

FEAT 2.0

Flash Environmental Assessment Tool

Pocket Guide

COMPACT REFERENCE
FOR FIELD USE

The Flash Environmental Assessment Tool (FEAT) 2.0 Pocket Guide builds upon the FEAT methodology developed by the National Institute for Public Health and the Environment (RIVM) for the United Nations Environment Programme (UN Environment) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA). After piloting the FEAT 2.0 Reference Guide in 2015, it was decided to develop the FEAT 2.0 Pocket Guide as a simplified field reference for disaster response. The development of the FEAT 2.0 Pocket Guide was made possible by technical support of RIVM and the inputs of FEAT practitioners, including experts from Pluriform and Royal HaskoningDHV. The focal point for the FEAT is the UN Environment/OCHA Joint Unit. The FEAT 2.0 Pocket Guide was designed by Romualdo Faura.

Disclaimer

FEAT combines large amounts of scientific insights and data into one simple tool for use in field-based situations. Assumptions are made in the FEAT, some of them approximate. Readers and users of FEAT are responsible for their operations and functions. FEAT outputs will help to prioritize activities of relief and risk management teams, but cannot provide definitive scientific assessments or analysis. For example, FEAT cannot provide exact impact perimeters. Exact results will depend on individual cases and conditions. Users will need to set priorities based on actual field situations, which may differ from those presented in this document.

FEAT is intended as guidance material only, and is not to be regarded as binding international regulation or legislation. FEAT does not reflect nor replace nor supersede national, regional or international legislation, regulations or policies. FEAT data has been derived from recognized scientific databanks of international authorities or institutions in good faith and on basis of information available at the date of publication. Resources include amongst others the European Chemicals Agency, UNECE Industrial Accidents Convention Directives and the US Environmental Protection Agency.

Neither the UN nor any of its agencies or employees make any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the UN or any agency thereof or its contractors or consultants.

UN Environment/OCHA Joint Unit
Palais des Nations
CH-1211 Geneva 10
Email: ochaunep@un.org

FEAT was produced with the support of

National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport
www.rivm.nl/en

February 2017



1. INTRODUCTION AND USER GUIDANCE

The Flash Environmental Assessment Tool (FEAT) Pocket Guide serves disaster workers in the field. It is a compact hands-on reference on how to conduct rapid field assessments, aimed at UNDAC teams, USAR teams, local authorities, disaster management agencies, and environmental specialists already familiar with the concept and use of FEAT. The Pocket Guide uses the same method, information and science as other FEAT tools, adding focus and ease of use by providing predefined estimates of most likely and priority hazards. The Pocket Guide focuses on most likely scenarios, leaving out all other possible impacts and situations. It is most useful in the first few days of a disaster. By identifying priority responses, the FEAT Pocket Guide can help to support initial emergency actions and should be seen as the entry point for more comprehensive expert assessments. The FEAT process can also be used in preparedness and community awareness efforts.

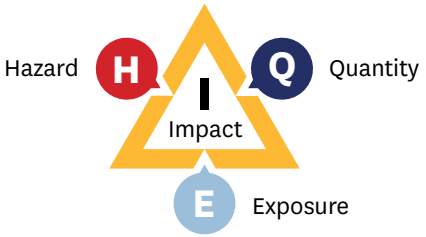
The FEAT Pocket Guide explains the FEAT concept followed by a description of the on-site FEAT assessment process using FEAT. Each assessment step and lookup action is complemented by practical hands-on guidance. The lookup tables needed to perform and report a FEAT assessment are found in the annexes in section 5.

For a complete overview of FEAT, see the FEAT 2.0 Reference Guide. The Reference Guide provides the technical details of FEAT, contains detailed information on applying FEAT for emergency preparedness and response, explains how to use the FEAT KoBo data collection tool, and provides a FEAT Q&A section.

2. FEAT CONCEPT REFRESHED

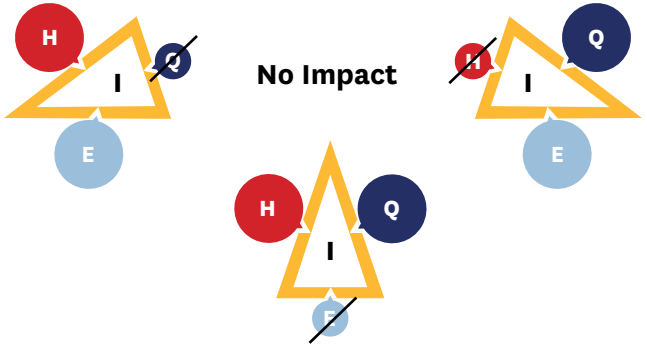
The FEAT Impact triangle forms the basis of the FEAT process. Impact assessments focus on the most likely impact type and the according impact zone (distance).

