

Appendix C: Rating Guide

Appendix C: Rating Guide – where not on list substance not classified by ERMA.

1 Introduction

Assigning hazard ratings to hazardous substances is an essential part of undertaking a HFSP evaluation. The user has four options for undertaking hazard ratings:

- | | | |
|---|---|---|
| <ol style="list-style-type: none">1 Find substance in Appendix B/ the HFSP Calculation Sheet (limited number only).2 Obtain HSNO Classification (will only gradually become available) and refer to Appendix A.3 Use default ratings:<ul style="list-style-type: none">• Fire/Explosion – Medium• Human Health – Medium• Environment – High | } | Hazard rating is supplied |
| <ol style="list-style-type: none">4 Research Hazard Rating according to the instructions in this rating guide. | } | Hazard rating must be developed by user |

This guide provides assistance with carrying out Option 4.

2 Researching and developing a HFSP Hazard Rating

Rating a substance for HFSP purposes can be a complex task, depending on the nature of the substance and the information available, and in most cases it will be easier to apply the default ratings. However, by following the three steps outlined below this is streamlined as much as possible:

- Step 1: Sourcing relevant information about a hazardous substance and its effects. In the interest of consistency and accessibility, databases that are freely accessible through the Internet are recommended.
- Step 2: Collation of the information into a work sheet (Form 1).
- Step 3: Rating of the substance through identifying relevant information and matching it up with applicable rating criteria from Appendix A. A flow chart is provided to assist with this process.

To illustrate how a hazard rating can be undertaken, the example of chlorpyrifos, the active ingredient in some pesticides (e.g. Lorsban) is used. A blank copy of Form 1 is provided at the end of this guide.

It is important to note, however, that information necessary to rate a substance for the HFSP is not always available. In such cases, the default rating for the Effects Group in which data is missing must be applied.

Step 1: Use the information sources in the order listed below to find the necessary substance information

(a) United Nations Recommendations on the Transport of Dangerous Goods (11th ed)

The UNRTDG book lists substances that have a UN Class and UN Number assigned to it. It is available in hard copy for purchase. As an alternative, the NZ Standard 5433:1999 Code of Practice for the Transport of Dangerous Goods on Land¹⁰ may be used as it provides essentially the same information as the UNRTDG book.

Use instructions

Substances are listed alphabetically (see Alphabetical Index of Substances and Articles), and by UN Number (see Dangerous Goods Lists). Note that not every substance has a UN classification, hence may not be listed in this document.

Search results: No entry under 'chlorpyrifos'.

(b) TOXNET Toxicology Data Network (<http://toxnet.nlm.nih.gov/>)

This website provides free access to a number of databases with chemical, toxicological and ecotoxicological information.¹¹

Use instructions

The first access point is ChemIDplus (see 'Search Databases' on the left of the screen – note that some browsers may display an intermediary screen asking for the display format for chemical structures. Choose "Chime" and submit). The search function accepts chemical names, CAS Registry Numbers and chemical formulas. (Note that the 'Structure Input Box' must be fully loaded before the search can begin.) A range of choices will appear at the top of the page to select the wanted information:

- Entire record – provides the CAS Number and a list of synonyms.
- Notes – gives basic information on the nature of the substance
- **Locator codes** – provides a choice of databases available for consultation. The information required for assigning a hazard rating will be found in one of the databases listed here.

¹⁰ Or the corresponding IMDG or IATA documents.

¹¹ A number of other databases listed in the bibliography are also useful but are only available for purchase.

Of the databases displayed under Locator Codes on the left side of the screen, the following are recommended (in order of usefulness):

- **HSDB** – provides comprehensive information about a substance, including ecotoxicology data if available and in-depth human toxicology information (but often no LD₅₀ information). Sections of relevance to HFSP rating are:
 - Synonyms and Identifiers
 - Chemical/Physical Properties
 - Human health Effects (Human Toxicity Excerpts)
 - Animal Toxicity Studies (Non-Human Toxicity Excerpts)
- **EPA ENVIROFACTS** – provides a hyperlink to the Environmental Defence Fund's **Chemical Scorecard**, which in turn provides hyperlinks to the **IPCS International Chemical Safety Card** and **New Jersey Fact Sheets**.
- **ATSDR Toxicology Profiles** – provides extensive information on human health effects (including LD₅₀ data) and information on chemical/physical properties of the substance, downloadable as .pdf files.
- **EXTOXNET** – provides comprehensive information on the human health and ecotoxic effects of pesticides.
- **IRIS** – provides basic information about health effects.

