SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

n-Dodecenyl Succinic Anhydride (J-12)

Synonyms: J-12, 3-(2-dodecenyl) succinic anhydride, 2,5-Furandione, 3-(2-dodecenyl) dihydro-, 3-(2-dodecenyl) dihydro-, n-DDSA Standard

Chemical Abstracts Registry No: 19780-11-1

REACH Registration Number: 01-2119980547-24-0001 (US manufactured material only), 01-2119980547-24-0003 (UK material)

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

Petroleum lubricant additive

1.3. Details of the supplier of the safety data sheet

Vertellus LLC
P.O. Box 730,
Delaware Water Gap, PA
800-344-3426

Vertellus Specialties UK Ltd.
Dock Road, Northside
Workington
Cumbria, CA14 1JJ, United Kingdom
+44 1900 604 371

E-mail Address: sds@vertellus.com

1.4. Emergency telephone number

Vertellus: 1-800-344-3426
CHEMTREC (USA): +1-800-424-9300 (collect calls accepted)
CHEMTREC (International): +1-703-527-3887 (collect calls accepted)
NRCC (China): +86 532 83889090

SECTION 2: Hazards identification


Skin Sensitization Category 1A
Serious Eye Irritation Category 2
Skin Irritation Category 2

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2.2. Label elements

Hazard Symbols (Pictogram):

![Warning Symbol]

Signal Word: Warning

Hazard Precautions:
- H317 - May cause an allergic skin reaction.
- H319 - Causes serious eye irritation.
- H315 - Causes skin irritation.

Prevention Precautionary Statements: P280 - Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Precautionary Statements:
- 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. P333+P313 - If skin irritation or rash occurs: Get medical advice/attention. P337+P313 - If eye irritation persists: Get medical advice/attention. P362 - Take off contaminated clothing and wash before reuse.

SECTION 3: Composition/information on ingredients

3.1. Substances or 3.2. Mixtures

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS Number</th>
<th>Concentration (weight %)</th>
<th>EC Number</th>
<th>CLP Inventory/Annex VI</th>
<th>EU CLP Classification (1272/2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-(2-dodecenyl) succinic anhydride</td>
<td>19780-11-1</td>
<td>~ 100</td>
<td>243-296-9</td>
<td>Not listed</td>
<td>Skin Irrit. 2; H315 Eye Irrit. 2; H319 Skin Sens. 1; H317</td>
</tr>
</tbody>
</table>

NOTE: See Section 8 for exposure limit data for these ingredients. See Section 15 for trade secret information (where applicable). See Section 16 for the full text of the R-phrases above.

SECTION 4: First aid measures

4.1. Description of first aid measures

| Skin Contact: | Remove contaminated clothing. Wash affected area with soap and water. Rinse thoroughly. If irritation persists or other symptoms are observed, seek medical advice. Wash/Decontaminate removed clothing before reuse. |
| Eye Contact: | Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15 minutes, or until the chemical is removed. Rinse eyes immediately with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. Remove contact lenses if present and easy to do. Get medical attention if irritation or other symptoms exist. |
| Inhalation: | If symptoms of respiratory irritation are experienced, remove source of contamination or move victim to fresh air and obtain medical advice. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention. |
| Ingestion: | If the material is swallowed, get immediate medical attention or advice – Do not induce vomiting. If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. |

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4.2 Most important symptoms and effects, both acute and delayed

Acute: Prolonged skin contact may cause irritation or dermatitis. Direct contact with the eyes may cause irritation; symptoms may include redness, pain and tearing.

Delayed Effects: None known.

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

Note to Physician: No specific indications. Treatment should be based on the judgment of the physician in response to the reactions of the patient.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Appropriate Extinguishing Media: Carbon dioxide, Alcohol foam, Water spray, Dry chemical, Use water spray to cool fire exposed containers.

5.2. Special hazards arising from the substance or mixture

Hazardous Products of Combustion: Dense smoke, irritating and toxic fumes and vapors may be generated by thermal decomposition and combustion. As with other organic materials, combustion will produce carbon monoxide and carbon dioxide.

