

# Appendix C

## Hazardous Facility Screening Procedure

### Introduction

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The Hazardous Facility Screening Procedure (HFSP) is to be applied to all proposed facilities and activities using or storing hazardous substances. The purpose of the HFSP is to determine the level of risk posed by the presence of hazardous substances. The level of risk will establish the status of the activity relative to rules in the Plan.

Hazardous facilities can range from home occupations to large chemical processing factories. Common examples of hazardous substances are acids, solvents, paints, fuels, and pesticides.

The HFSP is derived from Land Use Planning for Hazardous Facilities, 1995.

### Overview and Terminology

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The HFSP establishes a base Threshold for each hazardous substance. The Base Threshold is dependent on the intrinsic properties of the substance but can be modified by an Adjustment Factor. The Adjustment Factor relates to the physical state of the substance, type of storage and activity, site layout, and the environmental sensitivity of the site and location.

The multiplication of the Base Threshold with the Adjustment Factor generates an Adjusted Threshold for any effect. Next, the calculation of the Effects Ratio represents the quantity of substance relative to the Adjusted Threshold. The Effects Ratio forms the basis for determining the Plan status of a particular facility or activity.

The HFSP is illustrated in Figure C1: HFSP Conceptual Overview

### Effects Groups

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The types of effects from hazardous substances are put into three different Effect Groups, being:

Fire/Explosive Effect Group:	concerned with damage to property and the built environment, and danger to people
Health Effect Group:	concerned with reduction of the well-being, and health and safety of the community and people
Ecosystem Effect Group:	concerned with adverse effects on ecosystems and natural resources

Each of the Effect Groups is divided into levels of effect. The Fire/Explosive Effect Group is divided into three levels: high, medium and low. The Health, and Ecosystem Effect Groups are divided into four levels: extreme, high, medium, and low. The division into high, medium and low is based on the United Nations (UN) Hazardous Substances Classification System\*. The extreme level is added to deal with substances recognised as very hazardous. The UN system divides classes of effects into divisions.

Table C1: Classification of Hazardous Substances, shows how the UN Classes and Divisions are allocated Effect Groups and levels.

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\* United Nations Recommendations on the Transport of Dangerous Goods 8th Edition 1993, New York.

## Base Threshold

The Base Threshold (B) is dependent on the substances intrinsic hazardous properties. The Base Threshold is expressed as the weight (tonnes), or volume for compressed gases (m<sup>3</sup> at 101.3kPA and 20C), of each substance stored or used on site. Base Thresholds for Effect Group Levels are given in Table C2: Base Thresholds for all Effect Groups and Hazard Levels.

## Adjustment Factor

Adjustment Factors provide for circumstances that influence the severity of an effect reflected by the risk or consequences of release. Adjustment Factors consider:

- **physical state of the substance**
- **pressure and temperature required for storage and usage**
- **type of storage**
- **type of activity or use**
- **separation distance to site boundary**
- **environmental sensitivity of the site and location**

However, not all considerations are relevant to each Effect Group. Within each Effect Group, the Adjustment Factor is calculated by multiplying individual consideration values to produce a single value. Table C3: Adjustment Factors, presents consideration values for calculation of the Adjustment Factor.

FF, FH, and FE are adjustment Factors for the Fire/Explosion, Health, and Ecological Effect Groups, respectively.

## Adjusted Threshold

The Adjusted Threshold (T) is calculated for each Effect Group by multiplying the Base Threshold by the relevant Adjustment Factor. For example:

$B \times FF = T$	Adjusted Threshold for a substance in the Fire/Explosion Effect Group
$B \times FH = T$	Adjusted Threshold for a substance in the Health Effect Group
$B \times FE = T$	Adjusted Threshold for a substance in the Ecological Effect Group

The Adjusted Threshold defines the amount of a substance generating no significant off-site effects when released, after taking account of site and substance consideration.

## Effects Ratio

The Effects Ratio (R) represents the proposed quantity of hazardous substance divided by the Adjusted Threshold. Effects Ratios fulfil two important purposes. First, they define the hazardous facility threshold and determine the activities status within the Plan. The status is set by the highest value for R in any of the Effect Groups. Second, they assess the cumulative effects that may be created by several hazardous substances on the same site. By using a ratio it is possible to aggregate the assessment of effects from multiple substances on the same site.