Search results: Data are listed in Form 1 below (Step 2).

Step 2: Assemble substance information

Form 1 lists the data points necessary to assign hazard ratings to hazardous substances for the purposes of the HFSP. It is not always possible or indeed necessary to find all the information listed. For example, a single LD₅₀ value is generally sufficient to assign a Human Health Hazard Rating. Where no information at all is found that is relevant for an Effects Type the default rating for that Effects Group should be assigned.

If a range of data points is available – usually for toxicity and ecotoxicity information where data points for different species may be supplied – it is important to choose the most stringent value to ensure that the precautionary approach adopted by the HFSP is reflected. For example, if the substance is shown to have an LD₅₀ value for mice of 50 mg/l and an LD₅₀ of 300 mg/l for rabbits, the lower value (for mice) must be selected.

Form 1: Substance Information		Source	
Name	Chlorpyrifos		
CAS Number	2921-88-2	EXTOXNET	
UN Number	2783 (Organophosphorus pesticide, solid, toxic)	UNRTDG	
UN Class	6.1	UNRTDG	
UN Packaging Group	Not specified		
Specific Gravity	1.398	EXTOXNET	
Boiling Point	–		
Flash Point	Greater than 200°C	EXTOXNET	
Vapour Pressure	1.87 x 10 ⁻⁵ mm Hg @ 20°C	EXTOXNET	
Toxicity Data	LD ₅₀ (Oral) (lethal dose)	82–270 mg/l (rats) 60 mg/l (mice)	EXTOXNET
	LD ₅₀ (Dermal)	> 2,000 mg/l (rats)	EXTOXNET
	LC ₅₀ (Gas Inhalation Toxicity)	–	
	LC ₅₀ (Vapour Inhalation Toxicity)	–	
	LC ₅₀ (Dust/Mist Inhalation Toxicity) (lethal concentration)	–	
Ecotoxicity Data	LC ₅₀ Fish (96 hours) ¹²	0.0071–0.051 mg/l (rainbow trout)	EXTOXNET
	EC ₅₀ Crustacean (48 hours)	–	
	EC ₅₀ Algae/aquatic plant (72 hours)	–	
	NOEC Fish/Crustacean/Algae/Aquatic Plant ¹³	–	
	BCF (Bioconcentration Factor) ¹⁴	2.50–3.54	
	Log K _{ow}	–	
	BOD ₅ ¹⁵	–	
COD	–		

Step 3: Evaluate substance

The Evaluation Flow Chart assists with the systematic evaluation of the data recorded in Form 1 by matching up the rating criteria provided in Appendix A with the substance information. It is important to note that substances have to be evaluated for **all** hazards – for example, a substance may be flammable and toxic and ecotoxic, hence the entire flow chart must be worked through systematically.

¹² LC₅₀ and EC₅₀ values measure *acute* aquatic toxicity.

¹³ NOEC measure *chronic* aquatic toxicity.

