SAFETY DATA SHEET
(according to (EC) 1907/2006)

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

1.1. Product identifier
Ethyl Citrate

1.2. Relevant identified uses of the substance or mixture and uses advised against
Not provided.

1.3. Details of the supplier of the safety data sheet
Manufacturer Information:
Vertellus LLC
201 North Illinois Street, Suite 1800,
Indianapolis, IN 46204
Non-Emergency Fax Number: 1-336-854-4058
E-Mail Address: msds@vertellus.com
Non-Emergency Phone Number: 336-292-1781

1.4. Emergency telephone number
Vertellus: 1-336-292-1781
CHEMTREC (USA): 1-800-424-9300 (collect calls accepted); (Int’l): 1-703-527-3887 (collect calls accepted; 011 prefix not needed)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture
(According to Regulation (EC) No 1272/2008)
Acute Toxicity Inhalation Dust / MistCategory 4

Signal Word:
Warning

Hazard Precautions:
H332 - Harmful if inhaled.

2.2. Label elements
Prevention Precautions:
P271 - Use only outdoors or in a well-ventilated area.
P261 - Avoid breathing dust/fume/gas/mist/vapours/spray.

First Aid Precautions:
P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage Precautions:
Not required.

Disposal Precautions:
Not required.

Single Exposure Target Organs:
Not applicable

Repeated Exposure Target Organs:
Not applicable

2.3. Other hazards

Signs and Symptoms of Potential Overexposure: High gas, vapor, or mist concentrations may be harmful if inhaled. May cause irritation in eyes and skin. May be harmful if ingested in sufficient quantities.

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

Medical Conditions Aggravated by Exposure: No data found

SECTION 3: Composition/information on ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS Number</th>
<th>Concentration (%)</th>
<th>EINECS / ELINCS</th>
<th>EU Symbol</th>
<th>Risk Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diethyl Citrate</td>
<td>32074-56-9</td>
<td>40 - 60</td>
<td>250-914-0</td>
<td>N/A</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Triethyl Citrate</td>
<td>77-93-0</td>
<td>20 - 35</td>
<td>201-070-7</td>
<td>Xn</td>
<td>R20</td>
</tr>
</tbody>
</table>
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Monoethyl Citrate 172820-60-9 15 - 25 Not listed. N/A Not applicable
Citric Acid 77-92-9 0.1 - 5 201-069-1 N/A Not applicable

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

SECTION 4: First aid measures

4.1. Description of first aid measures
   Skin Contact: Wash thoroughly after skin contact. Causes skin irritation.
   Eye Contact: Immediately flush the eyes with plenty of water for at least 15 minutes. Call a physician.
   Inhalation: Remove from exposure. If not breathing, give artificial respiration and call a physician. High gas, vapor, or mist concentrations may be harmful if inhaled
   Ingestion: If swallowed, do not induce vomiting. Get prompt medical attention. May be harmful if ingested in sufficient quantities

4.2. Most important symptoms and effects, both acute and delayed
   Acute: High gas, vapor, or mist concentrations may be harmful if inhaled. May cause irritation in eyes and skin. May be harmful if ingested in sufficient quantities.
   Delayed Effects: None known.

4.3. Indication of any immediate medical attention and special treatment needed
   Thermal Exposure: Not applicable.
   Note to Physician: No additional first aid information available

SECTION 5: Firefighting measures

5.1. Extinguishing media
   Appropriate Extinguishing Media: Foam Dry chemical Water spray

5.2. Special hazards arising from the substance or mixture
   Hazardous Products of Combustion: As with other organic materials, combustion will produce carbon monoxide and carbon dioxide.
   Potential for Dust Explosion: Not applicable.
   Special Flammability Hazards: Not applicable.

