

# SAFETY DATA SHEET



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

### 1.1 Product identifier

**Product name** : **Optibor® RG**  
**Chemical name** : Boric acid  
**EC number** : 233-139-2  
**REACH Registration number**

| Registration number   | Legal entity                       |
|-----------------------|------------------------------------|
| 01-2119486683-25-0039 | Rio Tinto Iron & Titanium GmbH (5) |

**CAS number** : 10043-35-3  
**Product type** : Solid.  
**Other means of identification** : Orthoboric acid

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

**Material uses** : Refer to the table "Identified uses" below.

| Identified uses   |
|---|
| Importing and packaging<br>Abrasives (Binding agent)<br>Adhesives (Process regulator (other than polymerisation or vulcanization processes))<br>Agriculture (Fertilisers)<br>Analytical reagent (Laboratory chemicals)<br>Autocauticising (Processing aid not otherwise listed)<br>Catalysts (Process regulator (used in polymerisation or vulcanization processes))<br>Cellulose insulation (Flame retardants)<br>Ceramics (Intermediate)<br>Chemical synthesis (Laboratory chemicals, Chemical production, Intermediate, pH-regulating agents)<br>Coatings (Flame retardants)<br>Construction materials (Flame retardants)<br>Detergents (Complexing agent, Surface active agents, pH-regulating agents)<br>Glass (Intermediate)<br>Industrial fluids (Corrosion inhibitors and anti-scaling agents, Lubricants and lubricant additives)<br>Leather manufacturing (pH-regulating agents)<br>Metallurgy (Flux agents for casting, Oxidising agents, Plating agents and metal surface treating agents)<br>Non oxide ceramics (Intermediate)<br>Oil industry (Processing aid not otherwise listed)<br>Refractories (Flux agents for casting)<br>Tablet production and use (Stabilisers)<br>A complete list of uses is provided in the introduction to Annex - Exposure Scenarios |

| Uses advised against | Reason   |
|----------------------|--|
| Consumer uses.       | Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles |

### 1.3 Details of the supplier of the safety data sheet

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

**Borax Europe Limited**  
6 St. James's Square  
London, SW1Y 4AD  
United Kingdom  
T: +44 (0)20 7781 2000

**Borax Francais S.A.S.**  
Usine/Siège Social  
Route de Bourbourg  
59411 Coudekerque-Branche  
Cedex, France  
T: +33 3 28 29 28 30

**Rio Tinto Iron & Titanium GmbH**  
Alfred-Herrhausen-Allee 3-5,  
65760 Eschborn  
Germany  
T: +49 6196 96000

**e-mail address of person responsible for this SDS** : rtb.sds@riotinto.com

### 1.4 Emergency telephone number

**Telephone number** : +44 (0) 1235 239 670 (Rio Tinto Borates)  
For advice on chemical emergencies, spillages, fires or First Aid.

## SECTION 2: Hazards identification

### 2.1 Classification of the substance or mixture

**Product definition** : Mono-constituent substance

**Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]**

Repr. 1B, H360FD

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

### 2.2 Label elements

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** : May damage fertility. May damage the unborn child.

#### Precautionary statements

**Prevention** : Do not handle until all safety precautions have been read and understood.

**Response** : IF exposed or concerned: Get medical advice/attention.

**Storage** : Not applicable.

**Disposal** : Dispose of contents/container in accordance with local regulation.

**Hazardous ingredients** : boric acid

**Supplemental label elements** : Not applicable.

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## SECTION 2: Hazards identification

**Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles** : Restricted to professional users.

### Special packaging requirements

**Containers to be fitted with child-resistant fastenings** : Not applicable.

**Tactile warning of danger** : Not applicable.

### 2.3 Other hazards

**Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII** :

| PBT                        | P   | B   | T   | vPvB                       | vP  | vB  |
|----------------------------|-----|-----|-----|----------------------------|-----|-----|
| Not applicable (Inorganic) | N/A | N/A | N/A | Not applicable (Inorganic) | N/A | N/A |

**Other hazards which do not result in classification** : May be harmful if swallowed.

## SECTION 3: Composition/information on ingredients

**3.1 Substances** : Mono-constituent substance

| Product/ingredient name | Identifiers   | %     | Classification   | Specific Conc. Limits, M-factors and ATEs | Type |
|-------------------------|---|-------|--|---|------|
| boric acid              | REACH #:<br>01-2119486683-25<br>EC: 233-139-2<br>CAS: 10043-35-3<br>Index: 005-007-00-2 | >99.9 | Repr. 1B, H360FD<br><br>See Section 16 for the full text of the H statements declared above. | -   | [1]  |

There are no additional ingredients present which, within the current knowledge of the supplier, are classified and contribute to the classification of the substance and hence require reporting in this section.

### Type

[1] Constituent

Occupational exposure limits, if available, are listed in Section 8.

## SECTION 4: First aid measures

### 4.1 Description of first aid measures

- Eye contact** : Use eye wash fountain or fresh water to cleanse the eye. If irritation persists for more than 30 minutes, seek medical attention.
- Inhalation** : If symptoms such as nose or throat irritation are observed, remove to fresh air.
- 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.
- Protection of first-aiders** : No special protective clothing is required

### 4.2 Most important symptoms and effects, both acute and delayed

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## SECTION 4: First aid measures

### Over-exposure signs/symptoms

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : 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.
- Ingestion** : 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.

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

- Notes to physician** : 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.
- Specific treatments** : No specific treatment.

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

### 5.2 Special hazards arising from the substance or mixture

- Hazards from the substance or mixture** : None. The product is not flammable, combustible or explosive.
- Hazardous combustion products** : None.

### 5.3 Advice for firefighters

- Special protective actions for fire-fighters** : None.
- Special protective equipment for fire-fighters** : Not applicable.
- Additional information** : Not explosive.

## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Eye goggles and gloves are not required for normal industrial exposures, but eye protection according to CEN 166:2001, Respirators (CEN 149:2001) should be considered if environment is excessively dusty.
- For emergency responders** : Eye goggles and gloves are not required for normal industrial exposures, but eye protection according to CEN 166:2001, Respirators (CEN 149:2001) should be considered if environment is excessively dusty.