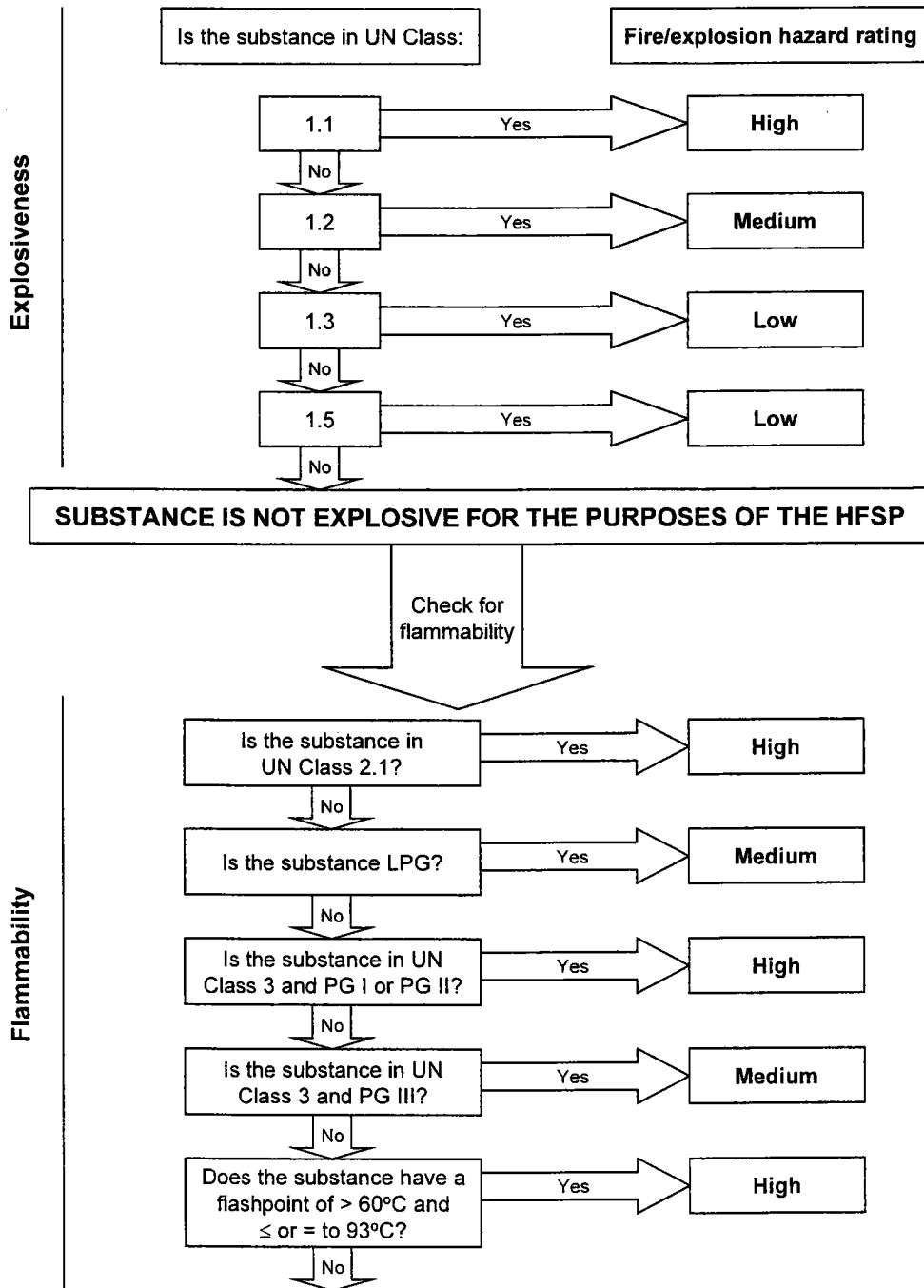
¹⁴ BCF and log K_{ow} measure whether a substance is bioaccumulative. A BCF of greater than or equal to 500 or the log K_{ow} of greater than or equal to 4 is indicative of bioaccumulation.

¹⁵ BOD₅ and COD measure whether a substance is readily degradable. Refer to HSNO Regulations for further detail.

Using the example of chlorpyrifos, the following hazard rating emerges:

