2 - Skin irritation category 2</p>
Abbreviation	<p>OEL – occupational exposure limit DNEL - derived no-effect level PNEC - predicted no effect concentration LD50 – lethal dose</p>

SAFETY DATA SHEET
 according to Regulation (EC) No. 1907/2006 (REACH)
 and Commission Regulation (EU) No 453/2010
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	LC50 – lethal concentration EC50 - half maximal effective concentration NOAEL - no observed adverse effect level PBT or vPvB - persistent, bioaccumulative and toxic or very persistent very bioaccumulative TWA - Time-weighted average
Training instructions	Read carefully the SDS before using the product
Further information	The data contained in the safety data sheet is based on the amount of information and experience available to the company at this time. A consumer product is responsible for the consequences of its use in specific purposes. Information refers to this particular substance. It may be invalid in case this substance is used together with any other materials or any other production process. The user bears responsibility for assessment of applicability and completeness of this information for his particular applications.
Key literature references and sources for data	REACH Registration dossier Chemical safety report for IRON SALTS CATEGORY. Chemical safety report for iron sulphate 2010-10-12 CSR-PI-5.2.6 Specifications TU U 24.1-32785994-007:2008 Iron (II) sulfate technical. State standard DSTU 2463-94 (GOST 6981-94) Commercial copperas. Safety data card of hazardous factor dated 15.08.2008 No. 9612 B000010 Iron (II) sulfate. Safety data card of hazardous factor dated 09.03.2005 No. 3836 B000306 Iron (II) sulfate heptahydrate. Copperas Material Safety Data Sheet MSDS 32785994.21.00131.

ANNEX

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ES 1. MANUFACTURING OF IRON SULFATES		
Section 1		
Exposure Scenario Title		
Title	Manufacturing of iron sulfates	
Use Descriptor	SU3, SU 8	
Process Categories and Environmental Release Categories	PROC 1, 2, 3, 8b ERC 1	
Processes, tasks, activities covered	<p>PROC 1: Use in closed process, no likelihood of exposure. (e.g. including enclosed sampling, waste collection & transfer, charging, discharging)</p> <p>PROC 2: Use in closed continuous processes with occasional exposure (e.g. during sampling, maintenance, equipment cleaning, occasional interventions).</p> <p>PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment breaks).</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging)</p> <p>ERC 1: Manufacture of substances</p>	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 1, 2, 3, 8b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product		
Amounts used	Used amount of substance per day: 483 t Fe/d Annual amount used per site: 145 kT Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to respiration and skin contact		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 480 1500 (PROC7)	(PROC2, PROC3) PROC8b)
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	Refer to control technologies below
	Breathing apparatus	Refer to control technologies below
Other risk management measures related to workers	Procedural and control technologies	It is assumed that solid salts are handled only in closed systems. If performing spraying, it is assumed that closed systems apply
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary

Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.
Human factors not influenced by risk management	Not available
2.2 Control of environmental exposure (ERC 1)	
Product characteristics	
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)
Concentration of substance in product	
Amounts used	Used amount of substance per day: 483 t Fe/d Annual amount used per site: 145 kT Fe/y
Frequency and duration of use	Emission days per site 300 d/y
Operational conditions of use	
Fraction of applied amount lost from process/use to waste gas	0
Fraction of applied amount lost from process/use to waste water	0.0015
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Not applicable.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.
Air emission abatement	Not applicable.
Resulting fraction of applied amount in waste gas released to environment	Not applicable.
Onsite waste treatment	Not applicable.
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.
Municipal or other type of external waste water treatment	Yes
Effluent (of the waste water treatment plant) discharge rate	10000 m ³ /d
Recovery of sludge for agriculture or horticulture	Yes
2.3 Control of consumer exposure	
Consumer exposure is not relevant for the production of iron sulfates.	
Section 3: Exposure estimation	
Section 3.1 Health	

Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	200 (PROC8b, in absence of LEV)
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.14 (PROC8b)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.014 (PROC8b)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m^3)/8h workday ¹ (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) Negligible, assuming any solids are processed only in a closed system. ii) 1.8 (PROC8a, 8b).(LEV but no PPE)
Inhalation exposure (in mg/m^3)/8h workday ² (refers only to any contributing tasks involving spraying of liquid product)	Negligible, assuming any spraying occurs only in a closed system.

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2 *	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3 **	Repeated dose	Not quantified		Not quantified	
	Combined routes				-		RCR Inhalation-systemic + RCR Dermal- systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3 ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal [†]		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.11	6.5 - 10.0 mg/kg bw/d	0.02
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.39	23 - 36 mg/kg bw/d	0.08
	Combined routes				0.50. Acceptable risk		0.10. Acceptable risk

Section 3.1 Environment

Emissions to air (dust)	0.08 (monohydrate) 0.004-0.08 (monohydrate and dried coppers) – bag filters ³ . 0.4 (monohydrate) – wet scrubbing <30-<50 mg/m^3
Emissions to water (Iron)	0.75 (with wet scrubbing)
Waste to land (Solid waste)	8-25 (monohydrate)
Risk characterisation	
Aquatic compartment (including sediment)	

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	6E-07 mg/l		-	-
Freshwater sediment	45,0 mg/kg dw	49,5 mg/kg dw	0,909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0,909. Conclusion: acceptable risk.
Risk characterisation for the terrestrial compartment				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Agricultural soil	53 mg/kg dw	55 mg/kg dw	0,965	The PEC associated with production results in a PEC/PNEC ratio of 0,965. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 2. GENERIC FORMULATION INCLUDING PELLETISATION		
Section 1		
Exposure Scenario Title		
Title	Generic formulation including pelletisation	
Use Descriptor	SU3, SU10	
Process Categories and Environmental Release Categories	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15 ERC2, ERC5	
Processes, tasks, activities covered	PROC1 Use in closed process, no likelihood of exposure PROC2 Use in closed, continuous process with occasional controlled exposure PROC3 Use in closed batch process (synthesis or formulation) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14 Production of preparations or articles by tableting, compression, extrusion, palletisation PROC15 Use as laboratory reagent ERC2 Formulation of preparations ERC5 Industrial use resulting in inclusion into or onto a matrix	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day 170 kg salt; 420 kg solution Annual amount used per site: 50 t/y	
Frequency and duration of use	Daily	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 (PROC1, PROC3, PROC15) 480 (PROC2, PROC4, PROC5, PROC8b, PROC9, PROC14) 960 (PROC8a)	
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	Refer to control technologies

	Breathing apparatus	below Refer to control technologies below
Other risk management measures related to workers	Procedural and control technologies	It is assumed that solid salts are handled only in closed systems. If performing spraying, it is assumed that closed systems apply
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC2, ERC5)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day 170 kg salt; 420 kg solution Annual amount used per site: 50 t/y	
Frequency and duration of use	Emission days per site 300 d/y	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	Variable depending on industry; different levels of control are typical. Worst case approx. 2% (e.g. Formulation of etchants)	
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Consumer exposure is not relevant for this scenario.		
Section 3: Exposure estimation		
Section 3.1 Health		

Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	400 (PROC5, in absence of LEV)
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.7 (PROC4)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.07 (PROC4)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) Negligible, assuming any solids are processed only in a closed system. ii) 1.8 (PROC8a, 8b).(LEV but no PPE)
Inhalation exposure (in mg/m^3)/8h workday ³ (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2 *	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3 **	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m^3 ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.54	6.5 - 10.0 mg/kg bw/d	0.11
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.39	23 - 36 mg/kg bw/d	0.08
	Combined routes				0.93. Acceptable risk		0.19. Acceptable risk

Section 3.1 Environment

Air Release (direct + STP)	0
Aquatic Release (before WWTP)	3.3 kg/d
Soil Release (direct releases only)	0
Risk characterisation	

Aquatic compartment (including sediment)				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Risk characterisation for the terrestrial compartment				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial soil	50.1 mg/kg dw	55 mg/kg dw	0.91	The PEC associated with production results in a PEC/PNEC ratio of 0.91. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 3. WATER TREATMENT: TREATMENT OF RAW AND POTABLE WATERS		
Section 1		
Exposure Scenario Title		
Title	Water treatment: treatment of raw and potable waters	
Use Descriptor	SU3, SU 0	
Process Categories and Environmental Release Categories	PROC 2, 5, 8a, 8b ERC 4	
Processes, tasks, activities covered	PROC2 Use in closed, continuous process with occasional controlled exposure PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities ERC4 Industrial use of processing aids in processes and products, not becoming part of articles	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 2, 5, 8a, 8b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Approx. 1800 kg iron salt per day. (approx. 700 kg Fe/day) Annual amount used per site: 210 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 (PROC2, PROC5, PROC8b) 960 (PROC8a)	
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used, in the absence of LEV
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	

2.2 Control of environmental exposure (ERC 4)							
Product characteristics							
Physical form of product		Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)					
Concentration of substance in product		No data					
Amounts used		Approx. 1800 kg iron salt per day. (approx. 700 kg Fe/day) Annual amount used per site: 210 T Fe/y					
Frequency and duration of use		Emission days per site 300 d/y					
Operational conditions of use							
Fraction of applied amount lost from process/use to waste gas		0					
Fraction of applied amount lost from process/use to waste water		1%					
Risk management measures related to environmental emissions from industrial sites							
Onsite pre-treatment of waste water		Not applicable.					
Resulting fraction of initially applied amount in waste water released from site to the external sewage system		Not applicable.					
Air emission abatement		Not applicable.					
Resulting fraction of applied amount in waste gas released to environment		Not applicable.					
Onsite waste treatment		Not applicable.					
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.		Not applicable.					
Municipal or other type of external waste water treatment		Yes					
Effluent (of the waste water treatment plant) discharge rate		2000 m ³ /d					
Recovery of sludge for agriculture or horticulture		Yes					
2.3 Control of consumer exposure							
Consumer exposure is not relevant for this scenario.							
Section 3: Exposure estimation							
Section 3.1 Health							
Dermal local exposure (in µg/cm ²)		400 (PROC5, in absence of LEV)					
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)		0.3 (PROC8a)					
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)		0.03 (PROC8a)					
Inhalation exposure		Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below					
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)		i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.					
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)		n/a					
Quantitative risk characterisation for workers							
	Route	exposure concentrations (EC)	Leading toxic end point /	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio

			Critical effect				
Acute - local effects	Dermal	mg/cm ² *	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³ **	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³ ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.23	6.5 - 10.0 mg/kg bw/d	0.05
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.66. Acceptable risk		0.14. Acceptable risk

Section 3.1 Environment

Air Release	0
Aquatic Release WWTP flow (default) – 2,000 m ³ /day Dilution in surface water (default) – 10	0.4 kg/day (potable water) 4 kg/day (industrial locations)
Soil Release	0

Risk characterisation

Aquatic compartment (including sediment)				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial use (coagulant)				
Surface water	2.6E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Industrial use (sludge conditioning)				
Surface water	2.6E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.

Risk characterisation for the terrestrial compartment

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial use (coagulant)				
Agricultural soil	50.0 mg/kg dw	55.0 mg/kg dw	0.911	The PEC associated with production results in a PEC/PNEC ratio of 0.911. Conclusion: acceptable risk.
Industrial use (sludge conditioning)				
Agricultural soil	50.1 mg/kg dw	55.0 mg/kg dw	0.911	The PEC associated with production results in a PEC/PNEC ratio of 0.911. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 4. WATER TREATMENT: TREATMENT OF WASTE WATERS AND WWTP SLUDGE		
Section 1		
Exposure Scenario Title		
Title	Water treatment: treatment of waste waters and WWTP sludge	
Use Descriptor	SU3, SU 0	
Process Categories and Environmental Release Categories	PROC 2, 5, 8a, 8b ERC 4,5	
Processes, tasks, activities covered	PROC2 Use in closed, continuous process with occasional controlled exposure PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities ERC4 Industrial use of processing aids in processes and products, not becoming part of articles ERC5 Industrial use resulting in inclusion into or onto a matrix	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 2, 5, 8a, 8b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Water treatment: 200 kg Fe/day assuming 2000 m ³ effluent Sludge treatment: approx. 34 kg Fe/day based on approx. 28 m ³ sludge/d Annual amount used per site: 85 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 (PROC2, PROC5, PROC8b) 960 (PROC8a)	
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used, in the absence of LEV
Other risk management measures related to workers	Breathing apparatus	None
	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary

Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.
Human factors not influenced by risk management	Not available
2.2 Control of environmental exposure (ERC 4)	
Product characteristics	
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)
Concentration of substance in product	No data
Amounts used	Water treatment: 200 kg Fe/day assuming 2000 m ³ effluent Sludge treatment: approx. 34 kg Fe/day based on approx. 28 m ³ sludge/d Annual amount used per site: 85 T Fe/y
Frequency and duration of use	Emission days per site 365 d/y
Operational conditions of use	
Fraction of applied amount lost from process/use to waste gas	0
Fraction of applied amount lost from process/use to waste water	1%
Other given operational conditions affecting environmental exposure	It is necessary to consider what loading levels are typically used for different purposes at different types of WWTPs, and the stage of the treatment that the iron salts are loaded, in order to consider the quantity which may pass to treated effluent and hence to the environment, and also, importantly, to consider the fate of the iron after use. Municipal WWTP: - Relief flocculation (usually a preprecipitation process) This is a temporary arrangement rather than a routine one, used in case of WWTP overload; during renovation; or in case of additional purification needed due to highly polluted influent (i.e. for a specific influent stream). - Sulfide control (outdoor control) (usually a pretreatment before primary sedimentation) - Phosphate removal. The iron passes to organic digester sludge, which will be spread to land, only under certain circumstances - Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge. As an overall worst case: a loading of 100 g/m ³ for the total flow of a typical municipal WWTP would be equivalent to approx. 200 kg Fe/d and this is assumed in the model for the coagulant use.
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Not applicable.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.
Air emission abatement	Not applicable.
Resulting fraction of applied amount in waste gas released to environment	Not applicable.
Onsite waste treatment	Not applicable.
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.
Municipal or other type of external waste water	Yes