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## SECTION 6: Accidental release measures

- 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**
- Small spill** : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.
- 6.4 Reference to other sections** : See Section 1 for emergency contact information.  
See Section 8 for information on appropriate personal protective equipment.  
See Section 13 for additional waste treatment information.

## SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

### 7.1 Precautions for safe handling

- Protective measures** : Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

### 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 temperature

Storage pressure: Ambient pressure

Special sensitivity: Moisture (Caking)

### 7.3 Specific end use(s)

- Recommendations** : Refer to Annex - Exposure Scenarios
- Industrial sector specific solutions** : Not available.

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## SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

### 8.1 Control parameters

#### Occupational exposure limits

| Product/ingredient name | Exposure limit values   |
|-------------------------|---|
| boric acid              | <b>ACGIH TLV (United States, 1/2022). [Borate compounds, Inorganic]</b><br>TWA: 2 mg/m <sup>3</sup> 8 hours. Form: Inhalable fraction<br>STEL: 6 mg/m <sup>3</sup> 15 minutes. Form: Inhalable fraction |

**Recommended monitoring procedures** : In the absence of a national OEL, Rio Tinto Borates recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m<sup>3</sup>. To convert product into equivalent boron (B) content, multiply by 0.175.

#### DNELs/DMELs

| Product/ingredient name | Type | Exposure             | Value                  | Population                     | Effects  |
|-------------------------|------|----------------------|------------------------|--------------------------------|----------|
| boric acid              | DNEL | Short term Oral      | 0.98 mg/kg bw/day      | General population [Consumers] | Systemic |
|                         | DNEL | Long term Oral       | 0.98 mg/kg bw/day      | General population [Consumers] | Systemic |
|                         | DNEL | Long term Inhalation | 4.15 mg/m <sup>3</sup> | General population [Consumers] | Systemic |
|                         | DNEL | Long term Dermal     | 196 mg/kg bw/day       | General population [Consumers] | Systemic |
|                         | DNEL | Long term Dermal     | 392 mg/kg bw/day       | Workers                        | Systemic |
|                         | DNEL | Long term Inhalation | 8.3 mg/m <sup>3</sup>  | Workers                        | Systemic |

#### PNECs

| Product/ingredient name | Compartment Detail     | Value  | Method Detail |
|-------------------------|------------------------|--|---------------|
| boric acid              | Fresh water            | 2.9 mg B/L                                     | -             |
|                         | Marine water           | 2.9 mg B/L                                     | -             |
|                         | Water - intermittent   | 13.7 mg B/L                                    | -             |
|                         | Air                    | No exposure expected                           | -             |
|                         | Soil                   | 5.7 mg B/kg dry soil                           | -             |
|                         | Sediment               | Waived due to lack of partitioning to sediment | -             |
|                         | Sewage Treatment Plant | 10 mg B/L                                      | -             |

### 8.2 Exposure controls

**Appropriate engineering controls** : If user operations generate dust, fumes, gas, vapour 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.

#### Individual protection measures

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## SECTION 8: Exposure controls/personal protection

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. Recommended: Eye protection according to CEN 166:2001 may be warranted if environment is excessively dusty
- Skin protection**
- Hand protection** : Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty
- Body protection** : No special protective clothing is required.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Where airborne concentrations are expected to exceed exposure limits, respirators should be used. (CEN 149:2001).
- 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 a 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 the PNEC 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

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

### 9.1 Information on basic physical and chemical properties

#### Appearance

- Physical state** : Solid. [Crystalline solid.]
- Colour** : White.
- Odour** : Odourless.
- Odour threshold** : Not applicable. Odourless.
- Melting point/freezing point** : No melting point can be defined in the range 25 - 1000 °C due to the decomposition of the substance above 100 °C.
- Initial boiling point and boiling range** : Not applicable. [melting point >300°C]
- Flammability** : Non-flammable. The product is not flammable, combustible or explosive.
- Lower and upper explosion limit** : Not applicable. Non-flammable.



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## SECTION 9: Physical and chemical properties

|                                  |   |
|----------------------------------|---|
| <b>Flash point</b>               | : Not applicable. Inorganic substance.  |
| <b>Auto-ignition temperature</b> | : Not applicable (solid). [Not self-heating.]   |
| <b>Decomposition temperature</b> | : If heated above 100 °C water is lost and boric acid converts initially to metaboric acid (HBO <sub>2</sub> ) and on further heating forms boric oxide (B <sub>2</sub> O <sub>3</sub> ). |
| <b>pH</b>                        | : 6.1 (0.1% solution); 5.1 (1.0% solution); 3.7 (4.7% solution)   |
| <b>Viscosity</b>                 | : Dynamic: Not applicable (not liquid). [solid substance]<br>Kinematic: Not applicable (not liquid). [solid substance]  |
| <b>Solubility(ies)</b>           | :   |

| Media      | Result  |
|------------|---------|
| cold water | Soluble |
| hot water  | Soluble |

|  |  |
|--|--|
| <b>Solubility in water</b>                     | : 49.2 g/l [EU A.6]                                |
| <b>Miscible with water</b>                     | : Yes.   |
| <b>Partition coefficient: n-octanol/ water</b> | : -1.09@ 22°C                                      |
| <b>Vapour pressure</b>                         | : Not applicable. Melting point>300°C              |
| <b>Evaporation rate</b>                        | : Not applicable (solid). [Non-volatile.]          |
| <b>Relative density</b>                        | : 1.49   |
| <b>Density</b>                                 | : 1.435 g/cm <sup>3</sup> [23°C (73.4°F)] [EU A.3] |
| <b>Bulk density</b>                            | : Not available. Depends on batch.                 |
| <b>Granulometry</b>                            | : Not available. Depends on batch.                 |
| <b>Vapour density</b>                          | : Not applicable. Melting point>300°C              |
| <b>Explosive properties</b>                    | : Not explosive.                                   |
| <b>Oxidising properties</b>                    | : Not oxidising.                                   |
| <b><u>Particle characteristics</u></b>         |  |
| <b>Median particle size</b>                    | : Not available.                                   |

