Section 1  Identification of the substance/mixture and of the Company/undertaking

1.1 Product Identifier  
Chemical name: Ammonium pentaborate tetrahydrate  
CAS No: 12046-04-7  
REACH Registration Number: 01-2119970312-43-0001  
EC No: 234-521-1  
Product Name: Ammonium pentaborate  
Grades: Technical, SQ

1.2 Relevant identified uses of the substance or mixture and uses advised against  
Identified Uses: Industrial manufacturing  
Uses advised against: Flame retardant

1.3 Details of the supplier of the SDS  
Company Name: Borax Europe Limited  
Address: 6 St. James’s Square  
London, SW1Y 4AD  
United Kingdom

Telephone number: +44 (0)20 7781 2000  
Email: rtm.msds@riotinto.com

1.4 Emergency telephone number: +44 (0) 1235 239 670  
Official advisory body telephone number: None

Section 2  Hazards identification

2.1 Classification of the substance or mixture  
Classification (CLP Regulation (EC) No 1272/2008): Classified as toxic for reproduction (Repr. 2; H361d). Ammonium pentaborate tetrahydrate has a specific concentration limit of ≥ 4.8% for toxic to reproduction classification.


2.2 Label Elements  
Labelling according to Regulation (EC) No 1272/2008 (CLP)

Hazard Pictograms:
Signal word: Warning

Hazard statements:
H361d: Suspected of damaging the unborn child.

Precautionary statements:
P202: Do not handle until all safety precautions have been read and understood.
P308+P313: IF exposed or concerned: Get medical advice.
P501: Dispose of contents/container in accordance with local regulation.

Supplemental information:
P312: Call a POISON CENTER or doctor/physician if you feel unwell.

2.3 Other Hazards
H303: May be harmful if swallowed.

Section 3 Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>EC#</th>
<th>% content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium pentaborate tetrahydrate</td>
<td>12046-04-7</td>
<td>234-521-1</td>
<td>&gt;99.0</td>
</tr>
</tbody>
</table>

Section 4 First aid measures

4.1 Description of First aid measures
Protection of first-aiders: No special protective clothing is required.

Inhalation: If symptoms such as nose or throat irritation are observed, remove to fresh air.

Eye contact: Use eye wash fountain or fresh water to cleanse eye. If irritation persists for more than 30 minutes, seek medical attention.

Skin contact: No treatment necessary.

Ingestion: Swallowing small quantities (one teaspoon) will cause no harm to healthy adults. If larger amounts are swallowed, give two glasses of water to drink and seek medical attention.

4.2 Most important symptoms and effects both acute and delayed: Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling (see Section 11).

4.3 Indication of any immediate medical attention and special treatment needed: Note to physicians: Supportive care only is required for adult ingestion of less than a few grams of the product. For ingestion of larger amounts, maintain fluid and electrolyte balance and maintain adequate kidney function. Gastric lavage is only recommended for heavily exposed, symptomatic patients in whom emesis has not emptied the stomach. Hemodialysis should be reserved for patients with massive acute absorption, especially for patients with compromised renal function. Boron analyses of urine or blood are only useful for verifying exposure and are not useful for evaluating severity of poisoning or as a guide in treatment.

Section 5 Fire-fighting measures

5.1 Extinguishing media
Suitable extinguishing media: Use extinguishing media that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media: None
5.2 Special hazards arising from substance or mixture
The product is not flammable, combustible or explosive. Ammonia gas may be released at high temperatures.

5.3 Advice for fire fighters
The product is itself a flame retardant. Ammonia gas may be released at high temperatures.

Section 6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel:
Eye goggles are not required for normal industrial exposures, but eye protection according to CEN166:1996, respirators according to CEN149:2001 should be considered.

For emergency responders:
Eye goggles are not required for normal industrial exposures, but eye protection according to CEN166:1996, respirators according to CEN149:2001 should be considered.

6.2 Environmental precautions: The product is a water-soluble white powder that may cause damage to trees or vegetation by root absorption. Avoid contamination of water bodies during clean up and disposal. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns the boron value to its normal environmental background level or meets local water quality standards.