Potential for Dust Explosion: not available

Special Flammability Hazards: Not applicable.

5.3. Advice for firefighters

Basic Fire Fighting Guidance: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Using water can cause frothing with increasing fire intensity. Water runoff can cause environmental damage. Dike and collect water used to fight fire.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuation Procedures: Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Special Instructions: See Section 8 for personal protective equipment recommendations. Remove all contaminated clothing to prevent further absorption. Decontaminate affected personnel using the first aid procedures in Section 4. Leather shoes that have been saturated must be discarded.

6.2. Environmental precautions

Prevent releases to soils, drains, sewers and waterways.

6.3. Methods and material for containment and cleaning up

Vacuum, scrape or scoop the material into a chemical waste container LARGE SPILLS: Shut off leak if safe to do so. Avoid generation of dust clouds during clean-up.

6.4. Reference to other sections

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Refer to section 8 for information on selecting personal protective equipment. Refer to section 13 for information on spilled product, absorbent and clean up material disposal instructions.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for Unique Hazards: Not applicable.

Practices to Minimize Risk: Wear appropriate protective equipment when performing maintenance on contaminated equipment. Wash hands thoroughly before eating or smoking after handling this material. Do not eat, drink or smoke in work areas. Prevent contact with incompatible materials. Avoid spills and keep away from drains. Handle in a manner to prevent generation of aerosols, vapors or dust clouds. Use with adequate ventilation. Avoid generating dusts, vapors or mists. Do not get on skin or in eyes. Do not ingest or inhale.

Special Handling Equipment: Not applicable.

7.2. Conditions for safe storage, including any incompatibilities

Storage Precautions & Recommendations: Store in a cool, dry area out of direct sunlight. Keep container closed when not in use.

Dangerous Incompatibility Reactions: Strong oxidizing agents Alkali Metals Amines

Incompatibilities with Materials of Construction: None known

7.3. Specific end use(s)

If a chemical safety assessment has been completed an exposure scenario is attached as an annex to this Safety Data Sheet. Refer to this annex for the specific exposure scenario control parameters for uses identified in subsection 1.2.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure Limit: Not applicable.

Air Monitoring Method: Not applicable.

Derived No Effect Levels (DNELs) – Workers:

<table>
<thead>
<tr>
<th>Route</th>
<th>DNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute - systemic effects (dermal)</td>
<td>Qualitative due to skin sensitization</td>
</tr>
<tr>
<td>Long-term - systemic effects (dermal)</td>
<td>0.33 mg/kg bw/day</td>
</tr>
<tr>
<td>Long-term - systemic effects (inhalation)</td>
<td>Not established; exposure unlikely</td>
</tr>
<tr>
<td>Long term - local effects (dermal)</td>
<td>Qualitative due to skin sensitization</td>
</tr>
</tbody>
</table>

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Derived No Effect Levels (DNELs) – General Population:

<table>
<thead>
<tr>
<th>Route</th>
<th>DNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute - systemic effects (oral, dermal)</td>
<td>Qualitative assessment - skin/eye/respiratory irritant. No applications involving general population</td>
</tr>
<tr>
<td>Acute - systemic effects (inhalation)</td>
<td>Qualitative assessment - skin/eye/respiratory irritant. No applications involving general population</td>
</tr>
<tr>
<td>Long-term - systemic effects (dermal)</td>
<td>Qualitative assessment - skin/eye/respiratory irritant. No applications involving general population</td>
</tr>
<tr>
<td>Long-term - systemic effects (inhalation)</td>
<td>Qualitative assessment - skin/eye/respiratory irritant. No applications involving general population</td>
</tr>
<tr>
<td>Long-term - systemic effects (oral)</td>
<td>Qualitative assessment - skin/eye/respiratory irritant. No applications involving general population</td>
</tr>
<tr>
<td>Acute and long-term - local effects (dermal, inhalation)</td>
<td>Qualitative assessment - skin/eye/respiratory irritant. No applications involving general population</td>
</tr>
</tbody>
</table>