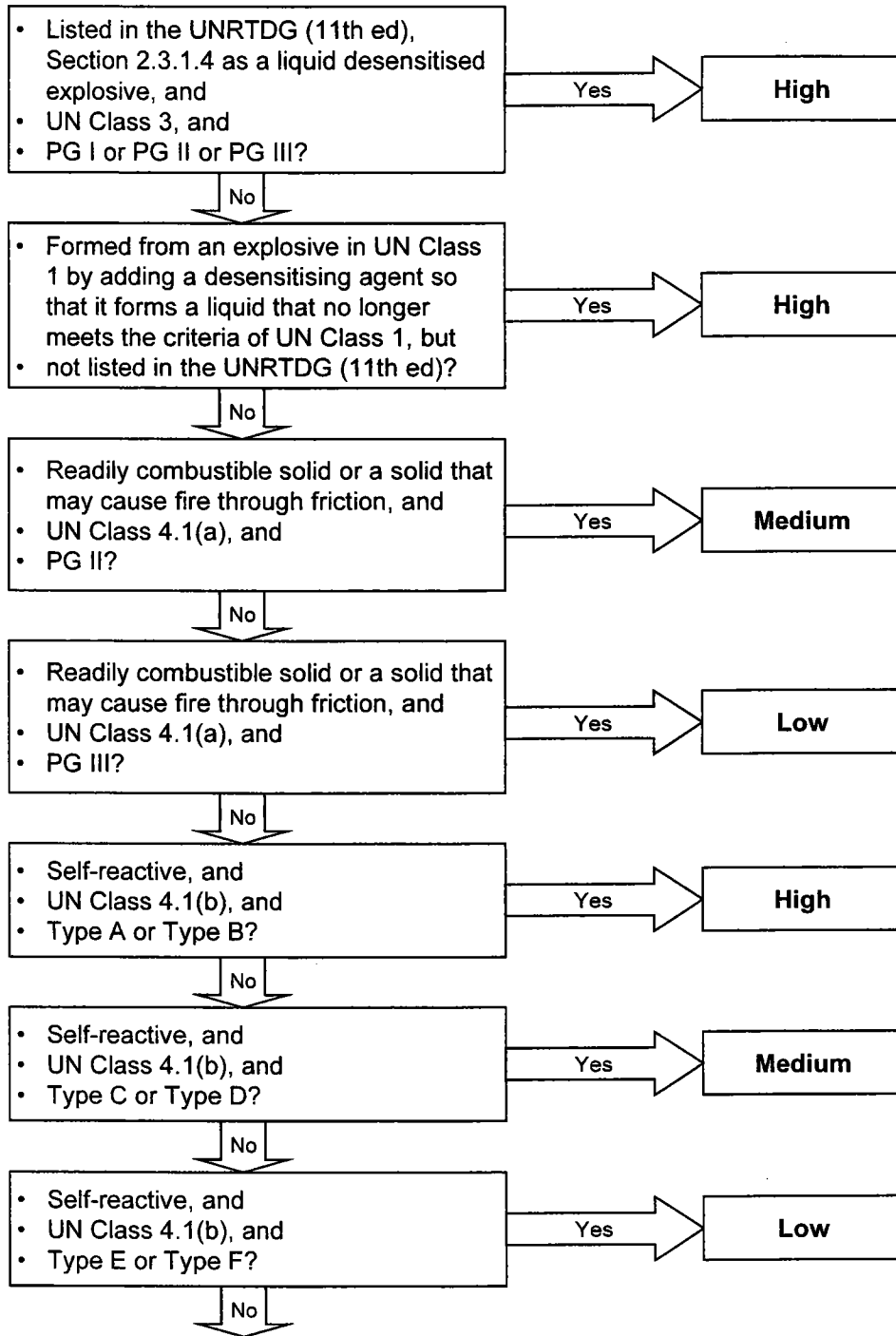
- Explosiveness: None – not a Class 1 substance.
- Flammability: None – not a Class 3 substance; flashpoint is very high.
- Oxidising capacity: None – not a Class 5 substance.
- Toxicity: **Medium** (Human Health Effects Type)
- Corrosiveness: None – not a Class 8 substance.
- Ecotoxicity: **High** (Environment Effects Type)