6.3 Methods and material for containment and cleaning up

Appropriate containment: Avoid spillage into water and cover drains.

Land spill: Vacuum, shovel or sweep up and place in containers for disposal in accordance with applicable local regulations.

Spillage into water: Where possible, remove any intact containers from the water.

6.4 Reference to other sections
Refer to sections 8, 12 and 13.

Section 7 Handling and storage

7.1 Precautions for safe handling
Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills. 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
No special handling precautions are required, but dry, indoor storage is recommended. To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first-out basis.

Storage temperature: Ambient
Storage pressure: Atmospheric
Special sensitivity: Moisture (Caking)

7.3 Specific end use(s)
None

Section 8 Exposure controls/personal protection

8.1 Control parameters
Occupational exposure limit values: In the absence of a national OEL, Rio Tinto Borax recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m³. To convert product into equivalent boron (B) content, multiply by 0.1986.

There is no OEL for ammonium pentaborate tetrahydrate (CAS 12046-04-7).
### DNELs

<table>
<thead>
<tr>
<th>Route of exposure</th>
<th>Workers</th>
<th>Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oral</strong></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Inhalation</strong></td>
<td>17.04 mg/m³</td>
<td>0.63 mg/kg/day</td>
</tr>
<tr>
<td><strong>Dermal</strong></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>* No hazard identified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### PNECs

<table>
<thead>
<tr>
<th>Compartment (Environment)</th>
<th>PNEC (added values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water, fresh and marine</td>
<td>2.02 mg B/L</td>
</tr>
<tr>
<td>Water, intermittent</td>
<td>13.7 mg B/L</td>
</tr>
<tr>
<td>Air</td>
<td>No exposure expected</td>
</tr>
<tr>
<td>Soil</td>
<td>5.4 mg B/kg dry soil</td>
</tr>
<tr>
<td>Sediment</td>
<td>Waived due to lack of partitioning to sediment</td>
</tr>
<tr>
<td>STP</td>
<td>10 mg B/L</td>
</tr>
</tbody>
</table>

### Exposure controls

#### 8.2 Exposure controls

**Appropriate engineering controls:** Use local exhaust ventilation to keep airborne concentrations of dust below permissible exposure limits.

**Personal protection equipment:**
- Eye and face protection: Eye protection according to CEN166:1996 may be warranted if environment is excessively dusty.
- Skin protection: Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty.
- Respiratory protection: Where airborne concentrations are expected to exceed exposure limits, respirators should be used (CEN149:2001).

**Environmental exposure controls:**

**Limiting releases from site:** Where appropriate, material should be recovered and recycled through the process.

**Spillages of powder or granulated borates should be swept or vacuumed up immediately and placed in containers for disposal in order to prevent unintentional release to the environment. Waste containing borates should be handled as an hazardous waste and removed by licensed operator to an offsite location where it can be incinerated or disposed to a hazardous landfill.**

**Water Emissions:** Storage should be sheltered from precipitation. Avoid spillage into water and cover drains. Removal from water can only be accomplished by very specific treatment technologies including ion exchange resins, reverse osmosis etc. Removal efficiency is dependent upon a number of factors and will vary from 40 to 90%. Much of the technology is currently not appropriate to high volume or mixed waste streams. Boron is not removed in considerable amounts in conventional STP. If sites discharge to a municipal STP the concentration of boron should not exceed 10 mg B/l in the municipal STP.

**Air Emissions:** Emissions to air can be removed by one or more of the following dust-control measures: electrostatic precipitators, cyclones, fabric or bag filters, membrane filters, ceramic and metal mesh filters, and wet scrubbers.