5.3. Advice for firefighters
   Basic Fire Fighting Guidance: Wear self-contained breathing apparatus and protective clothing. Normal firefighting procedures may be used.
   Flammability Classification (OSHA): Combustible Liquid - Class III A
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: 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
Containment Techniques and Clean-up Procedures: Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Remove all ignition sources. Ventilate the area of spill or leak. Wear protective equipment during clean-up. For small spills, use suitable absorbent material and collect for later disposal. For large spills, the area may require diking to contain the spill. Material can then be collected (e.g., suction) for later disposal. After collection of material, flush area with water. Dispose of the material in accordance with standard practice for disposal of potentially hazardous materials as required by applicable federal, state or local laws. Contain spilled liquid with sand or vermiculite and place in chemical waste container. Prevent runoff from entering drains, sewers, and streams.

Special Reporting Requirements: Not applicable.

6.4. Reference to other sections
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.
Special Handling Equipment: Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities
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Storage Precautions & Recommendations: This product should be stored at ambient temperature in a dry, well-ventilated location. Keep container closed when not in use.

Dangerous Incompatibility Reactions: Incompatible with oxidizing materials.

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
Exposure Limits (United States): OSHA PEL: None ACGIH TLV: Not established

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

Personal Protective Equipment: Goggles or glasses with side shields. Clothing should be sufficient to minimize physical contact. The use of a NIOSH-approved organic vapor respirator is recommended whenever this product is used in a confined space or heated above ambient temperature.


Ventilation: All operations should be conducted in well-ventilated conditions. Local exhaust ventilation should be provided.

Other Engineering Controls: All appropriate engineering controls should be used to minimize exposure potential. Use exhaust ventilation to keep airborne concentrations below exposure limits.

Thermal Hazards: Not applicable.

Additive or Synergistic Effects: None known.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties
Appearance, State & Odor (ambient temperature): Clear, oily liquid
Molecular Formula: Mixture
Molecular Weight: Mixture
Vapor Pressure: Not established
Evaporation Rate: Not determined
Specific Gravity or Density: 1.23
Vapor Density (air = 1): > 1
Boiling Point: 294 °C
Freezing / Melting Point: -49 °F -45 °C
Solubility in Water: Soluble
Octanol / Water Coefficient: Not available.
pH: Not available.
Odor Threshold: Essentially odorless.
Viscosity: Not available.
Autoignition Temperature: Not established
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Flash Point and Method: 140°F (60°C) (Not provided)  Flammable Limits: Not established (LEL) – Not established (UEL)

9.2. Other information
Not applicable.

SECTION 10: Stability and reactivity

10.1. Reactivity
Not classified as dangerously reactive.

10.2. Chemical stability
Stable

10.3. Possibility of hazardous reactions
Will not occur.

10.4. Conditions to avoid
No data.

10.5. Incompatible materials
Incompatible with oxidizing materials.

10.6. Hazardous decomposition products
Carbon dioxide

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute Oral LD₅₀:
- Oral LD₅₀ (rat) = 5900 mg/kg
- Oral LD₅₀ (cat) = 3500 mg/kg
- Oral LD₅₀ (guinea pig) > 25 mL/kg
- Oral LD₅₀ (rat) = 7952 mg/kg
- Oral LD₅₀ (cat) = 3976 mg/kg
- Oral LD₅₀ (rat) 3000 mg/kg

Acute Dermal LD₅₀:
- Dermal LD₅₀ (rabbit) > 5 g/kg

Acute Inhalation LC₅₀:
- Inhalation LC₅₀ (6h) (rat) = 1300 ppm

Other Toxicity Data:
- Intraperitoneal LD₅₀ (rat) = 4 g/kg
- Subcutaneous LD₅₀ (rat) = 6600 mg/kg
- Intraperitoneal LD₅₀ (mouse) = 1750 mg/kg

Skin Irritation:
May cause slight irritation.

Skin Sensitization:
No data available.

Eye Irritation:
May cause slight irritation.

Target Organs:
Triethyl Citrate was administered to rats in a 6-8 week feeding study, in varying doses up to 50% of the LD₅₀ value. No gross effects were observed, nor were any changes noted in histological examination and blood counts.

In cats treated with daily doses of 5 cc/kg for 8 weeks, no changes were observed in general appearance, behavior, urine or blood chemistry or blood count; body weight declines may be attributable to diarrhea effects observed during treatment. Triethyl citrate administration in cats at 6 and 9 cc/kg (well
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above the LD50) was found to cause progressive lowering of blood pressure to shock levels and slowing of the heart rate; however these effects were determined not to be due to any material interference with neuromuscular transmission.