## SECTION 10: Stability and reactivity

|  |  |
|--|--|
| <b>10.1 Reactivity</b>                         | : No specific test data related to reactivity available for this product or its ingredients.   |
| <b>10.2 Chemical stability</b>                 | : Under ambient temperatures, the product is stable. When heated it loses water, first forming metaboric acid (HBO <sub>2</sub> ), and on further heating it is converted into boric oxide (B <sub>2</sub> O <sub>3</sub> ). |
| <b>10.3 Possibility of hazardous reactions</b> | : Boric acid is a weak acid that may cause corrosion of base metals. Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard.         |
| <b>10.4 Conditions to avoid</b>                | : Avoid contact with strong reducing agents by storing according to good industrial practice   |
| <b>10.5 Incompatible materials</b>             | : Strong reducing agents   |
| <b>10.6 Hazardous decomposition products</b>   | : Under normal conditions of storage and use, hazardous decomposition products should not be produced.   |



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## SECTION 11: Toxicological information

### 11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

#### Acute toxicity

| Product/ingredient name | Result type                     | Species | Dose                           | Exposure |
|-------------------------|---------------------------------|---------|--------------------------------|----------|
| boric acid              | LC50 Inhalation Dusts and mists | Rat     | >2 mg/l                        | 4 hours  |
|                         | LD50 Dermal                     | Rabbit  | >2000 mg/kg body weight        | -        |
|                         | LD50 Oral                       | Rat     | 2000 to 5000 mg/kg body weight | -        |

**Conclusion/Summary** : Based on available data, the classification criteria are not met.

#### Irritation/Corrosion

| Product/ingredient name | Result                                       | Species                  | Score | Exposure                    | Observation |
|-------------------------|--|--------------------------|-------|-----------------------------|-------------|
| boric acid              | Eyes - Cornea opacity                        | New Zealand White Rabbit | <1    | 0.1 g                       | -           |
|                         | Skin - Primary dermal irritation index (PDI) | New Zealand White Rabbit | 0.1   | 0.5 g moistened with saline | -           |

#### Conclusion/Summary

**Skin** : Non-irritant to skin. Mean primary irritation score: 0.1. Based on the available data, the classification criteria are not met.

**Eyes** : Non-irritating to the eyes. Based on mean scores less than 1, the effects were fully reversible within 7 days. Based on the available data, the classification criteria are not met. Many years of occupational exposure indicate no adverse effects on human eye.

#### Sensitisation

| Product/ingredient name | Route of exposure | Species                  | Result                             |
|-------------------------|-------------------|--------------------------|------------------------------------|
| boric acid              | Respiratory skin  | Guinea pig<br>Guinea pig | Not sensitizing<br>Not sensitizing |

#### Conclusion/Summary

**Skin** : Non-sensitiser to skin. Based on the available data, the classification criteria are not met.

**Respiratory** : No respiratory sensitisation studies have been conducted. There are no data to suggest that boric acid is a respiratory sensitiser. Based on the available data, the classification criteria are not met.

#### Mutagenicity

| Product/ingredient name | Test                  | Experiment  | Result   |
|-------------------------|-----------------------|---|----------|
| boric acid              | (based on boric acid) | Experiment: In vitro<br>Subject: Mammalian-Animal<br>Cell: Germ | Negative |

**Conclusion/Summary** : Not mutagenic. Based on the available data, the classification criteria are not met.

#### Carcinogenicity

| Product/ingredient name | Result               | Species | Dose   | Exposure           |
|-------------------------|----------------------|---------|--|--------------------|
| boric acid              | Negative - Oral - TC | Mouse   | 446 to 1150 mg/kg bw /day (mg Boric acid / kg body weight / day) | Oral feeding study |

**Conclusion/Summary** : No evidence of carcinogenicity in mice. Based on the available data, the classification criteria are not met.

#### Reproductive toxicity

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## SECTION 11: Toxicological information

| Product/ingredient name | Maternal toxicity | Fertility effects | Developmental effects | Species | Effects   | Exposure                                |
|-------------------------|-------------------|-------------------|-----------------------|---------|---|---|
| boric acid              | Negative          | Negative          | Negative              | Human   | No adverse fertility effects in male workers. Epidemiological studies of human developmental effects have shown an absence of effects in exposed borate workers and populations living in areas with high environmental levels of boron. Epidemiological studies of human developmental effects have shown an absence of effects in exposed borate workers and populations living in areas with high environmental levels of boron. | Combined oral ingestion and inhalation. |
|                         | Positive          | -                 | Positive              | Rat     | NOAEL in rats for developmental effects on the foetus including foetal weight loss and minor skeletal variations is 9.6 mg B/kg body weight; NOAEL in rats for maternal toxicity is 13.3 mg B/kg body weight  | Oral feeding study                      |
|                         | -                 | Positive          | -                     | Rat     | NOAEL in rats for effects on fertility in males is 17.5 mg B/kg body weight.  | Oral feeding study                      |

**Conclusion/Summary** : Reprotoxicity studies have been conducted with boric acid and disodium tetraborate. A multigeneration study in the rat gave a NOAEL for fertility in males of 17.5 mg B/kg/day. Developmental effects have been observed in laboratory animals, the most sensitive species being the rat with a NOAEL of 9.6 mg B/kg bw/day. Boric acid is classified under the 1st ATP to CLP as Repr. 1B; H360FD. 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.

### Teratogenicity

**Conclusion/Summary** : See Reproductive toxicity.

### Specific target organ toxicity (single exposure)

| Product/ingredient name   | Category | Route of exposure | Target organs |
|---|----------|-------------------|---------------|
| Based on the available data, the classification criteria are not met. |          |                   |               |

### Specific target organ toxicity (repeated exposure)

| Product/ingredient name   | Category | Route of exposure | Target organs |
|---|----------|-------------------|---------------|
| Based on the available data, the classification criteria are not met. |          |                   |               |

### Aspiration hazard

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## SECTION 11: Toxicological information

| Product/ingredient name | Result  |
|-------------------------|---|
| Boric acid              | Physical form of solid powder indicates no aspiration hazard potential. |

**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.**

### Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : 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.
- Ingestion** : This product is not intended for ingestion. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms. 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.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : 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.
- Ingestion** : 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

#### Short term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

#### Long term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : 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.