### Section 9 Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

**Appearance:** White, crystalline solid

**Odour:** Ammonia-like

**Odour threshold:** Not measured

**pH @ 20°C:** 8.35 (1.0% solution); 7.32 (10.0% solution)

**Melting point/ Freezing point:** >300°C

**Initial boiling point and boiling range:** Not applicable: melting point >300°C
Ammonium Pentaborate

Flash point: Not applicable: inorganic substance
Evaporation rate: Not applicable: non-volatile
Flammability (solid/liquid): Non-flammable
Upper/lower flammability or explosive limits: Not applicable: non-flammable
Vapour pressure: Not applicable: melting point >300°C
Vapour density: Not applicable: melting point >300°C
Relative density: 1574 kg/m³
Solubility(ies): Water: 9.62% @ 20°C; 41.2% @ 90°C
Partition coefficient; n-octanol/water: Not applicable: inorganic substance
Auto-ignition temperature: Not applicable: not self-heating
Decomposition temperature: Not applicable: melting point >300°C
Viscosity: Not applicable: solid substance
Explosive properties: Not explosive: does not contain chemical groups associated with explosive properties
Oxidising properties: Not oxidising: does not contain chemical groups associated with oxidising properties

9.2 Other information
Molecular weight: 272
Formula: \( \text{NH}_4\text{B}_5\text{O}_8\cdot4\text{H}_2\text{O} \)

Section 10 Stability and reactivity

10.1 Reactivity: None known.
10.2 Chemical stability: Slowly breaks down to release ammonia.
10.3 Possibility of hazardous reactions: Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard. Reaction with strong bases such as NaOH will generate ammonia (\( \text{NH}_3 \)).
10.4 Conditions to avoid: Avoid contact with strong reducing agents or strong bases according to good industrial practice.
10.5 Incompatible materials: Strong reducing agents and strong bases.
10.6 Hazardous decomposition products: Ammonia.

Section 11 Toxicological Information

11.1 Information on toxicological effects

(a) Acute toxicity
Method: Acute Oral Toxicity Study
Species: Swiss mice
Dose: Doses used in study were not described in the report.
Routes of Exposure: Oral
Results: Low acute oral toxicity. LD₅₀ in mice is greater than 4,200 mg/kg of body weight. Based on the available data, the classification criteria are not met.

(b) Skin corrosion / irritation: Based on similar substance Ammonium Biborate
Method: Acute Oral Toxicity Study
Species: Rabbit
Dose: 0.5 grams applied to intact and abraded skin
Routes of Exposure: dermal
Results: Based on the lack of dermal irritation responses in the rabbit from dermal application of ammonium biborate, no dermal irritation would be expected from ammonium pentaborate.

(c) Serious eye damage / irritation:
Method: Primary Eye Irritation Study
Species: Rabbit
Dose: 0.1 grams
Routes of Exposure: placed in the left conjunctiva of three adult albino rabbits
Results: Slight initial reaction was observed subsiding after 30 minutes, Based on the results of the primary eye irritation
study, the classification criteria are not met.

(d) **Respiratory or skin sensitisation:** Not a skin sensitiser (based on boric acid).

(e) **Germ cell mutagenicity:** No data on the product itself. Not mutagenic based on boric acid.

(f) **Carcinogenicity:** No data on the product itself. Not carcinogenic based on boric acid.

(g) **Reproductive toxicity:**
No data on the product itself. However, animal feeding studies with boric acid and sodium tetraborate in rat, mouse and dog, at high doses, have demonstrated effects on fertility and testes. Studies with the chemically related boric acid in rat, mouse and rabbit, at high doses, demonstrate developmental effects on the foetus including foetal weight loss and minor skeletal variations. The lowest NOAEL is 9.6 mg B/kg in rats, based on developmental effects. The doses administered were many times in excess of those which humans would normally be exposed. While boron has been shown to adversely affect male reproduction in laboratory animals, there was no clear evidence of male reproductive effects attributable to boron in studies of highly exposed workers. Based on weight of evidence evaluation, classification of ammonium pentaborate as Repr. Cat. 2 is justified.

(h) **STOT-single exposure:** No data on the product itself.

(i) **STOT-repeated exposure:** No data on the product itself.

(j) **Aspiration hazard:** Physical form of solid powder indicates no aspiration hazard potential.