Impact = significant acute and/or long-term harmful effects on humans and the environment



To establish the **impact** type and zone you need information on the type of **hazard** you are facing, the **quantity** you are dealing with and the type of **human and environmental exposure** present in your actual situation. With estimates of these three impact determining factors, the **Exposure Distance Table** gives an estimate of the distance at which the indicated type of impact occurs.

Remember that there is only a significant impact if ALL three impact factors are present. No exposure OR no relevant quantities OR no relevant hazard results in non-significant impact.



Note! The FEAT works according to the hazard classification system of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). While FEAT is based on GHS, the hazard information contained in FEAT does not follow GHS exactly. Further information on hazard classifications is found in the **GHS Definitions Table**.

3. ON-SITE ASSESSMENT USING THE POCKET GUIDE

3.1 OVERVIEW AND LOGIC OF STEPS AND APPENDICES

A rapid field assessment using the FEAT pocket guide consists of 3 steps:

STEP 1 — **Collect information** on priority hazard, quantity and exposure

STEP 2 — **Look up the actual impact zone** corresponding to the hazard and quantity involved

STEP 3 — **Advise on impact reduction** and mitigation measures

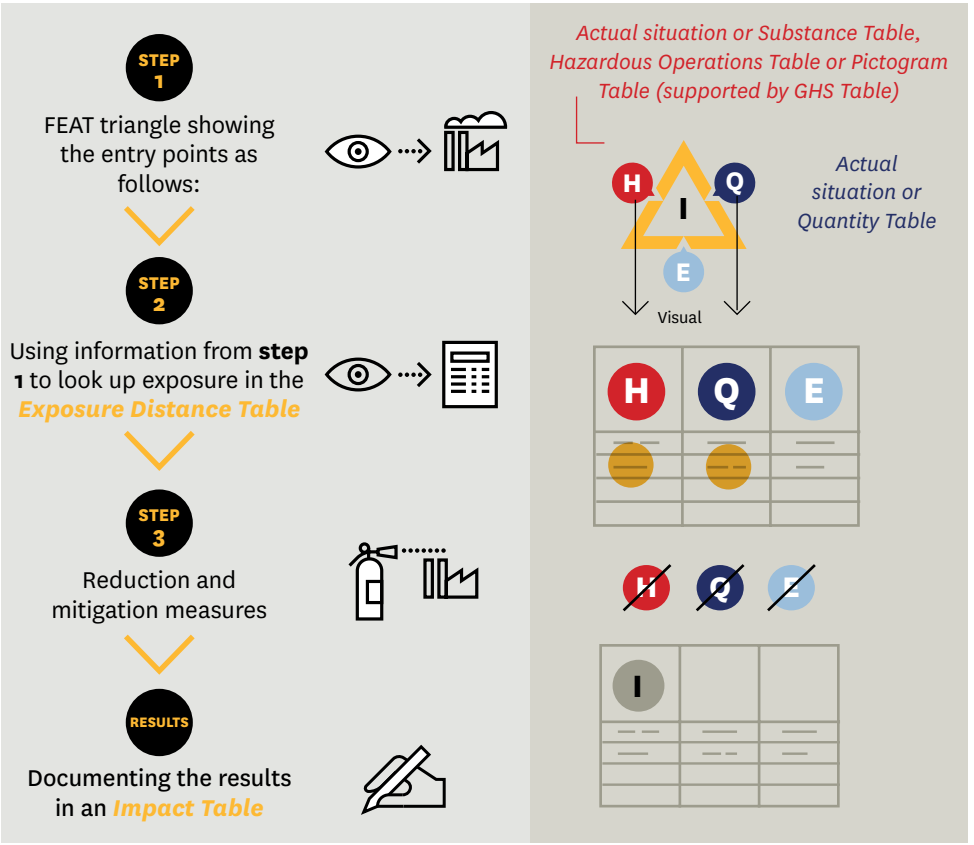


Fig 3.1: Steps of FEAT assessment and supporting annexes

See "*Checklist: Unterstanding Impact*" Table for an understanding of basic hazards and impacts.