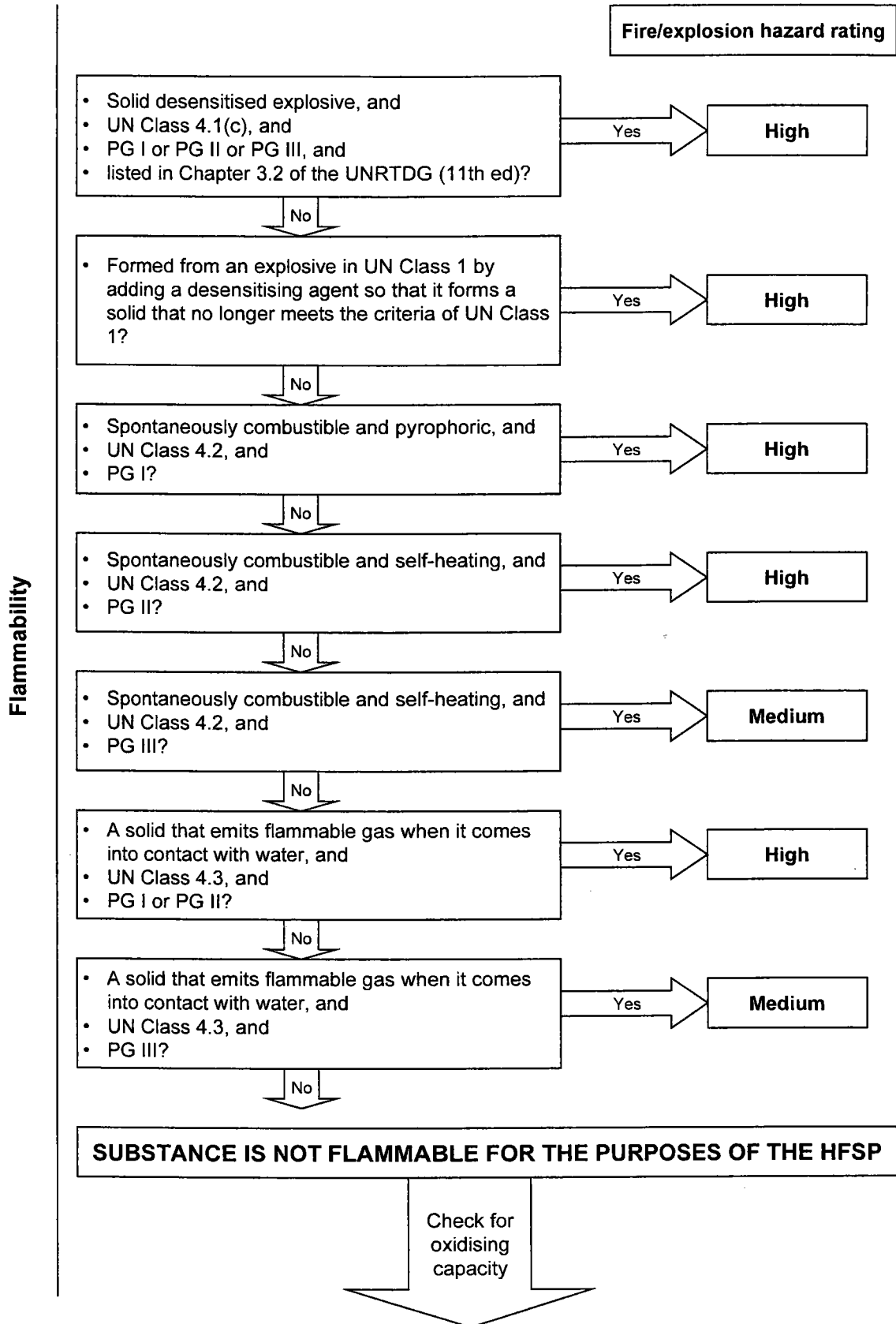
Hazard rating flow chart



What classification and properties apply to the substance?

Flammability





Fire/explosion hazard rating

What classification and properties apply to the substance?

Oxidising Capacity

• Liquid or solid
• UN Class 5.1, and
• PG I or PG II?

Yes → **High**

No ↓

• Liquid or solid
• UN Class 5.1, and
• PG III?

Yes → **Medium**

No ↓

• A gas
• UN Class 2.2 or 5.1?

Yes → **High**

No ↓

• Organic peroxide
• UN Class 5.2, and
• Type A or Type B?

Yes → **High**

No ↓

• Organic peroxide
• UN Class 5.2, and
• Type C or Type D?