**Table C1  
Classification of Hazardous Substances**

Un Class	Hazard	Division	Description	Effects Group	Hazard Level
1	Explosives	1.1	Articles and substances having a mass explosion hazard	Fire/Explosion	Extreme
		1.2	Articles and substances having a projection hazard, but not a mass explosion hazard	Fire/Explosion	High
		1.3	Articles and substances having a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard. This division comprises articles and substances that: <ul style="list-style-type: none"> <li>• give rise to considerable radiant heat, or</li> <li>• burn one after another, producing minor blast and/or projection effects</li> </ul>	Fire/Explosion	Medium
2	Gases	1.4, 1.5, 1.6	Not applicable		
		LPG		Fire/Explosion	Medium
		2.1	Flammable gases: Gases which at 20°C and a standard pressure of 101.3 kPa: <ul style="list-style-type: none"> <li>• are ignitable when in a mixture of 13% or less by volume with air, or</li> <li>• have a flammable range with air of at least 12% regardless of the lower flammability limit</li> </ul> This class includes aerosols containing flammable propellants.	Fire/Explosion	High
		2.2	Not applicable		
		2.3	Toxic gases: Gases which are known to be toxic or corrosive to humans and pose a hazard to health. This division is divided into the following categories: <ul style="list-style-type: none"> <li>a) Inhalation toxicity vapours LC<sub>50</sub>: &lt;200 ppm (= ml/m<sup>3</sup>)</li> <li>b) Inhalation toxicity vapours LC<sub>50</sub>: ≥ 200 ppm (= ml/m<sup>3</sup>) ≤ 5,000 ppm (= ml/m<sup>3</sup>)</li> </ul>	Health Health	Extreme High
3	Flammable Liquids		Flammable liquids comprising liquids, mixtures of liquids, or liquids containing solids in suspension which give off a flammable vapour at specific temperatures. This class is divided into packaging groups (PG).		
		3PG(I)	Flash point:- Initial boiling point: <23° <35°C	Fire/Explosion	High
		3PG(II)	Flash point: Initial boiling point: <23°C >35°C	Fire/Explosion	High

Un Class	Hazard	Division	Description	Effects Group	Hazard Level
4	Flammable Solids	3PG (III)	Flash point: $\geq 23^{\circ}\text{C}$ ; $\leq 60.5^{\circ}\text{C}$ Initial boiling point: $>35^{\circ}\text{C}$	Fire/Explosion	Medium
		Combustible Liquids	Flash point: $>60.5^{\circ}\text{C}$	Fire/Explosion Ecological	Low Medium
		4.1	<ul style="list-style-type: none"> <li>Flammable solids that are readily combustible or may cause fire easily through an ignition source or friction.</li> <li>Self-reacting substances that are thermally unstable and are liable to undergo a strongly exothermic decomposition even without the participation of oxygen.</li> <li>Desensitised explosives: Substances which are wetted with water or alcohol or diluted with other substances to suppress their explosive properties.</li> </ul>	Fire/Explosion	High
		4.2	<p>Substances liable to spontaneous combustion:</p> <ul style="list-style-type: none"> <li>Pyrophoric substances: liquid or solid substances which, even in small quantities, ignite within 5 minutes of coming in contact with air</li> <li>Self heating substances: solid substances which generate heat when in contact with air without additional energy supply</li> </ul>	Fire/Explosion	Extreme
5	Oxidising Substances & Organic Peroxides	4.3	Substances, which in contact with water, become spontaneously flammable, or emit flammable gases	Fire/Explosion	Extreme
		5.1	Oxidising substances: substances which, in themselves, are not necessarily combustible, but may cause or contribute to the combustion of other materials by yielding oxygen	Fire/Explosion	High
		5.2	<p>Organic peroxides: organic substances that are thermally unstable and may undergo exothermic, self accelerating decomposition. They may:</p> <ul style="list-style-type: none"> <li>Be liable to explosive decomposition</li> <li>Burn rapidly</li> <li>Be sensitive to impact or friction</li> <li>React dangerously with other substances</li> <li>Cause damage to the eyes</li> </ul>	Fire/Explosion	Extreme