Triethyl citrate was found to be a skin sensitizer in the guinea pig maximization test, but has been determined to have no skin sensitizing or irritation effects in humans based on a repeated insult patch test. TDLo (intraperitoneal, mouse) = 4,900 mg/kg/14D-I TDLo (oral, cat) = 15,904 mg/kg/8W-C

Carcinogenicity: No data available.
Teratogenicity: No data available.
Reproduction: No data available.
Neurotoxicity: No data available.
Mutagenicity: No data available.
Additional Toxicity Information: Toxicological data are for components.

SECTION 12: Ecological information

12.1. Toxicity
72 HR EC50 DAPHNIA MAGNA 120 mg/L
96 HR LC50 LEPOMIS MACROCHIRUS 1516 MG/L [STATIC]

12.2. Persistence and degradability
Based on environmental modeling, this material is expected to be readily biodegradable. Not expected to bioaccumulate.

12.3. Bioaccumulative potential
No data

12.4. Mobility in soil
No data

12.5. Results of PBT and vPvB assessment
Not available.

12.6. Other adverse effects
Not predicted to exhibit significant toxicity to fish. Eco-toxicological data are for components.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
US EPA Waste Number: Not applicable

Waste Classification: (per US regulations) Dispose of by incineration following Federal, State, Local, or Provincial regulations.
NOTE: Generator is responsible for proper waste characterization. State (USA) hazardous waste regulations may differ substantially from federal (USA) regulations.

Waste Disposal: Dispose of this material in accordance with standard practice for disposal of potentially hazardous materials as required by applicable international, national, regional, state or local laws. Do NOT dump into any sewers, on the ground, or into any body of water. For disposal within the EC, the appropriate code according to the European Waste Catalogue (EWC) should be used. Note that disposal regulations may also apply to empty containers and equipment rinsates.
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SECTION 14: Transport information

14.1. UN number
Not applicable

14.2. UN proper shipping name
Chemicals, n.o.s. (Ethyl Citrate)

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 available.

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

OSHA Hazards:
Health: Irritant.

Physical: Combustible Liquid.

WHMIS Classification:
Class D, Division 2, Subdivision B: Irritant.

Chemical Inventory Lists:

<table>
<thead>
<tr>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSCA: Present</td>
</tr>
<tr>
<td>EINECS:</td>
</tr>
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<td>250-914-0</td>
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<tr>
<td>201-070-7</td>
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<td>201-069-1</td>
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<td>Canada(DSL/NDSL):</td>
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<td>KE-20840</td>
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<tr>
<td>KE-20831</td>
</tr>
</tbody>
</table>

Australia:
Present

New Zealand:
Present

China:
Present

Philippines:
Present

Switzerland:
G-3153

New Zealand GHS Classification:
Not classified by this country.
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Japan GHS Classification: Not classified by this country.
Korea (MOL) GHS Classification: Not classified by this country.
Australia GHS Classification: Not classified by this country.
Taiwan GHS Classification: Not classified by this country.
Indonesia GHS Classification: Not classified by this country.
SARA 313: Not available.

15.2. Chemical safety assessment
Not applicable.

SECTION 16: Other information

Full text of R phrases in Section 3: R20: Harmful by inhalation.
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Legend of abbreviations:

ACGIH = American Conference on Governmental Industrial Hygienists.
CAS = Chemical Abstracts Service.
DSL/NDSL = Domestic Substances List/Non-Domestic Substances List.
EC = European Community.
EEC = European Economic 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.
MOL = Ministry of Labor.
NEMA = National Emergency Management Agency.
NIOSH = National Institute of Occupational Safety and Health.
NTP = National Toxicological Program.
OSHA = Occupational Safety and Health Administration.
PEL = Permissible exposure limit.
RQ = Reportable quantity.
TLV = Threshold limit value.
WHMIS = Workplace Hazardous Materials Information System.

Precautionary Statement: 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.

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Issued By: Regulatory Management Department
Revision Details: Revised in all sections to GHS format.