Yes → **Medium**

No ↓

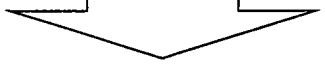
• Organic peroxide
• UN Class 5.2, and
• Type E, Type F or Type G?

Yes → **Low**

No ↓

SUBSTANCE DOES NOT HAVE OXIDISING CAPACITY FOR THE PURPOSES OF THE HFSP

Check for toxicity



What classification and properties apply to the substance?

Toxicity

- UN Class 6.1
- PG I or PG II, or
- UN Class 2.3, and/or
- Oral toxicity $LD_{50} \leq 50$ mg/kg and/or
- Dermal toxicity $LD_{50} \leq 200$ mg/kg and/or
- Inhalation toxicity (gas) $LC_{50} \leq 500$ ppm and/or
- Inhalation toxicity (vapour) $LC_{50} \leq 2.0$ mg/l and/or
- Inhalation toxicity (dust/mite) $LC_{50} \leq 0.5$ mg/l

Yes → **High**

No ↓

- UN Class 6.1
- PG III, or
- UN Class 2.3, and/or
- Oral toxicity $LD_{50} > 50$ mg/kg and ≤ 300 mg/kg and/or
- Dermal toxicity $LD_{50} > 200$ mg/kg and ≤ 1000 mg/kg and/or
- Inhalation toxicity (gas) $LC_{50} > 500$ ppm and ≤ 2500 ppm and/or
- Inhalation toxicity (vapour) $LC_{50} > 2.0$ mg/l and ≤ 10.0 mg/l and/or
- Inhalation toxicity (dust/mite) $LC_{50} > 0.5$ mg/l and ≤ 1.0 mg/l

Yes → **Medium**

No ↓

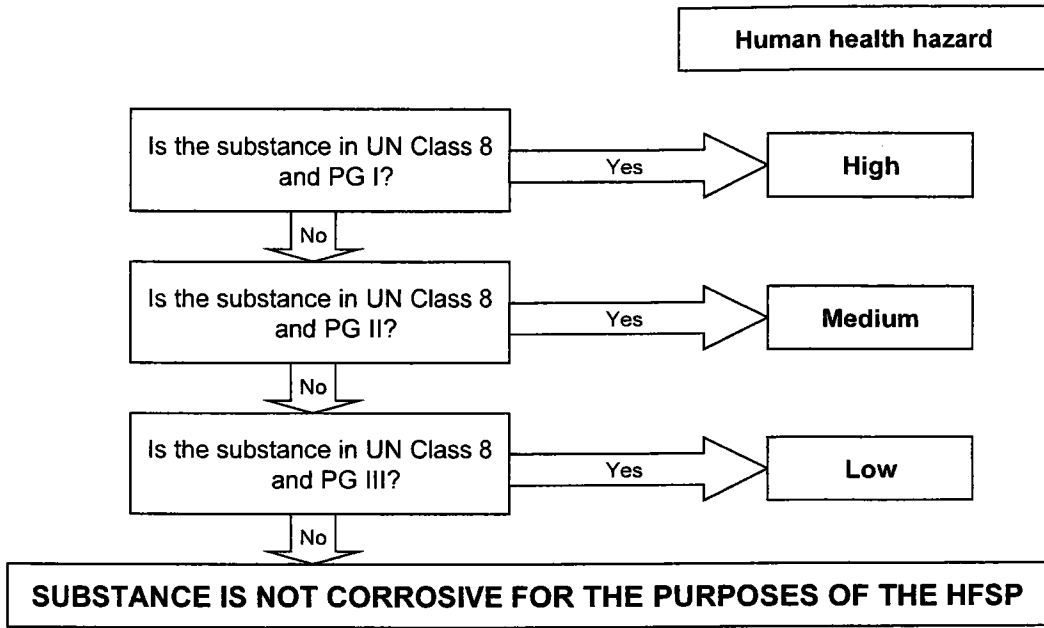
- A standard poison under the Toxic Substances Regulations and/or
- Oral toxicity $LD_{50} > 300$ mg/kg and ≤ 2000 mg/kg and/or
- Dermal toxicity $LD_{50} > 1000$ mg/kg and ≤ 2000 mg/kg and/or
- Inhalation toxicity (gas) $LC_{50} > 2500$ ppm and ≤ 5000 ppm and/or
- Inhalation toxicity (vapour) $LC_{50} > 10$ mg/l and ≤ 20 mg/l and/or
- Inhalation toxicity (dust/mite) $LC_{50} > 1.0$ mg/l and ≤ 5.0 mg/l