treatment							
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d						
Recovery of sludge for agriculture or horticulture	Yes						
2.3 Control of consumer exposure							
Consumer exposure is not relevant for this scenario.							
Section 3: Exposure estimation							
Section 3.1 Health							
Dermal local exposure (in µg/cm ²)	400 (PROC5, in absence of LEV)						
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.3 (PROC8a)						
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.03 (PROC8a)						
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a						
Quantitative risk characterisation for workers							
	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ² *	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³ **	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³ ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.23	6.5 - 10.0 mg/kg bw/d	0.05
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.43	23 - 36 mg/kg bw/d	0.09
	Combined				0.66. Acceptable		0.14. Acceptable

	routes			risk		risk
Section 3.1 Environment						
Air Release				0		
Aquatic Release WWTP flow (default) – 2E+06 l/day Dilution in surface water (default) – 10				200 kg Fe/day entering WWTP (potable water) 34 kg Fe/day entering WWTP (industrial locations)		
Soil Release				0		
Risk characterisation						
Aquatic compartment (including sediment)						
	Compartments	PEC	PNEC	PEC/PNEC	Discussion	
Industrial use (coagulant)						
	Surface water	2.4E-06 mg/l		-	-	
	Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.	
Industrial use (sludge conditioning)						
	Surface water	2.6E-06 mg/l		-	-	
	Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.	
Risk characterisation for the terrestrial compartment						
	Compartments	PEC	PNEC	PEC/PNEC	Discussion	
Industrial use (coagulant)						
	Agricultural soil	50.8 mg/kg dw	55.0 mg/kg dw	0.924	The PEC associated with production results in a PEC/PNEC ratio of 0.924. Conclusion: acceptable risk.	
Industrial use (sludge conditioning)						
	Agricultural soil	50.7 mg/kg dw	55.0 mg/kg dw	0.924	The PEC associated with production results in a PEC/PNEC ratio of 0.924. Conclusion: acceptable risk.	
Atmospheric compartment						
No basis for risk characterisation. Not applicable						
Section 4: Guidance to DU to check own conditions						
Not available						
Additional good practice advise beyond CSA						
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH						
Not available						

ES 5. BIOGAS TREATMENT AT WASTE TREATMENT PLANT		
Section 1		
Exposure Scenario Title		
Title	Biogas treatment at waste treatment plant	
Use Descriptor	SU3, SU 10	
Process Categories and Environmental Release Categories	PROC 2, 8a, 8b ERC 4, 2, 6b	
Processes, tasks, activities covered	PROC2 Use in closed, continuous process with occasional controlled exposure PROC 8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities ERC4: Industrial use of processing aids in processes and products, not becoming part of articles ERC2: Formulation of preparations ERC6b: Industrial use of reactive processing aids	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 2, 8a, 8b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day :2.6 kg Fe/day assuming 2000 m ³ effluent Annual amount used per site: 0.95 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 (PROC2, 960 (PROC8a)	PROC8b)
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	

2.2 Control of environmental exposure (ERC 4, 2, 6b)	
Product characteristics	
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)
Concentration of substance in product	No data
Amounts used	Used amount of substance per day :2.6 kg Fe/day assuming 2000 m ³ effluent Annual amount used per site: 0.95 T Fe/y
Frequency and duration of use	Emission days per site 365 d/y
Operational conditions of use	
Fraction of applied amount lost from process/use to waste gas	0
Fraction of applied amount lost from process/use to waste water	1%
Other given operational conditions affecting environmental exposure	The digestion process is enclosed; air emissions are unlikely, except during transfer to and from the digester. Particulate emissions are also less likely than from aerobic digestion because the process is enclosed, but there will probably be some waste preparation units which may have larger particulate emissions (BREF waste treatment date not given in ES). This is an exceptionally large local WWTP by the standards of the EU default. For a standard typical WWTP of 2,000 m ³ /day, the equivalent loading rate would be 6.6 kg iron salt/day, i.e. approx. 2.6 kg Fe/day. Disposal of the resulting digester sludge is presumed to be analogous to that from wastewater and sludge treatment at WWTPs. It is assumed that a proportion of the largely inorganic coagulated mass is removed from the process and destroyed. In any case further treatment or chemical disposal of the resulting sludge may be presumed.
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Not applicable.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.
Air emission abatement	Not applicable.
Resulting fraction of applied amount in waste gas released to environment	Not applicable.
Onsite waste treatment	Not applicable.
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.
Municipal or other type of external waste water treatment	Yes
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d
Recovery of sludge for agriculture or horticulture	Yes
2.3 Control of consumer exposure	
Consumer exposure is not relevant for this scenario.	
Section 3: Exposure estimation	
Section 3.1 Health	

Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	200 (PROC8b, in absence of LEV)
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.3 (PROC8a)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.03 (PROC8a)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2 *	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3 **	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3 ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^d		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.23	6.5 - 10.0 mg/kg bw/d	0.05
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.66. Acceptable risk		0.14. Acceptable risk

Section 3.1 Environment

Air Release	0 kg Fe/day
Aquatic Release WWTP flow (default) – $2\text{E}+06$ L/day Dilution in surface water (default) – 10	2.6 kg Fe/day
Soil Release	0
Risk characterisation	

Aquatic compartment (including sediment)				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Risk characterisation for the terrestrial compartment				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Agricultural soil	50.1 mg/kg dw	55 mg/kg dw	0.91	The PEC associated with production results in a PEC/PNEC ratio of 0.91. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 6. USE AS REACTIVE PRODUCT/PRECURSOR		
Section 1		
Exposure Scenario Title		
Title	Use as reactive product/precursor	
Use Descriptor	SU3, 8, 9, 10, 14	
Process Categories and Environmental Release Categories	PROC 2, 3, 4, 8b, 9, 22 15, 26 ERC 1, 4, 5, 6a, 6b	
Processes, tasks, activities covered	PROC2 Use in closed, continuous process with occasional controlled exposure PROC3 Use in closed batch process (synthesis or formulation) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC15 Use as laboratory reagent PROC22 Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting PROC26 Handling of solid inorganic substances at ambient temperature ERC1 Manufacture of substances ERC4 Industrial use of processing aids in processes and products, not becoming part of articles ERC5 Industrial use resulting in inclusion into or onto a matrix ERC6a Industrial use resulting in manufacture of another substance (use of intermediates) ERC6b Industrial use of reactive processing aids	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 2, 8a, 8b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day : Approx. 20 t/d Annual amount used per site: 6000 t/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 (PROC3, PROC15) 480 (PROC2, PROC4, PROC8b, PROC9) 1980 (PROC22) PROC26 – not specified by ECETOC but assumed to be approx. 1980	
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.