Un Class	Hazard	Division	Description	Effects Group	Hazard Level
6	Poisonous (Toxic) Substances	6.1	Poisonous substances: poisonous substances which are liable to cause death or injury, or to harm human health if swallowed, inhaled, or contacted by the skin. This division is divided into three packaging groups (PG).		
		6.1PG(I)	a) Oral toxicity LD <sub>50</sub> (mg/kg): ≤ 1 Dermal toxicity LD <sub>50</sub> (mg/kg): ≤ 10 Inhalation toxicity dust/mist LC <sub>50</sub> (mg/l): ≤ 0.5  b) Oral toxicity LD <sub>50</sub> (mg/kg): > 1 ≤ 5 Dermal toxicity LD <sub>50</sub> (mg/kg): > 10 ≤ 40 Inhalation toxicity dust/mist LC <sub>50</sub> (mg/l): ≤ 0.5	Health	Extreme
		6.1PG(II)	c) Oral toxicity LD <sub>50</sub> (mg/kg): > 5 ≤ 50 Dermal toxicity LD <sub>50</sub> (mg/kg): > 40 ≤ 200 Inhalation toxicity dust/mist LC <sub>50</sub> (mg/l): > 0.5 ≤ 2	Health	Medium
		6.1PG(III)	d) Oral toxicity LD <sub>50</sub> (mg/kg): > 50 ≤ 200 (solids) > 50 ≤ 500 (liquids) Dermal toxicity LD <sub>50</sub> (mg/kg): > 200 ≤ 1000 Inhalation toxicity dust/mist LC <sub>50</sub> (mg/l): > 2 ≤ 10	Health	Low
		6.2	Carcinogen	Health	Low
			Not applicable		
7	Radio-actives		Not applicable		
8	Corrosives		Substances which, by chemical action, can cause severe damage when in contact with living tissue or, in the case of leakage, will materially damage or destroy other materials. Corrosives are divided into three packaging groups (PG).		
		8PG(I)	Very dangerous substances and preparations.	Health	Medium
		8PG(II)	Substances and preparations presenting medium hazard.	Ecological	High
		8PG(III)	Substances and preparations presenting minor hazard.	Health	Medium
				Ecological	High
				Ecological	High

Un Class	Hazard	Division	Description	Effects Group	Hazard Level	
9	Ecotoxic	Group 1	Ecotoxic substances: any substance exhibiting a toxic effect on the ecosystem, based on the toxicity to aquatic life. This division is sub-divided into four categories:			
			a) 96 hr LC <sub>50</sub> salmonid fish (mg/l): < 0.1 48 hr EC <sub>50</sub> daphnia (mg/l): < 0.1 72 hr EC <sub>50</sub> algae (mg/l): < 0.1	Ecological	Extreme	
			b) 96 hr LC <sub>50</sub> salmonid fish (mg/l): ≥ 0.1 < 1.0 48 hr EC <sub>50</sub> daphnia (mg/l): ≥ 0.1 < 1.0 72 hr EC <sub>50</sub> algae (mg/l): ≥ 0.1 < 1.0	Ecological	High	
			c) 96 hr LC <sub>50</sub> salmonid fish (mg/l): ≥ 1.0 < 10.0 48 hr EC <sub>50</sub> daphnia (mg/l): ≥ 1.0 < 10.0 72 hr EC <sub>50</sub> algae (mg/l): ≥ 1.0 < 10.0	Ecological	Medium	
		d) 96 hr LC <sub>50</sub> salmonid fish (mg/l): ≥ 10.0 < 100.0 48 hr EC <sub>50</sub> daphnia (mg/l): ≥ 10.0 < 100.0 72 hr EC <sub>50</sub> algae (mg/l): ≥ 10.0 < 100.0	Ecological	Low		
		Group 2	Environmentally damaging or persistent substances: any substance exhibiting a damaging (other than toxic) effect on the ecosystem. This division is sub-divided into two categories:			
		c) BOD <sub>5</sub> (mg/l): > 10,000	Ecological	Medium		
		d) BOD <sub>5</sub> (mg/l): > 1,000	Ecological	Low		
		Pesticides	Pesticides are deemed to have an extreme hazard level unless data can be provided to demonstrate lesser toxicity.	Ecological	Extreme	
		Corrosives	All corrosives (Class 8, PG 1 - 11) have a high Ecological Effects hazard level.	Ecological	High	