Yes → **Low**

SUBSTANCE IS NOT TOXIC FOR THE PURPOSES OF THE HFSP

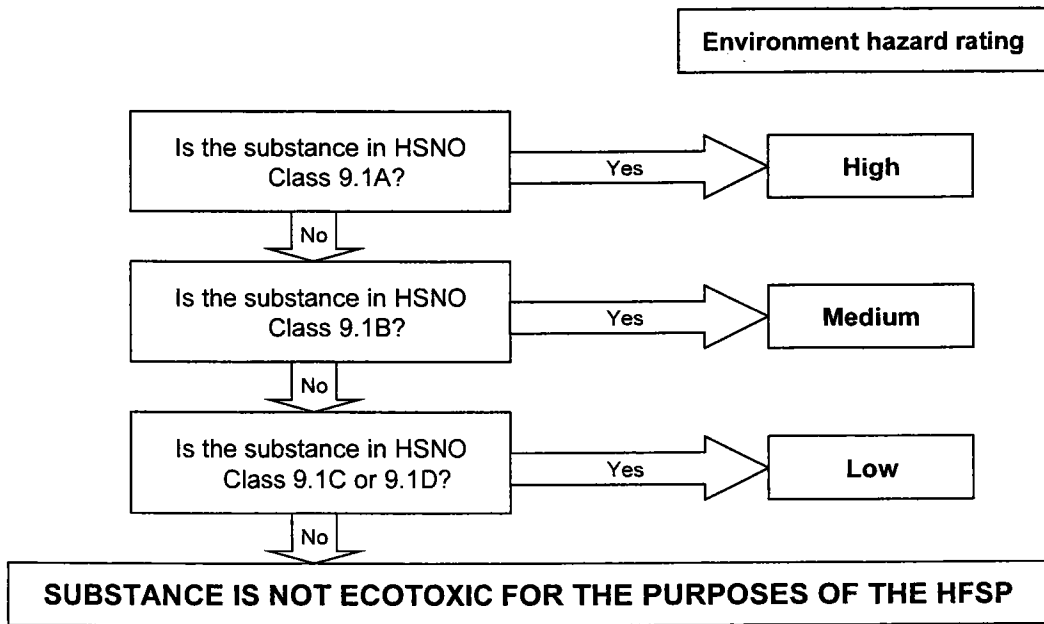
Check for
corrosiveness

Corrosiveness



Refer to ecotoxicity flowchart overleaf to obtain *pro forma* HSNO classification and check for toxicity

