SAFETY DATA SHEET
Glufosinate (ammonium salt)

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 16675
Product Name: Glufosinate (ammonium salt)
Synonyms: 2-amino-4-(hydroxymethylphosphinyl)-butanoic acid, monoammonium salt; Basta®; HOE 00661; HOE 39866;

1.2 Relevant identified uses of the substance or mixture and uses advised against:
Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108
Web site address: www.caymanchem.com
Information: +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:
2.1.1 Classification according to Regulation (EC) No 1272/2008 [CLP]:
Acute Toxicity: Inhalation, Category 4
Acute Toxicity: Oral, Category 4
Acute Toxicity: Skin, Category 4
Toxic To Reproduction, Category 1B
Target Organ Systemic Toxicity (repeated exposure), Category 2

2.2 Labelling:
2.2.1 Labeling according to Regulation (EC) No 1272/2008 [CLP]:

GHS Signal Word: Danger
GHS Hazard Phrases:
H332: Harmful if inhaled.
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H360: May damage fertility or the unborn child.
H373: May cause damage to organs through prolonged or repeated exposure.

GHS Precaution Phrases:
P261: Avoid breathing (dust/fume/gas/mist/vapours/spray).
P264: Wash (hands) thoroughly after handling.
P280: Wear (protective gloves/protective clothing/eye protection/face protection).
P362+364: Take off contaminated clothing and wash it before reuse.
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P281: Use personal protective equipment as required.
P260: Do not breathe {dust/fume/gas/mist/vapours/spray}.

GHS Response Phrases:
P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312: Call a {POISON CENTER/doctor/...} if you feel unwell.
P301+312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P330: Rinse mouth.
P302+352: IF ON SKIN: Wash with plenty of soap and water.
P321: Specific treatment {see ... on this label}.
P308+313: IF exposed or concerned: Get medical attention/advice.
P314: Get medical attention/advice if you feel unwell.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health Effects and Symptoms:
Harmful if inhaled.
Harmful if swallowed.
Harmful in contact with skin.
Material may be irritating to the mucous membranes and upper respiratory tract.
May cause damage to organs through prolonged or repeated exposure.
May cause eye, skin, or respiratory system irritation.
May damage fertility or the unborn child.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

### Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name)/ REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./ EC Index No.</th>
<th>GHS Classification</th>
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</thead>
<tbody>
<tr>
<td>77182-82-2 / EK7713600</td>
<td>Butanoic acid, 2-Amino-4-(hydroxymethylphosphinyl)-, monoammonium...</td>
<td>100.0 %</td>
<td>278-636-5 015-155-00-X</td>
<td>Acute Tox.(O) 4: H302 Acute Tox.(D) 4: H312 Acute Tox.(I) 4: H332 Toxic Repro. 1B: H360 TOST (RE) 2: H373</td>
</tr>
</tbody>
</table>

### Section 4. First Aid Measures

4.1 Description of First Aid Measures:

**In Case of Inhalation:** Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

**In Case of Skin Contact:** Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

**In Case of Eye Contact:** Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

**In Case of Ingestion:** Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.
Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.

5.2 Unsuitable Extinguishing Media: Use water spray to cool fire-exposed containers.

5.3 Flammable Properties and Hazards:
- Flash Pt: No data.
- Explosive Limits: LEL: No data. UEL: No data.
- Autoignition Pt: No data.

Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation.

6.2 Environmental Precautions:
- Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning: Contain spill and collect, as appropriate.
- Transfer to a chemical waste container for disposal in accordance with local regulations.
- A solid water stream may be inefficient.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling:
- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing:
- Keep container tightly closed.
- Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Partial Chemical Name</th>
<th>Britain EH40</th>
<th>France VL</th>
<th>Europe</th>
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<tbody>
<tr>
<td>77182-82-2</td>
<td>Butanoic acid, 2-Amino-4-(hydroxymethylphosphinyl)-, monoammonium...</td>
<td>No data.</td>
<td>No data.</td>
<td>No data.</td>
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</table>