	Respiratory protection	Refer to control technologies below
	Breathing apparatus	Refer to control technologies below
Other risk management measures related to workers	Procedural and control technologies	It is assumed that solid salts are handled only in closed systems or with LEV
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC 1, 4, 5, 6a, 6b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day : Approx. 20 t/d Annual amount used per site: 6000 t/y	
Frequency and duration of use	Emission days per site 300 d/y	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	0.005	
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Consumer exposure is not relevant for this scenario.		
Section 3: Exposure estimation		
Section 3.1 Health		

Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	200 (PROC8b, in absence of LEV)
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.7 (PROC4)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.07 (PROC4)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) Negligible, assuming any solids are processed only in a closed system. ii) 1.8 (PROC8a, 8b).(LEV but no PPE)
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2 *	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3 **	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3 ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal [†]		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.54	6.5 - 10.0 mg/kg bw/d	0.11
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.39	23 - 36 mg/kg bw/d	0.08
	Combined routes				0.93. Acceptable risk		0.19. Acceptable risk

Section 3.1 Environment

Air Release	In view of the low volatility of iron salts it is not envisaged that releases to air are realistic.
Aquatic Release	40 kg Fe/d
Soil Release	0
Risk characterisation	
Aquatic compartment (including sediment)	

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Risk characterisation for the terrestrial compartment				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial soil	50.8 mg/kg dw	55.0 mg/kg dw	0.924	The PEC associated with production results in a PEC/PNEC ratio of 0.924. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 7. MANUFACTURE OF CEMENT		
Section 1		
Exposure Scenario Title		
Title	Manufacture of cement	
Use Descriptor	SU3, 8, 13	
Process Categories and Environmental Release Categories	PROC 3, 4, 5, 8a,8b, 9, 14 ERC 2	
Processes, tasks, activities covered	PROC3 Use in closed batch process (synthesis or formulation) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC9 Transfer of substance or preparation into small containers (dedicated filling line,including weighing) PROC14 Production of preparations or articles by tableting, compression, extrusion, Palletisation ERC2 Formulation of preparations	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 3, 4, 5, 8a,8b, 9, 14)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day : 4.1 t Fe/d Annual amount used per site: approx. 1450 t Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 (PROC3) 480 (PROC4, PROC5, PROC8b, PROC9, PROC14) 960 (PROC8a)	
Body weight	70 kg	
Risk management measures		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
Other risk management measures related to workers	Breathing apparatus	None
	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training, Monitoring/reporting and	Equipment must be well

	auditing systems	maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC 2)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	~ 2.1kt cement equivalent to approx. 10 t per day iron salt (approx. 4.1 t Fe/day) Used amount of substance per day : 4.1 t Fe/d Annual amount used per site: approx. 1450 t Fe/y	
Frequency and duration of use	Emission days per site 350 d/y	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	2.00E-05	
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Consumer end use of cement is assessed under ES 9c		
Section 3: Exposure estimation		
Section 3.1 Health		

Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	400 (PROC5, in absence of LEV)
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.7 (PROC4)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.07 (PROC4)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Inhalation exposure (in mg/m^3)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.54	6.5 - 10.0 mg/kg bw/d	0.11
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.97. Acceptable risk		0.20. Acceptable risk

Section 3.1 Environment

Aquatic (before WWTP)	0.08 kg/d
Air (direct + STP)	0
Soil (direct releases only)	0
Risk characterisation	
Aquatic compartment (including sediment)	

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Risk characterisation for the terrestrial compartment				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial soil	50.0 mg/kg dw	55 mg/kg dw	0.909	The PEC associated with production results in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 8. INDUSTRIAL USE OF CEMENT		
Section 1		
Exposure Scenario Title		
Title	Industrial use of cement	
Use Descriptor	SU 3, 19	
Process Categories and Environmental Release Categories	PROC 5, 8b, 8a, 10 ERC 5, 8f, 10a	
Processes, tasks, activities covered	PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC10 Roller application or brushing ERC5 Industrial use resulting in inclusion into or onto a matrix ERC8f Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC10a Wide dispersive outdoor use of long-life articles and materials with low release	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 5, 8b, 8a, 10)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day : 40 tonnes cement mix containing 200 kg iron salt (approx. 80 kg Fe) Annual amount used per site: approx. 24 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 (PROC5, PROC8b) 960 (PROC8a, PROC10)	
Body weight	70 kg	
Risk management measures		
It is noted that the hazards associated with other constituents of cements are generally anticipated to be significantly worse than the iron salts. PPE and other risk management measures mentioned here refer only to measures necessary to manage possible risks from iron salts. In view of the other constituents of formulated cements more rigorous RMM may be necessary and/or already in place.		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and

		ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC 5, 8f, 10a)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	40 t cement mix containing 200 kg iron salt (approx. 80 kg Fe) Used amount of substance per day : 40 t cement mix containing 200 kg iron salt (approx. 80 kg Fe) Annual amount used per site: approx. 24 T Fe/y	
Frequency and duration of use	Emission days per site 300 d/y	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	0.002	
Risk management measures related to environmental emissions from wide dispersive professional use		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Professionals and consumers assessment is set out in ES9b and 9c respectively		
Section 3: Exposure estimation		
Section 3.1 Health		
Dermal local exposure (in µg/cm ²)	200 (PROC8b, in absence of LEV)	
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.6 (PROC10)	
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.06 (PROC10)	
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below	
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of	i) 1.8 (PROC8a, 8b),(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and	

dusts)	cleaned daily.
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ²	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.46	6.5 - 10.0 mg/kg bw/d	0.09
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.89. Acceptable risk		0.18. Acceptable risk

Section 3.1 Environment

Aquatic (before WWTP)	0.16 kg/d
Air (direct + STP)	0
Soil (direct releases only)	0

Risk characterisation

Aquatic compartment (including sediment)

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.

Risk characterisation for the terrestrial compartment

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial soil	50.0 mg/kg dw	55 mg/kg dw	0.909	The PEC associated with production results in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.