RESULTS

Assessment results are captured in the **Impact Table**. The Impact Table supports the assessment process and facilitates standardized reporting. Besides the essential information captured in the Impact Table it is recommended to make notes on ambient air and water temperature, wind force and direction and any other details. These details are highly relevant for experts following up on rapid FEAT assessments with more detailed assessments.

Impact Table

Area/ Location:										
Date/Time:										
Hazard Entry Point operation and/or substance		**Hazard Classification** priority responses	**Physical State** (gas, liquid, solid)	**Quantity** [kg]	**Receptor/s**	**Impact Zone [km]**				
						Human		**Environment**		
Operation Type (and location)	**Substance** (and CAS #)					**Lethal**	**Health**	**Soil**	**Lake**	**River**

Fig 3.2: Impact Table

The FEAT Pocket Guide contains a selection of the most hazardous and common operations and substances presented in the full version of FEAT.

In case you do not find an operation or substance in the Pocket Guide tables you can:

Use informants or information sources to obtain the information needed to lookup the impact distances in the Impact Table based on realistic worst case estimations

In extreme urgent and acute situations, assistance can be requested by contacting OCHA's Emergency Duty Officer:
+41 22 917 1600

Use information available online. Example resources include but are not limited to:
WISER (US)
ECHA Infocards (EU)
CAMEO (US)
Werkblad 14 (NL)

3.2 THE STEPS OF ON-SITE ASSESSMENT EXPLAINED ONE BY ONE

STEP 1

COLLECT INFORMATION ON LIKELY HAZARD, QUANTITY AND EXPOSURE

H The hazard: H

Entry points for determining the most likely hazard are:

The name of the chemical substance involved
Substance Table

The type of operation/facility present
Hazardous Operations Table

The labelling on the containment of a product
Pictogram Table
GHS Definitions

The name of the substance (and its physical state at which it has been released e.g. gas, liquid, solid) is the preferred entrance to define the hazard, because this information is most specific and thus allows for the most accurate assessment of the impact.

Note! All hazards of a substance are listed in the 'Hazard Classification" column. The 'priority' hazards of a substance are predefined expert assumptions of the most likely hazard.

! Practical guidance to using the **Substance Table**

1. **Find your substance** (alphabetic order) in the first column of the table and, if available, confirm the **CAS number**, a unique numerical identifier assigned by Chemical Abstracts Service (CAS) to every chemical substance.

Checklist Priority Hazardous Substances				**Entry point Exposure (FEAT-R)** [default choice by expert opinion]			
				First Priority Response		**Second priority Response**	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State (gas, liquid, solid)**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Acetylene	74-86-2	Flam. Gas 1	**Gas**	Flammable	Flam. Gas 1		
1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	57-14-7	Aquatic Chronic 2, Acute Tox. 3, Carc. 1B, Muta. 2, Skin Corr. 1B, Flam. Liq. 2,	**Liquid**	Flammable	Flam. Liq. 1	Aquatic Chronic	Aquatic Chronic 2
Acrolein [2-Propenal]	107-02-8	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Carc. 2, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Chronic	Aquatic Chronic 1

2. **Enter the corresponding priority hazard classification** in the Impact Table to carry out the impact assessment after estimating the quantity and possibilities of exposure.

Hazard Entry Point		**Hazard Classification**	**Physical State** (gas, liquid, solid)	**Quantity** [kg]	**Receptor/s**	**Impact Zone [km]**				
						Human		**Environment**		
Operation Type	**Substance**					**Lethal**	**Health**	**Soil**	**Lake**	**River**
		Acute Tox. 1								
		Aquatic Chronic 1								

Knowledge of the type of hazardous operation present (👁 Hazardous Operations Table). The entry of hazardous operations provides the hazard based on the most commonly used hazardous substances at the facility.

! Practical guidance to using the **Hazardous Operations Table**

1. **Look up the type of facility** and the type of operation you are dealing with in column 1 and 2.