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Partial Chemical Name</th>
<th>OSHA TWA</th>
<th>ACGIH TWA</th>
<th>Other Limits</th>
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<tbody>
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<td>Butanoic acid, 2-Amino-4-(hydroxymethylphosphinyl)-, monoammonium...</td>
<td>No data.</td>
<td>No data.</td>
<td>No data.</td>
</tr>
</tbody>
</table>
SAFETY DATA SHEET
Glufosinate (ammonium salt)

8.2 Exposure Controls:

8.2.1 Engineering Controls  Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses
Protective Gloves: Compatible chemical-resistant gloves
Other Protective Clothing: Lab coat
Respiratory Equipment: NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Do not take internally. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States: [ ] Gas [ ] Liquid [ X ] Solid
Appearance and Odor: A crystalline solid
Melting Point: No data.
Boiling Point: No data.
Flash Pt: No data.
Evaporation Rate: No data.
Explosive Limits: LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg): No data.
Vapor Density (vs. Air = 1): No data.
Specific Gravity (Water = 1): No data.
Solubility in Water: No data.
Solubility Notes: ~10 mg/ml in PBS (pH 7.2);
Autoignition Pt: No data.

9.2 Other Information

Percent Volatile: No data.
Molecular Formula & Weight: C5H11NO4P • NH4  198.2

Section 10. Stability and Reactivity

10.1 Reactivity: No data available.
10.2 Stability: Unstable [ ] Stable [ X ]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
Polymerization: Will occur [ ] Will not occur [ X ]
10.4 Conditions To Avoid: No data available.
10.5 Incompatibility - Materials No data available.
To Avoid:
10.6 Hazardous Decomposition Or Byproducts: No data available.
Section 11. Toxicological Information

11.1 Information on Toxicological Effects:
The toxicological effects of this product have not been thoroughly studied.

Glufosinate (ammonium salt) - Toxicity Data:
- Intraperitoneal LD50 (rat): 83 mg/kg;
- Subcutaneous LD50 (rat): 61 mg/kg;
- OralLD50 (mouse): 416 mg/kg;
- Intraperitoneal LD50 (mouse): 82 mg/kg;
- Subcutaneous LD50 (mouse): 88 mg/kg;
- Oral TDLO (man): 475.7 mg/kg;
- Oral TDLO (woman): 0.098 gm/kg;

Chronic Toxicological Effects:
Glufosinate (ammonium salt) - Investigated as an agricultural chemical, mutagen, and reproductive effector.

Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information.

Glufosinate (ammonium salt) RTECS Number: EK7713600

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<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
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<tr>
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<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Section 12. Ecological Information

12.1 Toxicity:
Avoid release into the environment.
Runoff from fire control or dilution water may cause pollution.

12.2 Persistence and Degradability:
No data available.

12.3 Bioaccumulative Potential:
No data available.

12.4 Mobility in Soil:
No data available.

12.5 Results of PBT and vPvB assessment:
No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method:
Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):
DOT Proper Shipping Name: Not dangerous goods.
DOT Hazard Class:
UN/NA Number:

14.1 LAND TRANSPORT (European ADR/RID):
ADR/RID Shipping Name: Not dangerous goods.
UN Number:
Hazard Class:

14.3 AIR TRANSPORT (ICAO/IATA):
ICAO/IATA Shipping Name: Not dangerous goods.
Additional Transport Information:
Transport in accordance with local, state, and federal regulations.
Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
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<tbody>
<tr>
<td>77182-82-2</td>
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<td>No</td>
<td>No</td>
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<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>Other US EPA or State Lists</th>
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<tr>
<td>77182-82-2</td>
<td>Butanoic acid, 2-Amino-4-(hydroxymethylphosphinyl)-, monoamm...</td>
<td>CAA HAP,ODC: No; CWA NPDES: No; TSCA: No; CA PROP.65: No</td>
</tr>
</tbody>
</table>

Regulatory Information

This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 03/02/2015
Additional Information About This Product: No data available.
Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.