### Potential chronic health effects

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## SECTION 11: Toxicological information

| Product/ingredient name | Result             | Species | Dose   | Exposure           |
|-------------------------|--------------------|---------|--|--------------------|
| boric acid              | Chronic NOAEL Oral | Rat     | 17.5 mg/kg<br>0; 33 (5.9); 100 (17.5); 334 (58.5)<br>mg boric acid (B)/kg bw per day<br>(nominal in diet); and 0; 52 (5.9);<br>155 (17.5); 516 (58.5) mg borax<br>(B)/kg/day (nominal in diet) | Oral feeding study |

**Conclusion/Summary** : A NOAEL of 17.5 mg B/kg body weight/day equivalent to 100 mg boric acid/kg body weight/day was determined in a chronic feeding study (2 years) in rats and is based on testes effects.

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.

**General** : No known significant effects or critical hazards.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Reproductive toxicity** : May damage fertility. May damage the unborn child.

### Toxicokinetics

**Absorption** : 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 %.

**Distribution** : Boric acid is distributed rapidly and evenly through the body, with concentrations in bone 2 - 3 higher than in other tissues.

**Metabolism** : In the blood boric acid is the main species present and is not further metabolised

**Elimination** : 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.

### 11.2 Information on other hazards

#### 11.2.1 Endocrine disrupting properties

Not available.

#### 11.2.2 Other information

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.

## SECTION 12: Ecological information

### 12.1 Toxicity

| Product/ingredient name | Result                    | Species                                | Exposure              |
|-------------------------|---------------------------|--|-----------------------|
| boric acid              | EC50 52.4 mg/l (as Boron) | <i>Pseudokirchneriella subcapitata</i> | Fresh water - Acute   |
|                         | LC50 91 mg/l (as Boron)   | <i>Ceriodaphnia dubia</i>              | Fresh water - Acute   |
|                         | LC50 79.7 mg/l (as Boron) | <i>Pimephales promelas</i>             | Fresh water - Acute   |
|                         | NOEC 6.4 mg/l (as Boron)  | <i>Brachydanio rerio</i>               | Fresh water - Chronic |
|                         | NOEC 14.2 mg/l (as Boron) | <i>Daphnia magna</i>                   | Fresh water - Chronic |

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## SECTION 12: Ecological information

|  |                           |  |  |
|--|---------------------------|--|--|
|  | NOEC 17.5 mg/l (as Boron) | <i>Pseudokirchneriella subcapitata</i> | Chronic<br>Fresh<br>water -<br>Chronic |
|--|---------------------------|--|--|

**Conclusion/Summary** : Note that the data values are expressed as boron equivalents. To convert product into equivalent boron (B) content, multiply by 0.175. Studies judged to be unreliable or with insufficient information to evaluate are not included.

Boron is an essential micronutrient for healthy growth of plants; however, it can be harmful to boron sensitive plants in high quantities. Care should be taken to minimize the amount of this product released to the environment.

### 12.2 Persistence and degradability

**Conclusion/Summary** : Not applicable. Inorganic substance.

### 12.3 Bioaccumulative potential

| Product/ingredient name | LogP <sub>ow</sub> | BCF | Potential |
|-------------------------|--------------------|-----|-----------|
| boric acid              | -1.09              | -   | low       |

### 12.4 Mobility in soil

**Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.

**Mobility** : 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

| Product/ingredient name | PBT                        | P   | B   | T   | vPvB                       | vP  | vB  |
|-------------------------|----------------------------|-----|-----|-----|----------------------------|-----|-----|
| Boric acid              | Not applicable (Inorganic) | N/A | N/A | N/A | Not applicable (Inorganic) | N/A | N/A |

### 12.6 Endocrine disrupting properties

Not available.

### 12.7 Other adverse effects

No known significant effects or critical hazards.

## SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

### 13.1 Waste treatment methods

#### Product

**Methods of disposal** : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

**Hazardous waste** : Yes. This product is classified as toxic to reproduction (Repr. 1B) and falls within scope of Directive 2008/98/EC as hazardous waste (H10). Dispose via a licensed waste disposal contractor

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## SECTION 13: Disposal considerations

### Packaging

**Methods of disposal** : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

**Special precautions** : Care should be taken when handling emptied containers that have not been cleaned or rinsed out.

## SECTION 14: Transport information

|                                 | ADR/RID        | ADN            | IMDG           | IATA           |
|---------------------------------|----------------|----------------|----------------|----------------|
| 14.1 UN number or ID number     | Not regulated. | Not regulated. | Not regulated. | Not regulated. |
| 14.2 UN proper shipping name    | -              | -              | -              | -              |
| 14.3 Transport hazard class(es) | -              | -              | -              | -              |
| 14.4 Packing group              | -              | -              | -              | -              |
| 14.5 Environmental hazards      | No.            | No.            | No.            | No.            |

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

## SECTION 15: Regulatory information

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

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

### Annex XIV

None of the components are listed.

### Substances of very high concern

| Intrinsic property    | Ingredient name | Status      | Reference number | Date of revision |
|-----------------------|-----------------|-------------|------------------|------------------|
| Toxic to reproduction | boric acid      | Recommended | ED/69/2013       | 7/1/2015         |

**Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles** : Restricted to professional users.

Other EU regulations

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## SECTION 15: Regulatory information

**Industrial emissions (integrated pollution prevention and control) - Air** : Not listed

**Industrial emissions (integrated pollution prevention and control) - Water** : Not listed

### Ozone depleting substances (1005/2009/EU)

Not listed.

### Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

### Persistent Organic Pollutants

Not listed.

### Seveso Directive

This product is not controlled under the Seveso Directive.