Predicted No Effect Concentrations (PNECs):

<table>
<thead>
<tr>
<th>Route</th>
<th>PNEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNEC aqua (freshwater)</td>
<td>0.02 mg/L</td>
</tr>
<tr>
<td>PNEC aqua (marine water)</td>
<td>0.002 mg/L</td>
</tr>
<tr>
<td>PNEC aqua (intermittent releases)</td>
<td>0.13mg/L</td>
</tr>
<tr>
<td>PNEC aqua (STP)</td>
<td>0.130 mg/L</td>
</tr>
<tr>
<td>PNEC sediment (freshwater)</td>
<td>1.7 mg/kg sediment dw</td>
</tr>
<tr>
<td>PNEC sediment (marine water)</td>
<td>0.17 mg/kg sediment dw</td>
</tr>
<tr>
<td>PNEC soil</td>
<td>0.2 mg/kg soil dw</td>
</tr>
<tr>
<td>PNEC oral (wildlife exposures)</td>
<td>Derivation waived - low Kow &gt;3</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Also see the annex to this SDS (if applicable) for specific exposure scenario controls.

**Personal Protective Equipment:** Wear impervious gloves (i.e., latex rubber), boots, work uniform and safety glasses

**Respirator Caution:** Observe OSHA regulations for respirator use (29 CFR 1910.134). Air-purifying respirators must not be used in oxygen-deficient atmospheres.

**Thermal Hazards:** Not applicable.

**Environmental Exposure Controls:** The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

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SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance, State &amp; Odor</td>
<td>Off-white to pink waxy solid with a vegetable oil odor.</td>
</tr>
<tr>
<td>Molecular Formula:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Molecular Weight:</td>
<td>266.37 g/mol</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>&lt; 0.06 Pa</td>
</tr>
<tr>
<td>Specific Gravity or Density:</td>
<td>0.9663 @ 20 °C</td>
</tr>
<tr>
<td>Boiling Point:</td>
<td>360 °C 680 °F</td>
</tr>
<tr>
<td>Solubility in Water:</td>
<td>0.13 mg/L @ 20C</td>
</tr>
<tr>
<td>pH</td>
<td>No data available.</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Flash Point and Method:</td>
<td>287.6 (142°C)</td>
</tr>
<tr>
<td>Flammability (solid, gas):</td>
<td>Not Flammable</td>
</tr>
<tr>
<td>Explosive Properties:</td>
<td>No data available.</td>
</tr>
</tbody>
</table>

SECTION 10: Stability and reactivity

10.1. Reactivity
Not classified as dangerously reactive.

10.2. Chemical stability
Stable under normal conditions.

10.3. Possibility of hazardous reactions
Not expected to occur.

10.4. Conditions to avoid
moisture Incompatible materials

10.5. Incompatible materials
Strong oxidizing agents; Alkali Metals; Amines

10.6. Hazardous decomposition products
Products from combustion may include dense smoke, irritating and toxic fumes and vapors.; Products of incomplete combustion may include carbon monoxide, carbon dioxide and dense smoke.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

- **Acute Oral LD₅₀**: Oral LD₅₀ (rat) > 2000 mg/kg  (KEY (Lowe, 2012))
- **Acute Dermal LD₅₀**: Dermal LD₅₀ (rabbit) > 2000 mg/kg  (KEY (Lowe, 2012))
- **Acute Inhalation LC₅₀**: Inhalation LC₅₀ (rat) > 5300 mg/cubic meter  (Welch 1982)
- **Skin Irritation**: Severely irritating to skin.
- **Eye Irritation**: May cause slight irritation.

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Skin Sensitization: Possible skin sensitizer; may cause allergic skin reaction.

Mutagenicity: Negative for mutagenic activity in Ames testing and mouse lymphoma assay, both with and without metabolic activation.

Reproductive / Developmental Toxicity: No evidence of reproductive or developmental toxicity

Carcinogenicity: No data available.

Target Organs: No data available.