**Toxicokinetics**
In the blood boric acid is the main species present and is not further metabolised. Boric acid is distributed rapidly and evenly through the body, with concentrations in bone 2-3 higher than in other tissues. Boric acid is excreted rapidly, with elimination half-lives of 1 h in the mouse, 3 h in the rat and < 27.8 h in humans, and has low potential for accumulation. Boric acid is mainly excreted in the urine. Absorption of borates via the oral route is nearly 100%. For the inhalation route also 100% absorption is assumed as worst case scenario. Dermal absorption through intact skin is very low with a percent dose absorbed of < 0.5%.

**Information on likely routes of exposure:**
Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because product is poorly absorbed through intact skin. Product is not intended for ingestion.

**Symptoms related to the physical, and chemical and toxicological characteristics:**
At high concentrations irritation of nose, throat and eye may be observed. Products are not intended for ingestion. Small amounts (e.g. a teaspoonful) swallowed accidentally are not likely to cause effects. Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling.

**Delayed and immediate effects as well as chronic effects from short and long-term exposure:**
Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to boric acid and sodium borate dust. Human epidemiological studies indicate no effect on fertility in occupational populations with chronic exposures to borate dust and indicate no effect to a general population with high exposures to borates in the environment.

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**Section 12**  
**Ecological information**

12.1 **Toxicity**

General: Boron occurs naturally in sea water at a nearly uniform average concentration of 5 mg B/l and fresh water between 0.01 and 0.4 mg B/l. In diluted aqueous solutions the predominant boron species present is undissociated boric acid. To convert product into equivalent boron (B) content, multiply by 0.1986.

**Algal toxicity**:  
Green algae, *Scenedesmus subspicatus*  
96-hr *EC*$_{10}$ = 24 mg B/l$^\dagger$

**Invertebrate toxicity:**  
Daphnids, *Daphnia magna* Straus  
48-hr *LC*$_{50}$ = 133mg B/l$^\dagger$  
21-day NOEC-LOEC = 6-13mg B/l$^\dagger$

**Fish toxicity:**
Sea water⁸: 
Dab, *Limanda limanda*  
96-hr LC₅₀ = 74 mg B/l†

Fresh water⁷:  
Rainbow trout, *Oncorhynchus mykiss* (embryo-larval stage)  
24-day LC₅₀ = 150 mg B/l†  
32-day LC₅₀ = 100 mg B/l†

Goldfish, *Carassius auratus* (embryo-larval stage)  
7-day LC₅₀ = 46 mg B/l†  
3-day LC₅₀ = 178 mg B/l†

Test substance:  
† Boric acid  
‡ Sodium tetraborate

**Phytotoxicity:** Boron is an essential micronutrient for healthy growth of plants. It can be harmful to boron sensitive plants in higher quantities. Care should be taken to minimise the amount of borate product released to the environment.

12.2 **Persistence and Degradability**  
Biodegradation is not an applicable endpoint since the product is an inorganic substance.

12.3 **Bioaccumulative potential**  
This product will undergo hydrolysis in water to form undissociated boric acid. Boric acid will not biomagnify through the food chain. Octanol/Water partition coefficient: Log P<sub>ow</sub> = -0.7570 @ 25°C (based on boric acid).

12.4 **Mobility in soil**  
The product is soluble in water and is leachable through normal soil. Adsorption to soils or sediments is insignificant.

12.5 **Results of PBT and vPvB assessment**  
Not applicable (see Section 15.2).

12.6 **Other adverse effects**  
None

**Section 13**  
**Disposal considerations**

13.1 **Waste treatment methods**  
Small quantities can be disposed of at landfill sites. Tonnage quantities are not recommended to be sent to landfill. Such product should, if possible, be used for an appropriate application.  
Product packaging should be recycled where possible.  
Local authorities should be consulted about any specific local requirements.