Atmospheric compartment

No basis for risk characterisation. Not applicable

Section 4: Guidance to DU to check own conditions

Not available

Additional good practice advise beyond CSA

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH

Not available

ES 9. PROFESSIONAL AND CONSUMER USE OF CEMENT		
Section 1		
Exposure Scenario Title		
Title	Professional and consumer use of cement	
Use Descriptor	SU 13, 21, 23	
Process Categories and Environmental Release Categories	PROC 5, 8b 8A 10 19, 26 ERC 8f, 10a, 8c	
Processes, tasks, activities covered	PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC10 Roller application or brushing PROC19 Hand-mixing with intimate contact and only PPE available PROC26 Handling of solid inorganic substances at ambient temperature ERC8c Industrial use of monomers for manufacture of thermoplastics ERC8f Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC10a Wide dispersive outdoor use of long life articles and materials with low release	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 5, 8b, 8a, 10)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance (as such or in preparation) per worker [workplace] per day: 8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe) Annual amount used per site: 5.1 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 cm ² (PROC5, 960 cm ² (PROC8A, 1980 cm ² (PROC19, assumed to apply for 26)	PROC8B) PROC10)
Body weight	70 kg	
Risk management measures for wide dispersive use		
It is noted that the hazards associated with other constituents of cements are generally anticipated to be significantly worse than the iron salts. PPE and other risk management measures mentioned here refer only to measures necessary to manage possible risks from iron salts. In view of the other constituents of formulated cements more rigorous RMM may be necessary and/or already in place.		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves.
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter

		mask P2 (FFP2) must be used
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC 5, 8f, 10a)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Amount per day consumer: 2.5 t cement mix containing 12 kg iron salt (approx. 5 kg Fe) Amount per day Professional use – small-scale: 8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe) Annual amount used per site: 5.1 T Fe/y	
Frequency and duration of use	Emission days per site: 365 d/y (consumer), 300 d/y (worker)	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	0.02	
Risk management measures related to environmental emissions from wide dispersive professional use		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day: 8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe) Annual amount: approx. 900 t/y	

Frequency and duration of use	Daily, up to 8 hours	
Risk management measures related to consumers' use		
It is noted that the hazards associated with other constituents of cements are generally anticipated to be significantly worse than the iron salts. PPE and other risk management measures mentioned here refer only to measures necessary to manage possible risks from iron salts. In view of the other constituents of formulated cements more rigorous RMM may be necessary and/or already in place.		
Personal protective equipment (PPE) required under regular conditions of consumer use	None	
Instructions addressed to consumers	As necessary, consumers should be advised to avoid contact with skin/eyes and/or to Use suitable protection	
Risk management measures related to emissions to the environment	Municipal or other type of waste water treatment	Yes
	Effluent (of the waste water treatment plant) discharge rate	2,000 m ³ /d
Section 3: Exposure estimation		
Section 3.1 Health		
Worker use		
Dermal local exposure (in µg/cm ²)	400 (PROC5, in absence of LEV)	
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.27 (PROC2, 8b)	
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.027 (PROC2, 8b)	
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below	
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	2.0 (PROC8a, 8b; handling solids indoors). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. 2.2 (PROC8a, 8b; handling solids outdoors). mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.	
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a	

Consumer use							
Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)		250					
Dermal systemic exposure (in $\text{mg}/\text{kg bw}/\text{d}$)		6.8E-05 (mixing stage i.e. exposure to substance as such) ≤ 0.017 (application stage i.e. once prepared as an aqueous mix)					
Inhalation exposure		Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below					
Inhalation exposure (in $\text{mg}/\text{m}^3/\text{day}^4$) (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)		1.1 (handling indoors). Mechanical/natural ventilation ⁵ should be available. Assumes Exposure duration up to 2 h/d and 1 d/w Use of a dust mask would be advisable if suitable ventilation is not available or for longer durations of activity					
Inhalation exposure (in $\text{mg}/\text{m}^3/\text{day}^6$) (refers only to any contributing tasks involving spraying of liquid product)		n/a					
Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)		250					
Quantitative risk characterisation for workers							
	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	$\text{mg}/\text{kg bw}/\text{d}$	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ⁴		Repeated dose	1.3 - 2.0 $\text{mg}/\text{kg bw}/\text{d}$	0.21	6.5 - 10.0 $\text{mg}/\text{kg bw}/\text{d}$	0.04
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.48	23 - 36 $\text{mg}/\text{kg bw}/\text{d}$	0.10
	Combined routes				0.69. Acceptable risk		0.14. Acceptable risk
Quantitative risk characterisation for consumers							
	Route	exposure concentrations (EC)	Leading toxic end	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio

			point / Critical effect				
Acute - local effects	Dermal	0.25 mg/cm ² *	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	0.017 mg/kg bw/d	Repeated dose	0.7 - 1.0 mg/kg bw/d		3.5 - 5.0 mg/kg bw/d	
	Inhalation	1.1 mg/m ³ **	Repeated dose	1.1 - 1.5 mg/m ³		5.5 - 7.5 mg/m ³	
	Combined routes				<1. Acceptable risk		<0.2. Acceptable risk
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m ³ ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a	<0.02	Repeated dose	0.7 - 1.0 mg/kg bw/d	<0.03	3.5 - 5.0 mg/kg bw/d	<0.006
	Inhalation	1.1 (without dust mask) 0.59 (with dust mask)	Repeated dose	1.1 - 1.5 mg/m ³	1 (no dust mask) 0.54 (with dust mask)	5.5 - 7.5 mg/m ³	0.2
	Combined routes				1. Limit of acceptable risk without dust mask		0.2. Acceptable risk

Section 3.1 Environment

Aquatic (before WWTP)	0.1 kg/d (consumer)
	0.34 kg/d (professional)
Air (direct + STP)	0
Soil (direct only)	0

Risk characterisation

Aquatic compartment (including sediment)

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.

Risk characterisation for the terrestrial compartment

Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial soil	50.1 mg/kg dw	55 mg/kg dw	0.91	The PEC associated with production results in a PEC/PNEC ratio of 0.91. Conclusion: acceptable risk.

Atmospheric compartment

No basis for risk characterisation. Not applicable

Section 4: Guidance to DU to check own conditions

Not available

Additional good practice advise beyond CSA

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH

Not available

ES 10. PROFESSIONAL USE IN LAND REMEDIATION APPLICATIONS	
Section 1	
Exposure Scenario Title	
Title	Professional use in land remediation applications
Use Descriptor	SU 19, 22
Process Categories and Environmental Release Categories	PROC 2, 8a, 8b ERC 8e
Processes, tasks, activities covered	PROC2 Use in closed, continuous process with occasional controlled exposure PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

	PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities ERC8e Wide dispersive outdoor use of reactive substances in open systems	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 2, 8a, 8b)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance (as such or in preparation) per worker [workplace] per day: Approx. 400 kg Fe/d Annual amount used per site: Approx. 100 tonnes of iron salt, containing approximately 40 tonnes Fe	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 cm ² 960 cm ² (PROC8A)	(PROC2, PROC8b)
Body weight	70 kg	
Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used
Other risk management measures related to workers	Breathing apparatus	None
	Procedural and control technologies	If handling solid salts, containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Waste related measures	Precautions against irritation	
Human factors not influenced by risk management	As necessary	
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC 8e)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Amount per day : 80 tonnes/day wet weight approx. 400 kg Fe/day Annual amount used per site: Approx. 100 tonnes of iron salt, containing approximately 40 tonnes Fe	
Frequency and duration of use	Emission days per site: 100 d/y	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from	0,8	

process/use to waste water							
Risk management measures related to environmental emissions from industrial sites							
Onsite pre-treatment of waste water	Not applicable.						
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.						
Air emission abatement	Not applicable.						
Resulting fraction of applied amount in waste gas released to environment	Not applicable.						
Onsite waste treatment	Not applicable.						
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.						
Municipal or other type of external waste water treatment	Yes						
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d						
Recovery of sludge for agriculture or horticulture	Yes						
2.3 Control of consumer exposure							
Consumer exposure is not expected for this scenario.							
Section 3: Exposure estimation							
Section 3.1 Health							
Dermal local exposure (in µg/cm ²)	200 (PROC8b, in absence of LEV)						
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.27 (PROC8a)						
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.027 (PROC8a)						
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a						
Quantitative risk characterisation for workers							
	Route	exposure concentration (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ²	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg m ⁻³	no data	Not relevant	-	Not relevant	-

Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ¹		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.21	6.5 - 10.0 mg/kg bw/d	0.04
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.64. Acceptable risk		0.13. Acceptable risk
Section 3.2 Environment							
Aquatic			Limited by water solubility of ferric iron oxide				
Air			0				
Soil			80 kg/day				
Risk characterisation							
Aquatic compartment (including sediment)							
Compartments	PEC	PNEC	PEC/PNEC	Discussion			
Surface water	2.4E-06 mg/l		-	-			
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.			
Risk characterisation for the terrestrial compartment							
Compartments	PEC	PNEC	PEC/PNEC	Discussion			
Industrial soil	51.7 mg/kg dw	55 mg/kg dw	0.94	The PEC associated with production results in a PEC/PNEC ratio of 0.94. Conclusion: acceptable risk.			
Atmospheric compartment							
No basis for risk characterisation. Not applicable							
Section 4: Guidance to DU to check own conditions							
Not available							
Additional good practice advise beyond CSA							
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH							

ES 11. USE AS A LABORATORY CHEMICAL (INDUSTRIAL)		
Section 1		
Exposure Scenario Title		
Title	Use as a laboratory chemical (industrial)	
Use Descriptor	SU 3, 24	
Process Categories and Environmental Release Categories	PROC 15	
Processes, tasks, activities covered	PROC15 Use as laboratory reagent	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 15)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	no information	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 (PROC15)	
Body weight	70 kg	
Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
Other risk management measures related to workers	Breathing apparatus	None
	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Waste related measures	Precautions against irritation	As necessary
	Any wastes are ultimately assumed to be disposed of via landfill or professional chemical waste handlers.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure		
The possibility of environmental exposure associated with use as a laboratory chemical is considered to be negligible and is not considered further.		
2.3 Control of consumer exposure		
Consumer exposure is not expected for this scenario.		
Section 3: Exposure estimation		
Section 3.1 Health		

Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	10 (PROC15, with LEV)
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.03 (PROC15)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.003 (PROC15)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m^3)/8h workday; (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Inhalation exposure (in mg/m^3)/8h workday; (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm^2	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m^3	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	$\text{mg}/\text{cm}^2/\text{d}$	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m^3	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.01	6.5 - 10.0 mg/kg bw/d	0.00
	Inhalation		Repeated dose	4.6 - 7.2 mg/m^3	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.44. Acceptable risk		0.09. Acceptable risk

Section 3.2 Environment

The possibility of environmental exposure associated with use as a laboratory chemical is considered to be negligible and is not considered further.

Section 4: Guidance to DU to check own conditions

Not available

Additional good practice advise beyond CSA

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH

ES 12. USE AS A LABORATORY CHEMICAL (PROFESSIONAL)		
Section 1		
Exposure Scenario Title		
Title	Use as a laboratory chemical (professional)	
Use Descriptor	SU 3, 24	
Process Categories and Environmental Release Categories	PROC 15	
Processes, tasks, activities covered	PROC15 Use as laboratory reagent	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 15)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	no information	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 (PROC15)	
Body weight	70 kg	
Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
Other risk management measures related to workers	Breathing apparatus	None
	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Waste related measures	Precautions against irritation	As necessary
Human factors not influenced by risk management	Any wastes are ultimately assumed to be disposed of via landfill or professional chemical waste handlers.	
Not available		
2.2 Control of environmental exposure		
The possibility of environmental exposure associated with use as a laboratory chemical is considered to be negligible and is not considered further.		
2.3 Control of consumer exposure		
Consumer exposure is not expected for this scenario.		
Section 3: Exposure estimation		
Section 3.1 Health		
Dermal local exposure (in µg/cm ²)	20 (PROC15, in absence of LEV)	
Dermal systemic exposure via	0.01 (PROC15)	

contact with substance as such (in mg/kg bw/d)	
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.001 (PROC15)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic endpoint / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ²	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.01	6.5 - 10.0 mg/kg bw/d	0.00
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.43	23 - 36 mg/kg bw/d	0.09
	Combined routes				0.44. Acceptable risk		0.09. Acceptable risk

Section 3.2 Environment

The possibility of environmental exposure associated with use as a laboratory chemical is considered to be negligible and is not considered further.

Section 4: Guidance to DU to check own conditions

Not available

Additional good practice advise beyond CSA

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH

ES 13. USE IN AGROCHEMICALS (PROFESSIONAL AND CONSUMER)		
Section 1		
Exposure Scenario Title		
Title	Use in Agrochemicals (professional and consumer)	
Use Descriptor	SU 1, 21, 22	
Process Categories and Environmental Release Categories	PROC1, PROC2, PROC8a, PROC8b, PROC11, PROC13 ERC8A, ERC 8D	
Processes, tasks, activities covered	PROC1 Use in closed process, no likelihood of exposure PROC2 Use in closed, continuous process with occasional controlled exposure PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC11 Non industrial spraying PROC13 Treatment of articles by dipping and pouring ERC8a Wide dispersive indoor use of processing aids in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC1, PROC2, PROC8a, PROC8b, PROC11, PROC13)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day: Approx. 330 kg Fe/d in local area Annual amount used per site: 80 t agrochemical products in the local area /y, assumed to contain not more than 40 tonnes Fe	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 cm ² (PROC1) 480 cm ² (PROC2, PROC8B, PROC9, PROC13) 960 cm ² (PROC8A) 1500 cm ² (PROC11)	
Body weight	70 kg	
Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, containment and ventilation

		must be available. If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d. If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	A limited release to drain is assumed which is related to an assumption of equipment washing. Spent packaging may be disposed of to landfill, recycling or by incineration	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC8A, ERC 8D)		
The local release of iron-containing fertiliser is envisaged as passing to soil only. Such products are envisaged to be granular solid formulations requiring no cleaning of equipment. Iron-based fertilisers are only likely to be used in circumstances where the local iron levels are deficient and detrimental to plant growth. In terms of this assessment, the application level is such as to return iron levels back to at or approaching normal background levels. There is no need for further evaluation for the environment.		
2.3 Control of consumer exposure		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Usage is likely to be characterised as small scale use in domestic gardening. Usage (based on exposure via a single WWTP, i.e. equivalent to estimated total usage in a small town)	
Frequency and duration of use	Daily	
Risk management measures related to consumers' use		
Personal protective equipment (PPE) required under regular conditions of consumer use	Type of PPE (gloves, etc): a) None - Worst case b) Gloves - More probable scenario	
Instructions addressed to consumers	As necessary, consumers should be advised to avoid contact with skin/eyes and/or to Use suitable protection	
Risk management measures related to emissions to the environment	Municipal or other type of waste water treatment	Yes
	Effluent (of the waste water treatment plant) discharge rate	2,000 m ³ /d
Section 3: Exposure estimation		
Section 3.1 Health		
Worker use		
Dermal local exposure (in µg/cm ²)	200 (PROC8b, in absence of LEV)	
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.27 (PROC8a)	
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.027 (PROC8a)	

Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	2.0 – 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker						
Consumer use							
Dermal local exposure (in µg/cm ²)	1000						
Dermal systemic exposure (in mg/kg bw/d)	a) 1.4 (in absence of gloves) b) 0.28						
Inhalation exposure	a) 0.14 (in absence of gloves) b) 0.028						
Inhalation exposure (in mg/m ³)/day ⁹ (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below						
Inhalation exposure (in mg/m ³)/day ¹⁰ (refers only to any contributing tasks involving spraying of liquid product)	1.1 (handling indoors). Mechanical/natural ventilation I I should be available. Assumes Exposure duration up to 2 h/d and 1 d/w Use of a dust mask would be advisable especially if suitable ventilation is not available or for longer durations of activity (refined exposure level 0.59 mg/m ³) 0.84 (handling outdoors). Assumes Exposure duration up to 4 h/d and 1 d/w						
Quantitative risk characterisation for workers							
	Route	exposure concentrations (EC)	Leading toxic endpoint / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ²	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-

Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.21	6.5 - 10.0 mg/kg bw/d	0.04
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.48	23 - 36 mg/kg bw/d	0.10
	Combined routes				0.69. Acceptable risk		0.14. Acceptable risk

Quantitative risk characterisation for consumers

	Route	exposure concentrations (EC)	Leading toxic endpoint / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	1.0 mg/cm ² *	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal		Repeated dose	0.7 - 1.0 mg/kg bw/d		3.5 - 5.0 mg/kg bw/d	
	Inhalation		Repeated dose	1.1 - 1.5 mg/m ³		5.5 - 7.5 mg/m ³	
	Combined routes				<1. Acceptable risk		<0.2. Acceptable risk
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m ³ ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a	a) 1.4 mg/kg bw/d b) 0.28 mg/kg bw/d (if gloves are worn)	Repeated dose	0.7 - 1.0 mg/kg bw/d	2. of concern if gloves are not worn. 0.4. Acceptable risk, if gloves are worn.	3.5 - 5.0 mg/kg bw/d	0.4 if gloves are not worn 0.08 if gloves are worn
	Inhalation	i) 1.1 mg/m ³ ii) 0.59 mg/m ³ 0.84 mg/m ³	Repeated dose	1.1 - 1.5 mg/m ³	1. Of concern if handled indoors without dust mask 0.54 (with dust mask) 0.76 (outdoors without dust mask)	5.5 - 7.5 mg/m ³	0.2 (handled indoors without dust mask) 0.11 (with dust mask) 0.15 (outdoors without dust mask)
	Combined routes				0.94 if gloves and dust mask worn. Acceptable risk		0.6. Acceptable risk

Section 3.1 Environment

By definition, the predicted environmental concentration associated with this application would be approximately equal to natural levels. In the context of this chemical safety assessment and the assumptions associated with this application, the conclusion is that normal use is within the range of acceptable risk.

Section 4: Guidance to DU to check own conditions

Not available

Additional good practice advise beyond CSA

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH

Not available

ES 14. ADHESIVES SEALANTS AND COATINGS (INDUSTRIAL)		
Section 1		
Exposure Scenario Title		
Title	Adhesives Sealants and Coatings (industrial)	
Use Descriptor	SU 3	
Process Categories and Environmental Release Categories	PROC5, 7, 8a, 8b, 9,10,12,13,14 ERC5	
Processes, tasks, activities covered	PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC7 Industrial spraying PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC10 Roller application or brushing PROC12 Use of blowing agents in manufacture of foam PROC13 Treatment of articles by dipping and pouring PROC14 Production of preparations or articles by tableting, compression, extrusion, Palletisation ERC5 Industrial use resulting in inclusion into or onto a matrix	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC5, 7, 8a, 8b, 9,10,12,13,14)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day: 200 kg iron salt (approx. 80 kg Fe) Annual amount used per site: 24 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	240 cm ² (PROC12) 480 cm ² (PROC5, PROC8B, PROC9, PROC13, PROC14) 960 cm ² (PROC8A, PROC10) 1500 cm ² (PROC7)	
Body weight	70 kg	
Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used, in the absence of LEV

		If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
		If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d.
	Training, Monitoring/reporting and auditing systems	If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w. Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC8A, ERC 8D)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day: 200 kg iron salt (approx. 80 kg Fe) Annual amount used per site: 24 T Fe/y	
Frequency and duration of use	300 d/y	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	0.002	
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Consumer exposure is not relevant for this scenario.		
Section 3: Exposure estimation		
Section 3.1 Health		
Dermal local exposure (in µg/cm ²)	400 (PROC5, in absence of LEV)	

Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.3 (PROC5, PROC8a)
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.09 (PROC7)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	i) 1.8 (PROC8a, 8b).(LEV but no PPE) ii) 2.0 – 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	3.3 (PROC11, spraying indoors). Spraying booth with containment and LEV must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d per worker 3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker

Quantitative risk characterisation for workers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ²	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³	Repeated dose	Not quantified		Not quantified	
	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.21	6.5 - 10.0 mg/kg bw/d	0.04
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.72	23 - 36 mg/kg bw/d	0.14
	Combined routes				0.93. Acceptable risk		0.19. Acceptable risk

Section 3.1 Environment

Aquatic (before STP)	0.16
Air (direct + STP)	0
Soil (direct releases only)	0
Risk characterisation	

Aquatic compartment (including sediment)				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Surface water	2.4E-06 mg/l		-	-
Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.
Risk characterisation for the terrestrial compartment				
Compartments	PEC	PNEC	PEC/PNEC	Discussion
Industrial soil	50.1 mg/kg dw	55 mg/kg dw	0.91	The PEC associated with production results in a PEC/PNEC ratio of 0.91. Conclusion: acceptable risk.
Atmospheric compartment				
No basis for risk characterisation. Not applicable				
Section 4: Guidance to DU to check own conditions				
Not available				
Additional good practice advise beyond CSA				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH				
Not available				

ES 15. ADHESIVES SEALANTS AND COATINGS (PROFESSIONAL AND CONSUMER)		
Section 1		
Exposure Scenario Title		
Title	Adhesives Sealants and Coatings (professional and consumer)	
Use Descriptor	SU 22,21	
Process Categories and Environmental Release Categories	PROC 8a 8b 9 10 11 13 19 ERC8e, 8f	
Processes, tasks, activities covered	PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC10 Roller application or brushing PROC11 Non industrial spraying PROC13 Treatment of articles by dipping and pouring PROC19 Hand-mixing with intimate contact and only PPE available ERC8e Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC8f Wide dispersive outdoor use resulting in inclusion into or onto a matrix	
Section 2		
Operational conditions and risk management measures		
Section 2.1 Control of worker exposure (PROC 8a 8b 9 10 11 13 19)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day: Approx 41 kg iron salt (approx. 17 kg Fe) Annual amount used per site: 5.1 T Fe/y	
Frequency and duration of use	Daily, up to 8 hours	
Operational conditions related to available dilution capacity and characteristics of exposed humans		
Respiration volume under conditions of use	10 m ³ /d	
Area of skin contact with the substance under conditions of use	480 cm ² (PROC8B, PROC9, PROC13) 960 cm ² (PROC8A, PROC10) 1500 cm ² 1980 cm ² (PROC19) (PROC11)	
Body weight	70 kg	
Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practice	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, containment and ventilation must be available.