### National regulations

### International regulations

### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

### Montreal Protocol

Not listed.

### Stockholm Convention on Persistent Organic Pollutants

Not listed.

### Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

### Inventory list

|                                |  |
|--------------------------------|--|
| <b>Australia</b>               | : All components are listed or exempted.   |
| <b>Canada</b>                  | : All components are listed or exempted.   |
| <b>China</b>                   | : All components are listed or exempted.   |
| <b>Eurasian Economic Union</b> | : <b>Russian Federation inventory</b> : All components are listed or exempted.   |
| <b>Japan</b>                   | : <b>Japan inventory (CSCL)</b> : All components are listed or exempted.<br><b>Japan inventory (ISHL)</b> : All components are listed or exempted. |
| <b>New Zealand</b>             | : All components are listed or exempted.   |
| <b>Philippines</b>             | : All components are listed or exempted.   |
| <b>Republic of Korea</b>       | : All components are listed or exempted.   |
| <b>Taiwan</b>                  | : All components are listed or exempted.   |
| <b>Thailand</b>                | : All components are listed or exempted.   |
| <b>Turkey</b>                  | : All components are listed or exempted.   |
| <b>United States</b>           | : All components are active or exempted.   |
| <b>Viet Nam</b>                | : All components are listed or exempted.   |

**15.2 Chemical safety assessment** : Complete.



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## SECTION 16: Other information

Indicates information that has changed from previously issued version.

**Abbreviations and acronyms** :

- ATE = Acute Toxicity Estimate
- CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
- DMEL = Derived Minimal Effect Level
- DNEL = Derived No Effect Level
- EUH statement = CLP-specific Hazard statement
- N/A = Not available
- PBT = Persistent, Bioaccumulative and Toxic
- PNEC = Predicted No Effect Concentration
- RRN = REACH Registration Number
- SGG = Segregation Group
- vPvB = Very Persistent and Very Bioaccumulative

**Key literature references and sources for data** : For general information on the toxicology of borates see Patty's Toxicology, 6th Edition Vol. I, (2012) Chap. 23, 'Boron'.

### Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

| Classification   | Justification   |
|------------------|-----------------|
| Repr. 1B, H360FD | Expert judgment |

### Full text of abbreviated H statements

|        |  |
|--------|--|
| H360FD | May damage fertility. May damage the unborn child. |
|--------|--|

### Full text of classifications [CLP/GHS]

|          |                                     |
|----------|-------------------------------------|
| Repr. 1B | REPRODUCTIVE TOXICITY - Category 1B |
|----------|-------------------------------------|

**Additional information** :

- Restricted to professional users.
- Keep out of reach of children.
- Do not ingest.
- Refer to safety data sheet.
- Not for use in food, drugs or biocides

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### Notice to reader

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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)

| Identified Use Number | Identified Use | Exposure Scenario (ES) |   | Sector of Use (SU)     | Article Category (AC) | Product Category (PC) | Process Category (PROC)                | Env. Release Category (ERC) | Subsequent Service Life | Borate   |
|-----------------------|----------------|------------------------|---|------------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|--|
| 1                     | Abrasives      | ES 1                   | Formulation into mixture                      | -                      | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium pentaborate (CAS 12007-92-0)  |
|                       |                | ES 2                   | Formulation into solid matrix                 | -                      | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                | ES 3                   | Industrial use of abrasives                   | 15                     | -                     | 0: other              | 2, 8a, 24, 28                          | 4                           | -                       |  |
|                       |                | ES 4                   | Professional use of abrasives                 | 15                     | -                     | 0: other              | 2, 8a, 24, 28                          | 8a, 8d                      | -                       |  |
|                       |                | ES 5                   | Consumer use of cutting wheels                | -                      | -                     | 0: other              | -                                      | 8a, 8d                      | -                       |  |
| 2                     | Adhesives      | ES 1                   | Formulation into mixture                      | -                      | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                | ES 2                   | Formulation into solid matrix                 | -                      | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                | ES 3                   | Industrial use of adhesives                   | 6a, 6b, 16, 17, 18, 19 | -                     | 1                     | 2, 7, 8b, 10, 11, 13, 28               | 5                           | ES 5, ES 6, ES 7        |  |
|                       |                | ES 4                   | Consumer use of boron containing adhesives    | -                      | -                     | 1                     | -                                      | 8c, 8f                      | ES 7                    |  |
|                       |                | ES 5                   | Industrial service life of adhered articles   | -                      | 2, 8, 11              | -                     | 21                                     | 12a, 12c                    | -                       |  |
|                       |                | ES 6                   | Professional service life of adhered articles | -                      | 2, 8, 11              | -                     | 21                                     | 10a, 11a                    | -                       |  |
|                       |                | ES 7                   | Consumer service life of adhered articles     | -                      | 2, 8, 11              | -                     | -                                      | 10a, 11a                    | -                       |  |

| Identified Use Number | Identified Use     | Exposure Scenario (ES) |   | Sector of Use (SU) | Article Category (AC) | Product Category (PC) | Process Category (PROC)                | Env. Release Category (ERC) | Subsequent Service Life | Borate  |
|-----------------------|--------------------|------------------------|---|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|---|
| 3                     | Agriculture        | ES 1                   | Formulation into mixture                                  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3)                             |
|                       |                    | ES 2                   | Formulation into solid matrix                             | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                    | ES 3                   | Professional use of micronutrient fertilizers             | 1                  | -                     | 12                    | 2, 3, 7, 8a, 9, 11, 28                 | 8a, 8d                      | -                       |   |
|                       |                    | ES 4                   | Consumer use of boron containing micronutrient fertiliser | -                  | -                     | 12                    | -                                      | 8a, 8d                      | -                       |   |
| 4                     | Analytical reagent | ES 1                   | Formulation into mixture                                  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                    | ES 2                   | Formulation into solid matrix                             | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                    | ES 3                   | Laboratory use of analytical reagent by the industry      | 24                 | -                     | 21                    | 2, 9, 15, 28                           | 4, 6b                       | -                       |   |
|                       |                    | ES 4                   | Laboratory use of analytical reagent by professionals     | 24                 | -                     | 21                    | 2, 9, 15, 28                           | 8a, 8b                      | -                       |   |
| 5                     | Autocausting       | ES 1                   | Formulation into mixture                                  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)  |
|                       |                    | ES 2                   | Formulation into solid matrix                             | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                    | ES 3                   | Processing aid  | 6b                 | -                     | 20                    | 1, 2, 3, 8a, 8b, 9, 15, 28             | 4, 6b                       | -                       |   |