Primary Route(s) of Exposure: Inhalation. Ingestion. Eye contact. Skin contact.

Most important symptoms and effects, both acute and delayed: Prolonged skin contact may cause irritation or dermatitis. Direct contact with the eyes may cause irritation; symptoms may include redness, pain and tearing. Delayed Effects: None known.

Additive or Synergistic effects: None known.

SECTION 12: Ecological information

12.1. Toxicity
96-hr LC50 ONCORHYNCHUS MYKISS > 100 mg/L Dinehart, Simon 2014
EC50 Daphnia magna > 100 mg/L Novak, 2013
EC50 (96h) Selenastrum capricornutum (algae) = 110 mg/L Ward, 1997

12.2. Persistence and degradability
The substance was not shown to be readily biodegradable in a ready biodegradability assay, although the substance was shown to exhibit properties of inherent ultimate biodegradability.

12.3. Bioaccumulative potential
Bioconcentration is not expected to occur.

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
This substance is not a PBT or vPvB.

12.6. Other adverse effects
No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
US EPA Waste Number: Not applicable
Waste Disposal:
NOTE: Generator is responsible for proper waste characterization. State hazardous waste regulations may differ substantially from federal regulations. Dispose of this material responsibly, and in accordance with standard practice for disposal of potentially hazardous materials as required by applicable international, national, regional, state or local laws, and environmental protection duty of care principles. Do NOT dump into any sewers, on the ground, or into any body of water. For disposal within the EC, the appropriate classification code according to the European Community List of Wastes should be used. Note that disposal regulations may also apply to empty containers and equipment rinsates.

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SECTION 14: Transport information

The following information applies to all shipping modes (DOT/IATA/ICAO/IMDG/ADR/RID/ADN), unless otherwise indicated:

14.1. UN number
Not applicable

14.2. UN proper shipping name
Chemicals, N.O.S. (n-Dodecenylsuccinic Anhydride)

14.3. Transport hazard class(es)
Not applicable

14.5. Environmental hazards
Not applicable

14.6. Special precautions for user
Non Hazardous

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

- Chemical Inventory Lists: Status:
  - USA TSCA: Listed
  - Canada(DSL/NDSL): NDSL
  - Korea: Not listed.
  - China: Listed
  - Taiwan: Listed
  - Germany Water Hazard Classification: No data available.
  - SARA 313: Not listed
  - HMIS IV: HEALTH 2, FLAMMABILITY 1, PHYSICAL HAZARD 0
  - NFPA:

15.2. Chemical safety assessment
Not applicable.

SECTION 16: Other information

Key Data Sources: Literature Reference:
- Hersham (1983) Summary of results of primary eye irritation study, The Lubrizol Corp
- Lowe (2012) Primary Skin irritation Study in Rabbits, DDSA-OSA Consortium
- Nakamura (1999) A quantitative comparison of induction challenge concentrations inducing a 50% positive response in three skin sensitization tests, published J Toxicological Sciences

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- Novak (2013) Triponeny succinic acid Acute immobilization Test to Daphnia magna, static 48 hour limit test, Clariant Product
- Schreib (2012) Reverse Mutation Assay Using Bacteria with n-Dodecenyl succinic anhydride, DDSA-OSA Consortium
- Takawale, Pradeep (2013) Reproduction/Developmental Toxicity Screening Test including Sperm Analysis in Wistar Rats with Novoperm, Clariant Product
- Ward, Magazu, Boeri (1997) Acute Toxicity of the Water Accommodated Fraction of OS# 1823OU to the Freshwater Algae, The Lubrizol Corporation
- Welch (1982) Inhalation Toxicity Study in Rats with EPA Response, Buffalo Color Corp

Training Advice: Not applicable.