		<p>If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d.</p> <p>If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w.</p>
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
	Precautions against irritation	As necessary
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.	
Human factors not influenced by risk management	Not available	
2.2 Control of environmental exposure (ERC8c, 8f)		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Used amount of substance per day (professional): 41 kg iron salt (approx. 17 kg Fe) Used amount of substance per day (consumer): 12 kg iron salt (approx. 5 kg Fe)	
Frequency and duration of use	365 d/y – consumer 300 d/y – professional	
Operational conditions of use		
Fraction of applied amount lost from process/use to waste gas	0	
Fraction of applied amount lost from process/use to waste water	0.02	
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Not applicable.	
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	Not applicable.	
Air emission abatement	Not applicable.	
Resulting fraction of applied amount in waste gas released to environment	Not applicable.	
Onsite waste treatment	Not applicable.	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	Not applicable.	
Municipal or other type of external waste water treatment	Yes	
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d	
Recovery of sludge for agriculture or horticulture	Yes	
2.3 Control of consumer exposure		
Product characteristics		
Physical form of product	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	
Concentration of substance in product	No data	
Amounts used	Usage is likely to be characterised as small scale, short term DIY projects and domestic garden use.	

	Consumption by users in a small town is expected to total approx. 900 t over a year.						
Frequency and duration of use	Daily						
Risk management measures related to consumers' use							
Personal protective equipment (PPE) required under regular conditions of consumer use	Type of PPE (gloves, etc): None - Worst case						
Instructions addressed to consumers	As necessary, consumers should be advised to avoid contact with skin/eyes and/or to Use suitable protection						
Risk management measures related to emissions to the environment	Municipal or other type of waste water treatment	Yes					
	Effluent (of the waste water treatment plant) discharge rate	2.000 m ³ /d					
Section 3: Exposure estimation							
Section 3.1 Health							
Worker							
Dermal local exposure (in µg/cm ²)	200 (PROC8b, in absence of LEV)						
Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	0.27 (PROC8a)						
Dermal systemic exposure via aqueous solution (in mg/kg bw/d)	0.03 (PROC8a)						
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	2.0- 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.						
Inhalation exposure (in mg/m ³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)	3.3 (PROC11, spraying indoors). Spraying booth with containment and LEV must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d per worker 3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker						
Quantitative risk characterisation for workers							
	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	mg/cm ²	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	mg/kg bw/d	Repeated dose	Not quantified		Not quantified	
	Inhalation	mg/m ³	Repeated dose	Not quantified		Not quantified	

	Combined routes				RCR Inhalation-systemic + RCR Dermal-systemic		RCR Inhalation-systemic + RCR Dermal-systemic
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	-	Not relevant	-
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal ^a		Repeated dose	1.3 - 2.0 mg/kg bw/d	0.21	6.5 - 10.0 mg/kg bw/d	0.04
	Inhalation		Repeated dose	4.6 - 7.2 mg/m ³	0.48	23 - 36 mg/kg bw/d	0.10
	Combined routes				0.69, Acceptable risk		0.14, Acceptable risk

Consumer

Dermal local exposure (in µg/cm ²)	1870
Dermal systemic exposure (in mg/kg bw/d)	0.28 mg/kg bw/d (acute) 7.8E-04 mg/kg bw/d (chronic)
Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below
Inhalation exposure (in mg/m ³ /day) ¹² (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	n/a
Inhalation exposure (in mg/m ³ /day) ¹³ (refers only to any contributing tasks involving spraying of liquid product)	n/a

Quantitative risk characterisation for consumers

	Route	exposure concentrations (EC)	Leading toxic end point / Critical effect	DN(M)EL (ECHA)	Risk characterisation ratio	DN(M)EL (ECETOC)	Risk characterisation ratio
Acute - local effects	Dermal	0.25 mg/cm ² *	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below
	Inhalation	mg/m ³	no data	Not relevant	-	Not relevant	-
Acute - systemic effects	Dermal	0.28 mg/kg bw/d	Repeated dose	0.7 - 1.0 mg/kg bw/d	0.4	3.5 - 5.0 mg/kg bw/d	0.08
	Inhalation	-	Repeated dose	1.1 - 1.5 mg/m ³	-	5.5 - 7.5 mg/m ³	-
	Combined routes				0.4, Acceptable risk		0.08, Acceptable risk
Long-term - local effects	Dermal	mg/cm ² /d	Skin and/or eye irritation	Not relevant	Refer to qualitative risk characterisation below	Not relevant	Refer to qualitative risk characterisation below

	Inhalation	mg/m ³ ***	no data	Not relevant	-	Not relevant	-
Long-term - systemic effects	Dermal [†]	8E-04	Repeated dose	0.7 - 1.0 mg/kg bw/d	0.001	3.5 - 5.0 mg/kg bw/d	0.0002
	Inhalation	=	Repeated dose	1.1 - 1.5 mg/m ³	-	5.5 - 7.5 mg/m ³	-
	Combined routes				0.001. Acceptable risk		2E-04. Acceptable risk
Section 3.2 Environment							
Aquatic (before WWTP)				0.1 kg/d (consumer) 0.34 kg/d (professional)			
Soil (direct only)				0			
Air (direct + STP)				0			
Risk characterisation							
Aquatic compartment (including sediment)							
	Compartments	PEC	PNEC	PEC/PNEC	Discussion		
	Surface water	2.4E-06 mg/l		-	-		
	Freshwater sediment	45.0 mg/kg dw	49.5 mg/kg dw	0.909	The PEC associated with production is less than the indicative PNEC, resulting in a PEC/PNEC ratio of 0.909. Conclusion: acceptable risk.		
Risk characterisation for the terrestrial compartment							
	Compartments	PEC	PNEC	PEC/PNEC	Discussion		
	Industrial soil	50.1 mg/kg dw	55 mg/kg dw	0.91	The PEC associated with production results in a PEC/PNEC ratio of 0.91. Conclusion: acceptable risk.		
Atmospheric compartment							
No basis for risk characterisation. Not applicable							
Section 4: Guidance to DU to check own conditions							
Not available							
Additional good practice advise beyond CSA							
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH							
Not available							