Hazardous Operation		Hazard			Entry Point Exposure Distance Table (FEAT-R) [*default choice by expert opinion*]	
		Hazardous Substance			First Priority Response	
Facility type	Operation type	Examples of most common hazardous substances at facility	Most common substance	Physical State	GHS hazard	Hazard classification
Agriculture and food production	Aquaculture	Disease control, oil, fertilizers, aquatoxic chemicals, antifoulants	antibiotics (veterinary drugs)	solid	Health hazard	Muta 1B
	Beer production (brewery)	ammonia, solvents, acid, alkalis, neutral detergents, disinfectants, (chlorine compounds), hydrogen peroxide, formaldehyde	ammonia	gas	Toxic gas	Acute Tox. 2
	Food processing (poultry, meat, fish and dairy)	ammonia, solvents, acid, alkalis, neutral detergents, disinfectants, (chlorine compounds), hydrogen peroxide, formaldehyde, hydrogen	ammonia	gas	Toxic gas	Acute Tox. 2

2. **Enter the corresponding priority hazard classification** in the Impact Table and carry out the impact assessment after estimating the quantity and possibilities of exposure.

Hazard Entry Point		Hazard Classification	Physical State (gas, liquid, solid)	Quantity [kg]	Receptor/s	Impact Zone [km]				
						Human		Environment		
Operation Type	Substance					Lethal	Health	Soil	Lake	River
		Muta 1B								

Note! The Hazardous Operations Table provides you with commonly used substances in the listed operations. If you are able to find information on the actual substances used in the operation please switch to the Substance or Pictogram Table since these provide more specific information on the hazard.

Labelling on the containment of products (👁 Pictogram Table). GHS (Globally Harmonized System) hazard labels and pictograms are widely used to indicate the properties (hazard) of a substance during transportation and storage.

! Practical guidance to using the **Pictogram Table**

1. **Match the depicted pictogram** in the first column of the table with the pictogram present on the substance containment. Be aware that there might be different pictograms indicating the same hazard. These refer to old and new labelling systems.

Hazard Pictograms					Priority Hazard
GHS Hazard	GHS Pictogram	Ex. UN Trans. picto	Old Symbols	Hazard Classification	Hazard Classification
Physical hazard					
Explosive				Category 1.1, 1.2, 1.5, Unst. Expl Self react. A, B, C Org. Perox. A, B, C	Ox. Sol. 1
Flammable				Flam. Gas 1, Flam. Liq. 1, 2, Flam. Aerosol 1, Pyr. Liq. 1, Water-react. 1	Flam. Liq. 1

2. **Enter the corresponding priority hazard classification** in the Impact Table and carry out the impact assessment after estimating the quantity and possibilities of exposure.

Hazard Entry Point		Hazard Classification	Physical State (gas, liquid, solid)	Quantity [kg]	Receptor/s	Impact Zone [km]				
						Human		Environment		
Operation Type	Substance					Lethal	Health	Soil	Lake	River
		flam. Liq.1								

3. **If the containment has more than one label attached**, list all the corresponding hazards as starting points of more than one impact assessment of the contained substance.

Note! If one of the tables provides more than one priority hazard as the most likely hazard, use both of the hazards to perform two impact assessments (create two rows in the Impact Table).

Caution! Containers may be improperly marked or labeled.

Q Quantity: Q

Information on quantities is preferably gathered from people with knowledge of the operation or situation. They can also be estimated using the **Quantity Table**, which provides quantities of instantaneous releases and continues release of commonly used modalities of industry, transport and pipelines.

Try to estimate the quantity of released substance rather than the total containment size. In unclear situations a worst case estimation can be used (whole containment).

E Exposure: E

Possible exposure is obtained from informants, field observations (safety first!) or maps containing information on the location of the incident, the location of humans (settlements, cities), rivers, lakes, fishing grounds, resources of drinking water, agricultural areas and irrigation channels. Weather conditions such as temperature, rain, wind speed and wind direction, as well as flow direction of rivers and drainage systems, are of major importance to note and consider.

Common possible exposure pathways and associated receptors are:

Gas	Contact of humans with gaseous substances that disperse though the air.
Liquids	Often directly target the aquatic environment, soil and groundwater. Humans may be indirectly exposed to liquids via drainage systems, groundwater wells or use of contaminated water. During the response firewater potentially disperses the hazardous substances onto the soil, aquatic environment or sewage systems.
Vapour and/ or gas from a liquid	Humans may be exposed to gas that evaporates from volatile liquids.
Solids	Usually pose little exposure although dust and micro-particles may disperse by the wind, solute in water or drift on water.

STEP 2 LOOK UP ACTUAL IMPACT ZONE

The priority hazard, quantity and potential type of exposure are used to estimate the actual impact zone using the Exposure Distance Table.

! Practical guidance to using the **Exposure Distance Table**

1. **Look up the priority hazard classification in the second column**. Find the released or potentially released quantity in the column 'quantity' and look up the corresponding impact distances to be considered for the different types of potential impact (human lethal, human health, environment-soil, environment-lake, environment-river).