Legend of Abbreviations:

ACGIH = American Conference on Governmental Industrial Hygienists.
CAS = Chemical Abstracts Service.
DSSL/NDSL = Domestic Substances List/Non-Domestic Substances List.
EC = European Community.
EINECS = European Inventory of Existing Commercial Chemical Substances.
ELINCS = European List of Notified Chemical Substances.
EU = European Union.
GHS = Globally Harmonized System.
LC = Lethal Concentration.
LD = Lethal Dose.
NIOSH = National Institute of Occupational Safety and Health.
NTP = National Toxicology Program.
OSHA = Occupational Safety and Health Administration
PEL = Permissible Exposure Limit.
RQ = Reportable Quantity.
TLV = Threshold Limit Value.
WHMIS = Workplace Hazardous Materials Information System.

Important Note: Please note that the information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. The information contained herein may change without prior notice. THIS SAFETY DATA SHEET SUPERSEDES ALL PREVIOUS EDITIONS.

Revision Date: 22 Aug 2018
Issued by: Regulatory Management Department
Email: SDS@Vertellus.com
Revision Details: Revised use and added REACH information.
SAFETY DATA SHEET

Annex

n-Dodecenyl Succinic Anhydride - Summary of Uses

<table>
<thead>
<tr>
<th>ES Number</th>
<th>Name</th>
<th>SU</th>
<th>ERC</th>
<th>PROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formulation</td>
<td>3/8</td>
<td>2</td>
<td>3,8a,8b,15</td>
</tr>
<tr>
<td>2</td>
<td>Use as an intermediate</td>
<td>3/8</td>
<td>6a</td>
<td>3,4,8a,8b,15</td>
</tr>
</tbody>
</table>

n-Dodecenyl Succinic Anhydride Exposure Scenarios

Note: Guidance below is in addition to that indicated in sections 1-16 of the SDS

ES 1
Title: Formulation
Exposure scenario covering the following
Main Sector of Use Group
- SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites
  - SU8: Manufacture of bulk, large scale chemicals
Process Categories
- PROC 3: Formulation in closed bath process
- PROC 8a: Transfer of substance- non-dedicated facilities
- PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
- PROC 15: Laboratory use - sampling
Environmental Release Categories
- ERC 2: Formulation

ES 2
Title: Use as an Intermediate
Exposure scenario covering the following
Main Sector of Use Group
- SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites
  - SU8: Manufacture of bulk, large scale chemicals
Process Categories
- PROC 3: Use in closed batch process (synthesis or formulation)
- PROC 4: Use in batch processes-opportunities for exposure
- PROC 8a: Transfer of substance-Non-Dedicated facilities
- PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
- PROC 15: Laboratory Use - Sampling
Environmental Release Categories
- ERC 6a: Use as an Intermediate

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1. Control of Worker Exposure
   
   **Product Characteristic**
   - The material exists only in the liquid form

   **Amounts used**
   - Not relevant for human risk assessment

   **Frequency and duration of use/exposure**
   
<table>
<thead>
<tr>
<th>PROC</th>
<th>Hours / shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>&lt; 8 hours</td>
</tr>
<tr>
<td>4</td>
<td>&lt; 8 hours</td>
</tr>
<tr>
<td>8a</td>
<td>&lt; 4 hours</td>
</tr>
<tr>
<td>8b</td>
<td>&lt; 4 hours</td>
</tr>
<tr>
<td>15</td>
<td>&lt; 1 hour</td>
</tr>
</tbody>
</table>

   **Other given operational conditions affecting workers exposure**
   - The work is performed indoors

   **Technical conditions and measures at process level (source) to prevent release:**
   - See Section 7 of SDS

   **Technical conditions and measures to control dispersion from source towards the worker:**
   - See Section 7 and 8 of SDS
   - Ventilation

<table>
<thead>
<tr>
<th>PROC</th>
<th>General Ventilation</th>
<th>Local Ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>General (1-3 air changes per hour)</td>
<td>Yes 90% Efficiency</td>
</tr>
<tr>
<td>4</td>
<td>General (1-3 air changes per hour)</td>
<td>Yes 90% Efficiency</td>
</tr>
<tr>
<td>8a</td>
<td>General (1-3 air changes per hour)</td>
<td>Yes 90% Efficiency</td>
</tr>
<tr>
<td>8b</td>
<td>General (1-3 air changes per hour)</td>
<td>Yes 90% Efficiency</td>
</tr>
<tr>
<td>15</td>
<td>General (1-3 air changes per hour)</td>
<td>Yes 90% Efficiency</td>
</tr>
</tbody>
</table>