| Identified Use Number | Identified Use       | Exposure Scenario (ES) |   | Sector of Use (SU) | Article Category (AC) | Product Category (PC) | Process Category (PROC)                | Env. Release Category (ERC) | Subsequent Service Life | Borate   |
|-----------------------|----------------------|------------------------|---|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|--|
| 6                     | Catalysts            | ES 1                   | Formulation into mixture                          | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)   |
|                       |                      | ES 2                   | Formulation into solid matrix                     | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Boron production                                  | 8                  | -                     | 32                    | 1, 2, 4, 8a, 8b, 9                     | 6a                          | -                       |  |
|                       |                      | ES 4                   | Polymer production                                | 17                 | -                     | 32                    | 1, 2, 4, 8a, 8b, 9                     | 6b                          | -                       |  |
| 7                     | Cellulose insulation | ES 1                   | Formulation into mixture                          | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)<br>Sodium pentaborate (CAS 12007-92-0) |
|                       |                      | ES 2                   | Formulation into solid matrix                     | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Industrial use of cellulose insulation            | 19                 | -                     | 0: other              | 2, 11, 28                              | 5                           | ES 5, ES 6, ES 7        |  |
|                       |                      | ES 4                   | Professional use of cellulose insulation          | 19                 | -                     | 0: other              | 2, 11, 28                              | 8c, 8f                      | ES 5, ES 6, ES 7        |  |
|                       |                      | ES 5                   | Industrial service life of cellulose insulation   | -                  | 4a                    | -                     | 21                                     | 12a, 12c                    | -                       |  |
|                       |                      | ES 6                   | Professional service life of cellulose insulation | -                  | 4a                    | -                     | 21                                     | 10a, 11a                    | -                       |  |
|                       |                      | ES 7                   | Consumer service life of cellulose insulation     | -                  | 4a                    | -                     | -                                      | 10a, 11a                    | -                       |  |
| 8                     | Ceramics             | ES 1                   | Formulation into mixture                          | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)         |
|                       |                      | ES 2                   | Formulation into solid matrix                     | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Production of frits                               | 13                 | -                     | 20                    | 0: other, 1, 2, 3, 7, 8b, 13, 15, 28   | 6a                          | -                       |  |

| Identified Use Number | Identified Use     | Exposure Scenario (ES) |  | Sector of Use (SU) | Article Category (AC) | Product Category (PC) | Process Category (PROC)                | Env. Release Category (ERC) | Subsequent Service Life | Borate  |
|-----------------------|--------------------|------------------------|--|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|---|
| 9                     | Chemical synthesis | ES 1                   | Formulation into mixture                                     | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                    | ES 2                   | Formulation into solid matrix                                | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                    | ES 3                   | Manufacture of new chemicals using borates as intermediate   | 8                  | -                     | 21                    | 1, 2, 8a, 8b, 9, 15, 28                | 6a                          | -                       |   |
|                       |                    | ES 4                   | Manufacture of new chemicals using borates as processing aid | 8                  | -                     | 21                    | 1, 2, 8a, 8b, 9, 15, 28                | 6b, 6c                      | -                       |   |
| 10                    | Coatings           | ES 1                   | Formulation into mixture                                     | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3)                                     |
|                       |                    | ES 2                   | Formulation into solid matrix                                | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                    | ES 3                   | Industrial use of paints and coatings                        | 7, 19              | -                     | 9a, 18                | 2, 7, 8a, 10, 13, 28                   | 5                           | ES 5, ES 6, ES 7        |   |
|                       |                    | ES 4                   | Professional use of paints and coatings                      | 7, 19              | -                     | 9a, 18                | 2, 8a, 10, 11, 13, 28                  | 5                           | ES 5, ES 6, ES 7        |   |
|                       |                    | ES 5                   | Industrial service life of coated articles                   | -                  | 7a, 8                 | -                     | 21, 24                                 | 12a, 12c                    | -                       |   |
|                       |                    | ES 6                   | Professional service life of coated articles                 | -                  | 7a, 8                 | -                     | 21, 24                                 | 10a, 11a                    | -                       |   |
|                       |                    | ES 7                   | Consumer service life of coated articles                     | -                  | 7a, 8                 | -                     | -                                      | 10a, 11a                    | -                       |   |

| Identified Use Number | Identified Use        | Exposure Scenario (ES) |  | Sector of Use (SU) | Article Category (AC) | Product Category (PC) | Process Category (PROC)                | Env. Release Category (ERC) | Subsequent Service Life | Borate   |
|-----------------------|-----------------------|------------------------|--|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|--|
| 11                    | Construction material | ES 1                   | Formulation into mixture   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)<br>Sodium pentaborate (CAS 12007-92-0)   |
|                       |                       | ES 2                   | Formulation into solid matrix  | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                       | ES 3                   | Industrial use of borates in construction materials (plaster boards, wood) | 19                 | -                     | 0: other, 8           | 2, 8a, 21, 28                          | 5                           | ES 6, ES 7, ES 8        |  |
|                       |                       | ES 4                   | Professional use of construction materials (plaster boards, wood)          | 19                 | -                     | 0: other, 8           | 2, 8a, 21, 28                          | 8c, 8f                      | ES 6, ES 7, ES 8        |  |
|                       |                       | ES 5                   | Consumer use of construction material (plaster boards, wood)               | -                  | -                     | 0: other              | -                                      | 8c                          | ES 8                    |  |
|                       |                       | ES 6                   | Industrial service life of construction material                           | -                  | 4a, 11a               | -                     | 21                                     | 12a, 12c                    | -                       |  |
|                       |                       | ES 7                   | Professional service life of construction material                         | -                  | 4a, 11a               | -                     | 21                                     | 10a, 11a                    | -                       |  |
|                       |                       | ES 8                   | Consumer service life of construction material                             | -                  | 4a, 11a               | -                     | -                                      | 10a, 11a                    | -                       |  |
| 12                    | Detergents            | ES 1                   | Formulation into mixture   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                       | ES 2                   | Formulation into solid matrix  | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                       | ES 3                   | Professional use of detergents   | 0: other           | -                     | 35                    | 2, 8a, 19, 28                          | 8a                          | -                       |  |
|                       |                       | ES 4                   | Consumer use of detergents   | -                  | -                     | 35                    | -                                      | 8a                          | -                       |  |
| 13                    | Glass                 | ES 1                   | Formulation into mixture   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3)  |
|                       |                       | ES 2                   | Formulation into solid matrix  | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                       | ES 3                   | Production of fiberglass, high alkali glass and low alkali glass           | 13                 | -                     | 0: other              | 0: other, 1, 2, 8b, 9, 15, 28          | 6a                          | -                       |  |