Hazard			Quantity	Priority Hazard [expert opinion]				
				Human		Environment		
GHS Hazard	Hazard Classification	Explanation	kg	Lethal	Health	Soil	Lake	River
				km	km	km	km	km
Physical hazard								
Explosive	Category 1.1, 1.2, 1.5, Unst. Expl	Mass explosion, fragments	1,000	**0.2 km**	**0.4 km**			
	Self react. A, B, C	Explosive when heated	10,000	**0.3 km**	**0.7 km**			
	Org. Perox. A, B, C	Explosive when heated	100,000	**0.6 km**	**1.5 km**			
			1,000,000	**1.3 km**	**3.2 km**			
Flammable	Flam. Gas 1	Extremely flammable	1,000,000	**0.2 km**	**0.3 km**			
	Flam. Liq. 1, 2	Flashpoint < 23 °C	10,000,000	**0.4 km**	**0.6 km**			
	Flam. Aerosol 1	Extremely flammable	100,000,000	**1.2 km**	**1.8 km**			

2. **Enter the corresponding priority hazard classification** in the Impact Table and carry out the impact assessment after estimating the quantity and possibilities of exposure.

Hazard Entry Point		Hazard Classification	Physical State (gas, liquid, solid)	Quantity [kg]	Receptor/s	Impact Zone [km]				
						Human		Environment		
Operation Type	Substance					Lethal	Health	Soil	Lake	River
		Category 1.1 explosive		1,000		0.2 km	0.4 km			

Note! Use the **Checklist: Understanding Impact** to establish the links between hazards and exposure (routes and receptors) from the impact assessment after estimating the quantity and possibilities of exposure.

STEP 3 REDUCTION AND MITIGATION MEASURES

Come up with impact **reduction and mitigation measures** and advice.

Communicate your findings and results of the impact assessment with the authority in charge, e.g. local emergency management agencies (LEMA) and look for specialized personal to implement suitable mitigation measures (e.g. fire brigades, hazmat teams and plant managers). If there is a need to improvise on possible mitigation measures, the impact triangle provides guidance on the possibilities.

Your response to reduce impact takes the following order and steps:

A **Protect yourself.** Assess areas from a distance. Stay upwind and uphill. Do not contact substances or containers.

B **Stop the source, minimizing all three impact determining factors at once: hazard, quantity and exposure.** In case of volatile liquids that disperse harmful gasses, stopping the source means absorbing the liquid or covering it with foam to prevent evaporation.

C **Reduce exposure** where the best method depends on the form/consistency of the substance you are dealing with:

GAS	LIQUID	SOLID
In case of a gas it is in most cases not feasible to reduce the spreading/distribution. **Focus should be on removal or protection of the receptors** (humans and large animals). Examples include closing windows, sheltering or evacuating. Sheltering in buildings is not always suitable in earthquake situations when the structural integrity of houses might be compromised. In some cases it is feasible to prevent the distribution by using a water curtain to wash the substance down from the air.	Focus will be on **preventing the dispersion as, in most cases, the receptors are hard to protect** (aquatic environment, soil). Examples include using sand bags, dikes, blocking or redirecting waterways to a less vulnerable area, absorption of liquid using special materials or sawdust.	**Isolate the area and cover in case of dust or small particles**. Consider dispersion by human activities. Use sawdust.

Note! Especially toxic liquids rated as 'aquatic chronic' may result in long term pollution and impact if they disperse into soil and water systems. Rapid response to minimize dispersion will possibly prevent long lasting impacts on livelihood of humans and the environment.

Further Mitigation Actions

Further emergency response guidance can be obtained in the Emergency Response Guidebook (ERG) and from hazardous materials response specialists. For releases of unknown substances, reference ERG Guide Number 111.

Note on scope of impact assessment in the field

The Pocket Guide Tables offer an expert opinion on the most likely priority hazard(s) of a substance, hazardous operation or a hazard label encountered focusing on hazards impacts of most concern. FEAT users should verify the predefined expert opinion with the actual situation in the field. Some notes and guidance:

- In some cases a chemical substance poses more than one type of hazard that needs to be taken into account. Several toxic liquids are hazardous to humans as well as to the aquatic environment. For example, a toxic liquid may flow into a river harming fishing grounds and at the same time enter the drinking water system with subsequent direct human health impacts. FEAT lists both hazards as priority concern, and the user should perform an impact assessment for both hazards.