**Section 14**  
**Transport information**

Transport Classification for Road (ADR) / Rail (RID); Inland waterways (ADN); Sea (IMDG); Air (ICAO/IATA)

14.1 **UN Number:**  
Not Regulated

14.2 **UN Proper Shipping Name:**  
Not Regulated

14.3 **Transport hazard class(es):**  
Not Regulated

14.4 **Packing Group:**  
Not Regulated

14.5 **Environmental Hazards**  
Not Regulated

14.6 **Special precautions for user:**  
Not Regulated

14.7 **Transport in bulk according to Annex II of Marpol 73/78 and the IBC code:**  
Not Regulated

**Section 15**  
**Regulatory information**

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

Regulation (EC) No 2037/2000 - Substances that deplete the ozone layer: Not manufactured with and does not contain
any Group I or Group II ozone depleting substances.

**Clean Air Act (Montreal Protocol) - Substances that deplete the ozone layer:** Not manufactured with and does not contain any Class I or Class II ozone depleting substances.

**Regulation (EC) No 689/2008 - Export and Import of Dangerous Chemicals:** Not listed.

**National Regulations:** Ensure all national/local regulations are observed.

**Chemical inventory listing:** The listing is sometimes under the Inventory number of the anhydrous form of this inorganic salt.

- **U.S. EPA TSCA Inventory:** 12007-89-5
- **Canada DSL:** 12007-89-5
- **EINECS:** 234-521-1

### 15.2 Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance.

**Section 16 Other information**

**Revision Details:**
- Section 1: Addition of registration number, Supplier address, Emergency telephone numbers.
- Section 8: Addition of DNELs and PNECs.

**Abbreviations and acronyms:**
- **CLP:** Classification, Labelling and Packaging Regulation (EC) No. 1272/2008
- **CMR:** Carcinogen, Mutagen, Reproductive Toxicant
- **LC:** Lethal Concentration
- **LD:** Lethal Dose
- **NOAEL:** No Observed Adverse Effect Level
- **NOEC:** No Observed Effect Concentration
- **STOT:** Specific Target Organ Toxicity
- **DNEL:** Derived No Effect Level
- **PNEC:** Predicted No Effect Concentration
- **PBT:** Persistent, Bioaccumulative and Toxic
- **vPvB:** very Persistent, very Bioaccumulative
- **STP:** Sewage Treatment Plant

**References:**
8. Taylor et al. (1985). Aquatic Toxicology, 7 (1985) 135-144


**Full text of Hazard statements mentioned in section 2:**
- **H361d:** Suspected of damaging the unborn child.

**Precautionary statements:**
- **P202:** Do not handle until all safety precautions have been read and understood.
- **P308+P313:** IF exposed or concerned; Get medical advice.
- **P501:** Dispose of contents/container in accordance with local regulation.

**Precautionary Phrases:**
- Call a POISON CENTER or doctor/physician if you feel unwell.
Do not ingest.
Keep out of reach of children.
Refer to safety data sheet.
Not for use in food, drugs or pesticides.

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**Annex**

**Exposure Scenarios**

The following table lists the uses identified and registered for this substance. Each use has a number of applicable human health, environmental and consumer exposure scenarios. These can be found at [www.borax.com/EU-REACH/exposure-scenarios](http://www.borax.com/EU-REACH/exposure-scenarios)
<table>
<thead>
<tr>
<th>IU number</th>
<th>Identified Use</th>
<th>Setting (industrial/professional worker / consumer)</th>
<th>Life cycle stage</th>
<th>Sector of use category (SU)</th>
<th>Process category (PROC)</th>
<th>Environmental release category (ERC)</th>
<th>Exposure Scenario Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacture of ammonium borate</td>
<td>Industrial</td>
<td>X</td>
<td>8</td>
<td>1, 9</td>
<td>1</td>
<td>ES1 Manufacture; Manufacture of substance</td>
</tr>
<tr>
<td>2</td>
<td>Industrial use in electrolytic capacitors</td>
<td>Industrial</td>
<td>X</td>
<td>9, 10, 16</td>
<td>2, 3, 5, 9</td>
<td>4</td>
<td>ES2 Use at industrial site; Industrial use in electrolytic capacitors</td>
</tr>
</tbody>
</table>