| Identified Use Number | Identified Use   | Exposure Scenario (ES) |  | Sector of Use (SU) | Article Category (AC) | Product Category (PC) | Process Category (PROC)                | Env. Release Category (ERC) | Subsequent Service Life | Borate   |
|-----------------------|------------------|------------------------|--|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|--|
| 14                    | Industrial fluid | ES 1                   | Formulation into mixture   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                  | ES 2                   | Formulation into solid matrix  | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                  | ES 3                   | General industrial use of lubricants and greases in vehicles or machinery (ATIEL-ATC Use Group B(i)) | 0: other           | -                     | 16, 17, 24            | 1, 2, 8b, 9, 28                        | 4, 7                        | -                       |  |
|                       |                  | ES 4                   | (Industrial) Use of lubricants and greases in open systems (ATIEL ATC Use Group C(i))                | 0: other           | -                     | 24                    | 2, 7, 8b, 9, 10, 13, 28                | 4, 7                        | -                       |  |
|                       |                  | ES 5                   | (Industrial) Use of lubricants in high energy open processes (ATIEL ATC Use Group F(i))              | 0: other           | -                     | 24, 25                | 2, 8b, 17, 18, 28                      | 4                           | -                       |  |
|                       |                  | ES 6                   | General professional use of lubricants and greases in vehicles or machinery (ATIEL-ATC Group B(p))   | 15, 17             | -                     | 16, 17, 24            | 1, 2, 8a, 8b, 20                       | 9a, 9b                      | -                       |  |
|                       |                  | ES 7                   | (Professional) Use of lubricants and greases in open systems (ATIEL-ATC Group C(p))                  | 15, 17             | -                     | 24                    | 2, 8a, 10, 11, 13                      | 8a, 8d                      | -                       |  |
|                       |                  | ES 8                   | (Professional) use of lubricants in high energy open processes (ATIEL-ATC Group F(p))                | 15, 17             | -                     | 24, 25                | 2, 8a, 17, 18                          | 8a                          | -                       |  |
|                       |                  | ES 9                   | General consumer use of lubricants and greases in vehicles or machinery (ATIEL-ATC Group B(c))       | -                  | -                     | 24                    | -                                      | 9a, 9b                      | -                       |  |



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|-----------------------|---------------------|------------------------|---|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|---|
| 15                    | Leather manufacture | ES 1                   | Formulation into mixture                  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)   |
|                       |                     | ES 2                   | Formulation into solid matrix             | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                     | ES 3                   | Industrial use in leather manufacturing   | 5                  | -                     | 23                    | 2, 8a, 9, 10, 13, 28                   | 6b                          | -                       |   |
|                       |                     | ES 4                   | Professional use in leather manufacturing | 5                  | -                     | 23                    | 2, 8a, 9, 10, 13, 28                   | 8b                          | -                       |   |
| 16                    | Maritime industry   | ES 1                   | Formulation into mixture                  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2) |
|                       |                     | ES 2                   | Formulation into solid matrix             | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                     | ES 3                   | Industrial production of marine ropes     | 1, 2b              | -                     | 0: other              | 2, 7, 8a, 13, 28                       | 5                           | ES 5, ES 6              |   |
|                       |                     | ES 4                   | Professional production of marine ropes   | 1, 2b              | -                     | 0: other              | 2, 8a, 11, 13, 28                      | 8c, 8f                      | ES 5, ES 6              |   |
|                       |                     | ES 5                   | Industrial service life of marine ropes   | -                  | 5h                    | -                     | 21                                     | 12a, 12c                    | -                       |   |
|                       |                     | ES 6                   | Professional service life of marine ropes | -                  | 5h                    | -                     | 21                                     | 10a, 11a                    | -                       |   |