**Table C2**  
**Base Thresholds for all Effect Groups and Hazard Levels**

Fire/Explosion Effect Group					
Un Class	Hazard	Hazard Levels			
		Low	Medium	High	Extreme
Sub-Category: Flammables					
	LPG		LPG		
2	Gases			2.1 (exclude LPG)	
3	Flammable Liquids	Combustible Liquids	3 PGIII	3 PGI 3 PGII	
4	Flammable Solids			4.1	4.2 4.3
5	Oxidisers			5.1	5.2
B (tonnes)		100	30	10	1
B (m <sup>3</sup> )*				10,000	
Sub-Category: Explosives					
1	Explosives		1.3	1.2	1.1
B (tonnes)			3	1	0.1

Health Effect Group					
Un Class	Hazard	Hazard Levels			
		Low	Medium	High	Extreme
2.3	Toxic Gases			2.3(b) - (d)	2.3(a)
6	Poisons	6.1 PGIII	6.1 PGII	6.1 PGI(b)	6.1 PGI(a)
	Carcinogen			Carcinogen	
8	Corrosives		8 PGI 8 PGII		
B (tonnes)		30	10	1	0.1
B (m <sup>3</sup> )*				500	50

Ecological Effect Group					
Un Class	Hazard	Hazard Levels			
		Low	Medium	High	Extreme
3	Flammable Liquids		3C		
8	Corrosives			8 PGI 8 PGII 8 PGIII	
	Ecotoxic	Group 1(d) Group 2(d)	Group 1(c) Group 2(c)	Group 1(b)	Group 1(a)
	Pesticides				Pesticides
B (tonnes)		100	30	3	0.3

**Note:** \* Base Threshold in m<sup>3</sup> at 101.3 kPa and 20°C for permanent or compressed gases.

Table C3 Adjustment Factors for Each Effect Group			
Adjustment Factors For Fire/Explosion Effect Group	Adjustment Factors For Health Effect Group	Adjustment Factors For Ecological Effect Group	
<b>F1: Substance Form</b>	<b>F1: Substance Form</b>	<b>F1: Substance Form</b>	<b>F1: Substance Form</b>
Solid = 1 Liquid, Powder = 1 Gas (at 101.3 kPa and 20°C) = 0.1	Solid = 3 Liquid, Powder = 1 Gas (at 101.3 kPa and 20°C) = 0.1	Solid = 3 Liquid, Powder = 1	Solid = 3 Liquid, Powder = 1
<b>F2: Handling/Storage Conditions</b>	<b>F2: Separation Distance From Site Boundary (For Gases Only)</b>	<b>F2: Environmental Sensitivity</b>	
Stored < flash point = 1 Stored > flash point < boiling point = 0.3 Stored > boiling point = 0.1	≤ 30 metres = 1 > 30 metres = 3	Normal = 1 Proximity to ecological area*1 = 0.3	
<b>F3: Separation Distance From Site Boundary</b>	<b>F3: Proximity to Potable Water Resource</b>	<b>F3: Type of Activity</b>	
≤ 30 metres = 1 > 30 metres = 3	Normal = 1 Proximity to potable water resource*1 = 0.3	Use = 3 Above ground storage = 1 Underground storage*3 = 3	
<b>F4: Type of Activity</b>	<b>F4: Type of Activity</b>		
Use = 0.3 Above ground storage = 1 Underground storage*3 = 10	Use = 0.3 Above ground storage = 1 Underground storage*3 = 10		
<b>F1*F2*F3*F4 = FF</b>	<b>F1*F2*F3*F4 = FH</b>	<b>F1*F2*F3 = FE</b>	

\*1 As identified by the Council

\*2 As identified by the Council

\*3 Applicable to UN Clause 3 Substances (Flammable Liquids) and Combustible Liquids only.



## HFSP Step By Step Guide

The following provides a step by step guide to use of the HFSP. The sequence of steps is shown in Figure C2: HFSP step by step guide. In addition, standard forms provide a check list, and present information in a standard format for use in the HFSP.