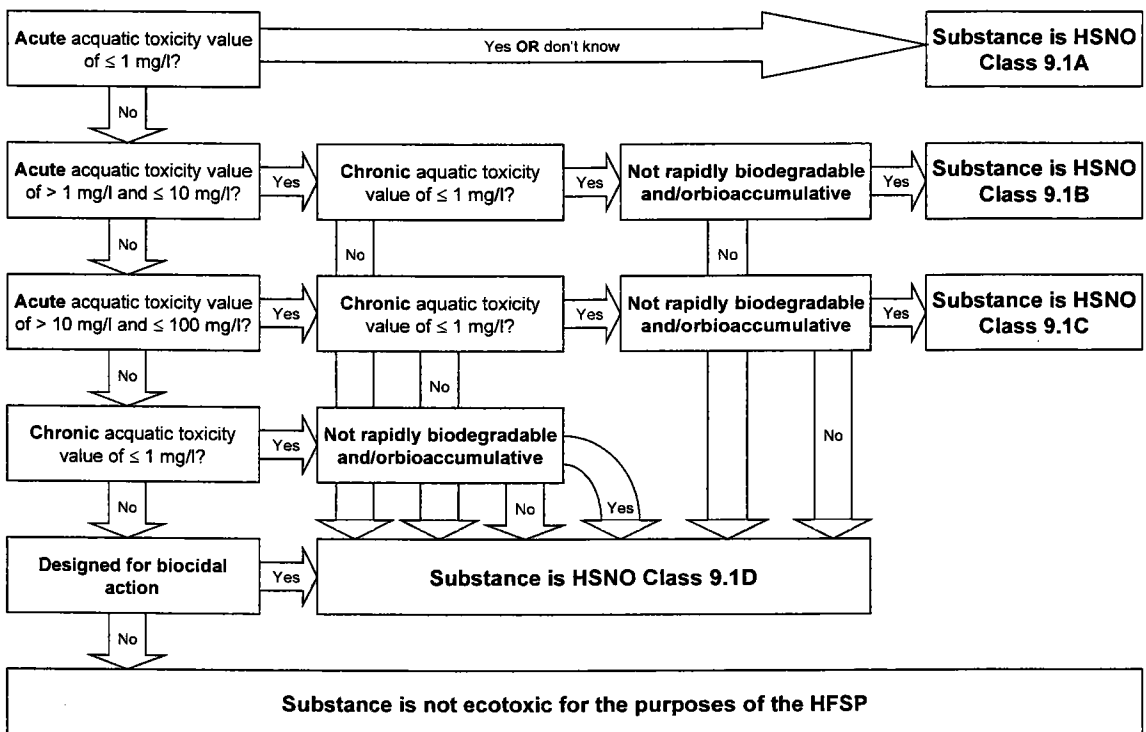
Ecotoxicity



Ecotoxicity flowchart

Acute aquatic toxicity is measured by:	<ul style="list-style-type: none"> • LC₅₀ (any fish species) (96 hours) and/or • EC₅₀ (any crustacean species) (48 hours) and/or • EC₅₀ (any aquatic algae or plant species) (72 hours)
Chronic aquatic ecotoxicity is measured by:	<ul style="list-style-type: none"> • NOEC (any fish, crustacean or aquatic algae or plant species)
Degradability and bioaccumulation may be measured by:	<ul style="list-style-type: none"> • BCF (Bioconcentration Factor) and/or • log K_{ow}.

Which ecotoxic properties apply?



Note: If information is not known or not given, follow YES arrow.

Form 1: Template

Form 1: Substance Information		Source
Name CAS Number UN Number UN Class UN Packaging Group Specific Gravity Boiling Point Flash Point Vapour Pressure		mm Hg @ 20°C
Toxicity Data	LD ₅₀ (Oral)	mg/l (<i>species</i>)
	LD ₅₀ (Dermal)	mg/l (<i>species</i>)
	LC ₅₀ (Gas Inhalation Toxicity)	ppm (<i>species</i>)
	LC ₅₀ (Vapour Inhalation Toxicity)	ppm (<i>species</i>)
	LC ₅₀ (Dust/Mist Inhalation Toxicity)	ppm (<i>species</i>)
Ecotoxicity Data	LC ₅₀ Fish (96 hours) ¹⁶	mg/l (<i>species</i>)
	EC ₅₀ Crustacean (48 hours)	mg/l (<i>species</i>)
	EC ₅₀ Algae/aquatic plant (72 hours)	mg/l (<i>species</i>)
	NOEC Fish/Crustacean/Algae/Aquatic Plant ¹⁷	mg/l (<i>species</i>)
	BCF (Bioconcentration Factor) ¹⁸	
	Log K _{ow}	
	BOD ₅ ¹⁹	
COD		

¹⁶ LC₅₀ and EC₅₀ values measure *acute* aquatic toxicity.

¹⁷ NOEC measure *chronic* aquatic toxicity.

¹⁸ BCF and K_{ow} measure whether a substance is bioaccumulative. A BCF of greater than or equal to 500 or the log K_{ow} of greater than or equal to 4 is indicative of bioaccumulation.

¹⁹ BOD₅ and COD measure whether a substance is readily degradable. Refer to HSNO Regulations for further detail.