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|-----------------------|----------------|------------------------|--|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|---|
| 17                    | Metallurgy     | ES 1                   | Formulation into mixture   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | <p><b>all ES:</b><br/>Boric acid (CAS 10043-35-3)<br/>Disodium tetraborate (CAS 1330-43-4)</p> <p><b>ES 1-6, ES 9, ES 11-13:</b><br/>Boric oxide (CAS 1303-86-2)</p> <p><b>ES 1-2, ES 8, ES 10:</b><br/>Disodium octaborate (CAS 12008-41-2)</p> <p><b>ES 1-2, ES 7, ES 11-13:</b><br/>Sodium metaborate (CAS 7775-19-1)</p> <p><b>ES 1-2, ES 4-7, ES 9, ES 11-13:</b><br/>Sodium pentaborate (CAS 12007-92-0)<br/>Dipotassium tetraborate (CAS 1332-77-0)<br/>Potassium pentaborate (CAS 11128-29-3)</p> |
|                       |                | ES 2                   | Formulation into solid matrix  | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |   |
|                       |                | ES 3                   | Formulation into alloys  | 14                 | -                     | 7                     | 0: other, 1, 2, 8a, 8b, 9, 15, 28      | 5                           | ES 11, ES 12, ES 13     |   |
|                       |                | ES 4                   | Industrial use of fluxes for (precious) metal smelting                               | 14                 | -                     | 7                     | 0: other, 1, 2, 8a, 8b, 9, 15, 28      | 6b                          | -                       |   |
|                       |                | ES 5                   | Industrial use of flux pastes for coating brazing and welding rods                   | 15                 | -                     | 38                    | 2, 8a, 28                              | 5                           | ES 11, ES 12, ES 13     |   |
|                       |                | ES 6                   | Industrial use of welding, brazing or soldering rods                                 | 14, 15, 17, 19     | -                     | 38                    | 2, 8a, 25, 28                          | 4, 6b                       | -                       |   |
|                       |                | ES 7                   | Use of borates in metal treatment (plating, passivation, galvanising, cleaning, etc) | 14, 17             | -                     | 14                    | 2, 7, 8a, 8b, 10, 13, 28               | 5                           | ES 11, ES 12, ES 13     |   |
|                       |                | ES 8                   | Industrial use for slag stabilisation treatment                                      | 14                 | -                     | 7                     | 2, 4, 8a, 28                           | 6b                          | -                       |   |
|                       |                | ES 9                   | Professional use of welding, brazing or soldering rods                               | 14, 15, 17, 19     | -                     | 38                    | 2, 8a, 25, 28                          | 8a, 8d                      | -                       |   |
|                       |                | ES 10                  | Professional use for slag stabilisation treatment                                    | 14                 | -                     | 7                     | 2, 4, 8a, 28                           | 8b                          | -                       |   |
|                       |                | ES 11                  | Industrial service life of metal articles  | -                  | 7                     | -                     | 21                                     | 12a, 12c                    | -                       |   |
|                       |                | ES 12                  | Professional service life of metal articles  | -                  | 7                     | -                     | 21                                     | 10a, 11a                    | -                       |   |
|                       |                | ES 13                  | Consumer service life of metal articles  | -                  | 7                     | -                     | -                                      | 10a, 11a                    | -                       |   |

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|-----------------------|----------------------|------------------------|---|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|--|
| 18                    | Non oxide ceramics   | ES 1                   | Formulation into mixture  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)   |
|                       |                      | ES 2                   | Formulation into solid matrix                                   | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Intermediate use in the production of non oxide ceramic powders | 13                 | -                     | 0: other              | 0: other, 1, 2, 8a, 8b, 9, 15, 24, 28  | 6a                          | -                       |  |
| 19                    | Nuclear applications | ES 1                   | Formulation into mixture  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3)   |
|                       |                      | ES 2                   | Formulation into solid matrix                                   | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Industrial use of borates in closed nuclear system              | 23                 | -                     | 37                    | 1, 2, 8a, 8b, 9, 15, 28                | 4, 6b                       | -                       |  |
| 20                    | Oil industry         | ES 1                   | Formulation into mixture  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Disodium octaborate (CAS 12008-41-2)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                      | ES 2                   | Formulation into solid matrix                                   | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Industrial use of cement  | 2b                 | -                     | 0: other              | 1, 2, 8b, 9, 15, 28                    | 6b                          | -                       |  |
| 21                    | Photography          | ES 1                   | Formulation into mixture  | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3)   |
|                       |                      | ES 2                   | Formulation into solid matrix                                   | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                      | ES 3                   | Industrial use of photographic solutions                        | 7                  | -                     | 30                    | 2, 4, 8a, 13, 28                       | 4                           | -                       |  |
|                       |                      | ES 4                   | Professional use of photographic solutions                      | 7                  | -                     | 30                    | 2, 4, 8a, 9, 13, 28                    | 8a                          | -                       |  |

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|-----------------------|---------------------------|------------------------|--|--------------------|-----------------------|-----------------------|--|-----------------------------|-------------------------|--|
| 22                    | Printing paper            | ES 1                   | Formulation into mixture                   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)<br>Sodium metaborate (CAS 7775-19-1)<br>Sodium pentaborate (CAS 12007-92-0)<br>Dipotassium tetraborate (CAS 1332-77-0)<br>Potassium pentaborate (CAS 11128-29-3) |
|                       |                           | ES 2                   | Formulation into solid matrix              | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                           | ES 3                   | Use of borate PVA solutions for printing   | 7                  | -                     | 26                    | 2, 3, 4, 8a, 28                        | 5                           | ES 5, ES 6              |  |
|                       |                           | ES 4                   | Use of borate PVA solutions for printing   | 7                  | -                     | 26                    | 2, 3, 4, 8a, 28                        | 8c                          | ES 5, ES 6              |  |
|                       |                           | ES 5                   | Professional service life of printed paper | -                  | 8                     | -                     | 21                                     | 10a, 11a                    | -                       |  |
|                       |                           | ES 6                   | Consumer service life of printed paper     | -                  | 8                     | -                     | -                                      | 10a, 11a                    | -                       |  |
| 23                    | Refractories              | ES 1                   | Formulation into mixture                   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Boric oxide (CAS 1303-86-2)<br>Disodium tetraborate (CAS 1330-43-4)   |
|                       |                           | ES 2                   | Formulation into solid matrix              | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                           | ES 3                   | Industrial use of refractory mixtures      | 14                 | -                     | 15                    | 2, 3, 7, 23                            | 6b                          | -                       |  |
| 24                    | Tablet production and use | ES 1                   | Formulation into mixture                   | -                  | -                     | 0: other              | 1, 2, 3, 8a, 8b, 9, 15, 28             | 2                           | -                       | Boric acid (CAS 10043-35-3)<br>Disodium tetraborate (CAS 1330-43-4)  |
|                       |                           | ES 2                   | Formulation into solid matrix              | -                  | -                     | 0: other              | 1, 2, 7, 8a, 8b, 9, 14, 15, 23, 24, 28 | 3                           | -                       |  |
|                       |                           | ES 3                   | Swimming pool tablet use                   | 0: other           | -                     | 37                    | 2, 8a, 26, 28                          | 8a, 8d                      | -                       |  |