### Step 1: Site Specific Information

A Site Information Sheet (refer Attachment C1) is used to describe the site with data from the Form used together with the Substance Data Record Sheet to carry out the HFSP calculation.

### Step 2: Hazardous Substance Inventory

It is necessary to create a full inventory of hazardous substances held on site. Such an inventory should initially comprise the names, quantities and UN Classes.

### Step 3: Select Priority Substances

It is common for several hazardous substances to be held on a single site. It is neither practical or necessary to submit every substance to the HFSP. Where multiple hazardous substances occur on a site:

- if ten or less substances, carry out the HFSP on individual substances
- if more than ten substances, carry out the HFSP on those substances that have an extreme or high effect level, or are held in quantities exceeding 10% of the appropriate Base Threshold.

### Step 4: Substance Specific Information

Substance specific information required is defined on the Hazardous Substance Inventory Sheet (refer Attachment C2). This information forms the basis for determining the level of effects for hazardous substances held. To assist classification of substances into Effect Groups and Levels, refer to the Hazardous Substance Worksheet. (Refer Attachment C3). Information for Sheets is available in material safety data sheets, national and international data bases, and text and reference books.

### Step 5: Identify Effects Groups and Levels

Hazardous substances can be classified into Effect Groups and Levels using Table C1: Classification of Hazardous Substances. The Effect Group and Levels can be recorded on Attachment C4: Summary Sheet for Manual HFSP Calculation.

### Step 6: Find Base Threshold Quantities

The Base Threshold for substances are found in Table C2: Base Thresholds for all Effect Groups and Hazard Levels. Record data on the Summary Sheet for Manual HFSP Calculations (Attachment C4).

### **Step 7: Find Adjustment Factors**

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Pre-calculated Adjustment Factors for each Effect Group are found in Table C3: Adjustment Factors for each Effect Group. Record data on the Summary Sheet for Manual HFSP calculation.

### **Step 8: Calculate Adjusted Threshold Quantities**

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Adjusted Threshold is calculated by multiplying the Base Threshold by the relevant Adjustment Factor. Record data on the Summary Sheet for Manual HFSP calculation.

### **Step 9: Calculate Effects Ratio**

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The Effects Ratio (R) is a dimensionless number. It is obtained by dividing the proposed quantity of a substance (Q) by the Adjusted Threshold (T).

$$R = Q/T$$

Record data on the Summary Sheet for Manual HFSP calculation and Total Effects Ratio: Manual Calculation Sheet: Attachment C5.

The Effects Ratio of hazardous substances will form the basis for determining the Plan status of any particular activity, by reference to the hazardous facility threshold standard for the particular activity or site.

### **Step 10: HFSP Calculations**

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The HFSP calculation of a hazardous substance Effects Ratio is undertaken using the HFSP Evaluation Form (refer Attachment C3). Where several hazardous substances occur on a single site, it will be necessary to sum the individual Effects Ratios.

### **Step 11: Determine Activity Status**

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The Total Effects Ratio determines the Plan status of an activity involving hazardous substances when compared against trigger levels for zones. The Total Effects Ratio is determined by summing the individual ratio for each Effect Group.

The highest Effects Ratio will determine the activities status: whether the activity is permitted, control, discretionary or non complying. Where the activity is not permitted it may be appropriate to review options to reduce the effects. This reduction may be achieved by reducing the number or quantity of substances held on site.

<b>Attachment C1 Site Information Form</b>	
<b>Item</b>	<b>Information</b>
Facility Name	
Address	
Map Reference	
Description of activity	
Nature of adjoining land use	
Proximity to potable water resource <sup>23</sup>	
Within 20 metres of a waterbody <sup>4</sup>	
Map of Site (Show adjoining land uses and location of waterbodies)	

<sup>2</sup> Groundwater reservoir/aquifer as identified by the council

<sup>3</sup> 'Waterbody' includes streams, springs, lakes, wetlands, sea and estuaries, but does not include aquifers and entry points to the stormwater drainage network.