   **Organisational measures to prevent /limit releases, dispersion and exposure:** See SDS

   **Conditions and measures related to personal protection, hygiene and health evaluation:**
   - See sections 7, 8 and 10 of SDS
   - Respirators: not defined
   - Gloves with specific activity training, 95% efficiency assumed for all

2. Control of Environmental Exposure

   **Product characteristics**
   - The substance is a liquid.

   **Frequency and duration of use**
   - Continuous and Intermittent release possible

   **Environment factors not influenced by risk management**
   - Default values of 18,000 m³/d for receiving waters are assumed

   **Other given operational conditions affecting environmental exposure**
SAFETY DATA SHEET

- Operations are assumed to be indoors
- Production is in closed systems

Technical conditions and measures at process level (source) to prevent release
- See sections 7 and 8 of the SDS

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Water
- Discharge to STP: Treatment efficiency assumed 90.19%
- STP Discharge rate: 2000 m³/day
- Compliance with local water discharge regulations

<table>
<thead>
<tr>
<th>Use</th>
<th>Release Rate %</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Formulation</td>
<td>0</td>
<td>FEICA 2.1bv2: Formulation of solvent borne adhesives</td>
</tr>
<tr>
<td>2: Use as Intermediate</td>
<td>0.01</td>
<td>Closed system; upper worst case release limit</td>
</tr>
</tbody>
</table>

Air

<table>
<thead>
<tr>
<th>Use</th>
<th>Release Rate %</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Formulation</td>
<td>0.024</td>
<td>FEICA 2.1bv2: Formulation of solvent borne adhesives</td>
</tr>
<tr>
<td>2: Use as intermediate</td>
<td>0</td>
<td>Use in closed systems</td>
</tr>
</tbody>
</table>

Soil

<table>
<thead>
<tr>
<th>Use</th>
<th>Release Rate %</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Formulation</td>
<td>0</td>
<td>FEICA 2.1bv2: Formulation of solvent borne adhesives</td>
</tr>
<tr>
<td>2: Use as Intermediate</td>
<td>0</td>
<td>Used in closed systems</td>
</tr>
</tbody>
</table>

Organizational measures to prevent/limit release from site
- See Sections 6 and 7 of the SDS

Conditions and measures related to municipal sewage treatment plant disposal
- The default STP value of 2000 m³/d was used.

Conditions and measures related to external treatment of waste for disposal
- See section 13 of the SDS
- Empty raw material packaging containers (EU waste code: 15 01 10)
- Residual in shipping containers assumed to be <0.1%
- Observe all regional, state and local environmental regulations

Conditions and measures related to external recovery of waste
- There is no recovery at an external waste treatment site

3. Exposure estimation and reference to its source

The human health risk assessment and the environmental risk assessment were performed using Chesar with ECETOC TRA 3.0... Tables below summarize the calculated exposures and resulting Risk Characterization Ratios (RCR) at < 1.0. Note the worker exposures in ECETOC TRA are calculated by multiplying the full shift calculations by the following factors:
- >4 hours: 1
- 1-4 hours: 0.6

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The activities discussed above result in an acceptable exposure if individually performed by an industrial/professional worker, and considering the operational conditions and the risk management measures (RMM) as defined. The downstream user may re-calculate the RCR values based on variations in the local operational conditions and application of RMM to confirm that operations are within the control limits.