### Attachment C2: Hazardous Substances Inventory Sheet

Facility Name: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_

Substance Name	Substance Form	Con. <sup>3</sup> (%)	Specific Gravity	Proposed Quantity (in known measurements)	Proposed Quantity (converted to tonnes or m <sup>3</sup> ) <sup>4</sup>	UN Class	Storage or Use	Type and Number of Storage Containers <sup>5</sup>	Location of Storage Containers	Distance from Site Boundary (m)

<sup>3</sup> Concentration  
<sup>4</sup> Convert to tonnes for solids, liquids and powders, and to m<sup>3</sup> for gases  
<sup>5</sup> Identify type of container (eg; drums, bulk storage), typical size (eg; 209 litre drum) and number of containers.

<b>Attachment C3: Hazardous Substance Worksheet</b>			
<b>1. Substance Description</b>			
Substance Name			
Proprietary Name and Supplier			
Substance Form (Gas, liquid, solid, powder)			
<b>2. Available Information</b> (Extract from packaging material, MSDS, UN Recommendation for the Transport of Dangerous Goods (8th edition))			
UN Number			
UN Primary Class			
UN Subsidiary Class			
Packaging Group(s)			
<b>3. Additional Information Requirements</b>			<b>Data Source</b>
Physical parameters	Initial boiling point (°C)		
	Flash point (°C)		
	Specific gravity @ (20°C)		
	Molecular weight		
	Vapour pressure (mm Hg at 20°C)		
Toxicity Data <sup>8</sup>	Oral toxicity LD <sub>50</sub> (mg/kg)		
	Dermal Toxicity LD <sub>50</sub> (kg)		
	Inhalation Toxicity LC <sub>50</sub> (ppm)		
	Carcinogen <sup>9</sup> (yes/no)		
Ecotoxicity Data <sup>10</sup>	LC <sub>50</sub> (Salmonid fish) (mg/l)		
	EC <sub>50</sub> (Daphnia) (mg/l)		
	EC <sub>50</sub> (Algae) (mg/l)		
	BOD <sub>5</sub> (mg/kg)		
	Pesticide (yes/no)		
Other			

<sup>8</sup> List lowest level available for human or mammalian species, type of species, test duration and data source.

<sup>9</sup> See Appendix B, Land Use Planning for Hazardous Facilities, June 1995.

<sup>10</sup> For LC50 and EC50 list lowest levels for indicated or other aquatic species, type of species and data source.

4. Assessment (Extract from information in categories 2 and 3)						
Hazard	UN Class	Division/ Packaging Group	Does hazardous property apply? (Yes/No)	Effects Groups and Hazard Level <sup>11</sup>		
				Fire/ Explosion	Health	Ecological
Explosive	1.1 - 1.3					
Flammable Gas	2.1					
Flammable liquid	3					
Flammable solid	4.1 - 4.3					
Oxidiser	5.1 - 5.2					
Toxic Gas	2.3					
Toxic material	6.1					
Corrosive	8					
Ecotoxic						

<sup>11</sup> Use E for extreme hazard level, H for high, M for medium, L for low and OSL if hazard is outside specified levels.

Attachment C4: Summary Sheet for Manual HFSP Calculations											
Substance	Step 4		Step 6	Step 7				Step 8		Step 9	
	Effect Group	Hazard Level		Base Threshold B(t/m <sup>3</sup> )	Adjustment Factors				Adjusted Threshold T (t/m <sup>3</sup> )		Proposed Quantity Q (t/m <sup>3</sup> )
				F1	F2	F3	F4				
1	Fire/Explosion										
	Health										
	Ecological										
2	Fire/Explosion										
	Health										
	Ecological										
3	Fire/Explosion										
	Health										
	Ecological										
4	Fire/Explosion										
	Health										
	Ecological										
5	Fire/Explosion										
	Health										
	Ecological										

**Worksheet 5:  
Total Effects Ratios: Manual Calculation Sheet**

Substance	Fire/Explosion Effects Ratio	Health Effects Ratio	Ecological Effects Ratio
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
<b>Total Effects Ratios</b>			

**Note:** Only fill out those sections applicable to the substance being assessed: for example, non-flammables need not be assessed in the *Fire/Explosion Effects Group*.



Figure C1  
HFSP Conceptual Overview