Predicted Exposure Concentrations / Risk Characterization – Environmental

<table>
<thead>
<tr>
<th>Compartent</th>
<th>Local PEC; Use 1</th>
<th>RCR*</th>
<th>Local PEC; Use 2</th>
<th>RCR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water: Fresh; mg/L</td>
<td>2.622E-9</td>
<td>&lt;0.01</td>
<td>0.002</td>
<td>0.094</td>
</tr>
<tr>
<td>Water: Fresh Sediment; mg/kg</td>
<td>2.258E-7</td>
<td>&lt;0.01</td>
<td>0.163</td>
<td>0.096</td>
</tr>
<tr>
<td>Water: Marine; mg/L</td>
<td>1.999E-11</td>
<td>&lt;0.01</td>
<td>1.889E-4</td>
<td>0.094</td>
</tr>
<tr>
<td>Water: Marine Sediment; mg/kg</td>
<td>1.721E-9</td>
<td>&lt;0.01</td>
<td>0.016</td>
<td>0.096</td>
</tr>
<tr>
<td>Water: STP mg/L</td>
<td>0</td>
<td>&lt;0.01</td>
<td>0.019</td>
<td>0.146</td>
</tr>
<tr>
<td>Soil: mg/kg</td>
<td>5.94E-5</td>
<td>&lt;0.01</td>
<td>2.429E-4</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

*Risk Characterization Ratio

Predicted Exposure Concentrations – Worker

<table>
<thead>
<tr>
<th>Route of exposure:</th>
<th>PROC 3</th>
<th>PROC 4</th>
<th>PROC 8a</th>
<th>PROC 8b</th>
<th>PROC 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation: Acute Systemic: mg/m3</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Inhalation: Long Term Local: mg/m3</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Inhalation: Long Term Systemic: mg/m3</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Dermal: Acute Systemic: mg/kg bw/day</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Dermal: Long Term Local: mg/cm2</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Dermal: Long Term Systemic: mg/kg bw/day</td>
<td>0.034</td>
<td>0.034</td>
<td>0.069</td>
<td>0.034</td>
<td>0.034</td>
</tr>
</tbody>
</table>

Qual: Qualitative assessment completed to demonstrate control considering alternate modes and the use of defined Operational Conditions and Risk Management Measures

Risk Characterization Ratio – Worker

<table>
<thead>
<tr>
<th>Route of exposure:</th>
<th>PROC 3</th>
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<th>PROC 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation: Acute Systemic:</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Inhalation: Long Term Local:</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Inhalation: Long Term Systemic:</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
<tr>
<td>Dermal: Acute Systemic:</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
</tbody>
</table>

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SAFETY DATA SHEET

<table>
<thead>
<tr>
<th></th>
<th>Qual</th>
<th>Qual</th>
<th>Qual</th>
<th>Qual</th>
<th>Qual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermal: Long Term Local:</td>
<td>0.105</td>
<td>0.105</td>
<td>0.208</td>
<td>0.105</td>
<td>0.105</td>
</tr>
<tr>
<td>Dermal: Long Term Systemic</td>
<td>0.105</td>
<td>0.105</td>
<td>0.208</td>
<td>0.105</td>
<td>0.105</td>
</tr>
<tr>
<td>Combined: Long Term Systemic</td>
<td>0.105</td>
<td>0.105</td>
<td>0.208</td>
<td>0.105</td>
<td>0.105</td>
</tr>
<tr>
<td>Combined: acute systemic</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
<td>Qual</td>
</tr>
</tbody>
</table>

Qual: Qualitative assessment completed to demonstrate control considering alternate modes and the use of defined Operational Conditions and Risk Management Measures

The primary hazard is sensitisation by skin contact.
Substance is classified as an eye irritant. Skin irritant.

Avoid skin contact. Wear gloves conforming to at least EN374.
Wear suitable working clothes, taking all precautions against exposure. Wash contaminated clothing before reuse.

Contact with aerosols or vapours will cause severe eye irritation. Use suitable eye protection: goggles during normal operations, with faceshield where there is a risk of splashing.

Avoid direct eye contact with product, also via contamination on hands.

The vapour pressure of the substance is relatively low and the substance is not expected to readily volatilize. If used at elevated temperatures, vapours may cause respiratory irritation. Where there is a risk of vapour formation, respiratory protection (APF10 or greater) is required.