- The form of the substance is an important factor when establishing priority hazards and possibilities of exposure. FEAT uses the form of a substance under ambient conditions to predefine the hazards. Liquids with high volatility may cause impact due to evaporation. The Exposure Distance Table provides estimates for 'toxic liquids' as toxic impacts on humans due to evaporation (assuming a spill of 1500 m2 or 10.000 m2 depending on the amount of substance). Worst cases for impact distances may be estimated by using the distance indicating the most toxic gas (acute tox 1) with an estimate of the quantity evaporating.

- Substances flammable under ambient conditions often also pose a hazard of vapour cloud explosion in case they're not (properly) contained. FEAT evaluates substances as explosive in case of explosive properties even without containment. Highly flammable substances are not listed as explosive but may explode in certain conditions (heated containment).

- FEAT provides an expert opinion of the most likely priority hazard, but does not include all types of exceptions and specific situations. FEAT users must check the full range of possible hazards present in order to assess possibilities of serious impact caused by substances and situations other than those included in the Pocket Guide.

- Distance–concentration relationships were analysed to determine impacts for the different exposure pathways in standard scenarios. Local lake or river shapes will differ from the standard scenarios. When local conditions differ from the defaults, expert judgement can be used to evaluate the tabulated ranking results, e.g., a water body twice as deep as the standard water body yields a halved impact distance as modified from the lookup table results.Exposure assessment for gases was done assuming a wind speed of 5 m/s (moderate, light breeze; 3 Beaufort; small branches and leaves are moving continuously) and a Pasquill stability class D (neutral conditions). Concentrations for liquids were assessed in relation to various pathways, whereby the lookup tables represent the outcomes for predefined conditions (emission to a standard lake, river and soil, respectively). For a standard lake (depth 1 m, cylindrical shape), a critical impact distance was defined as the lake radius (in m) for which it would hold that the critical concentration for an endpoint would not be passed. For a standard river (depth 1 m, width 50 m), a critical impact distance was defined as the length of the affected river stretch (in m). For soil, the standard scenario was based on the standard lake scenario, and led as if dispersion occurs via a small water layer (2 cm thick) on the earth.

- Although the FEAT Pocket Guide focuses on estimating impacts for first and second priority hazard classifications, if a release is confirmed for a substance with a priority hazard classification, the FEAT process should be completed for all hazard classifications for that substance.

4. EXAMPLE OF ONSITE ASSESSMENT USING THE POCKET GUIDE

Situation: Following an earthquake a small industrial facility producing polymer foams is reported damaged. One of the small installations is leaking **hydrazine** (used as foaming agent in the production process. Hydrazine is a colorless flammable liquid). Part of the installation failed and approximately half of the content was dispersed into the water treatment plant. The discharge of the treatment plant is connected to one of the main rivers of the area, running from the small industrial zone into an agricultural area.
Action: Open a **Impact table** to capture the findings of the assessment

Impact Table

Hazard Entry Point (operation and/or substance)		Hazard Classification priority responses	Physical State (gas, liquid, solid)	Quantity [kg]	Receptor/s	Impact Zone [km]				
						Human		Environment		
Operation Type (and location)	Substance (and CAS #)					Lethal	Health	Soil	Lake	River

EXAMPLE **STEP 1**

Collect information on the hazard

Since the name of the substance involved is known and the substance lookup table is the preferred entry, the **Substance Table** is used to lookup the hazard(s) of **hydrazine**. Refer to figure 4.1 as a visual instruction to find the first priority hazard to be "Carc. 1A" (=causing cancer).

The table shows that **hydrazine** has a second priority hazard which is its acute aquatic toxicity (aquatic acute 1). Note the entry point (**Hydrazine**), physical state and hazard in the Result Table (figure 4.2)

Checklist Priority Hazardous Substances				Entry Point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	CAS Number	Hazard Classification	Physical State (gas, liquid, solid)	GHS Hazard	Hazard Classification	GHS Hazard	Hazard Classification
Furan	110-00-9	Aquatic Chronic 3, Acute Tox. 1, Acute Tox. 4, Carc. 1B, Muta. 2, Skin Irrit. 2, STOT RE 2, Flam. Liq. 1	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Hydrazine	302-01-2	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 2, Acute Tox. 3, Carc. 1A, Carc. 1B, Skin Corr. 1B, Skin Sens. 1, Flam. Liq. 3	**Liquid**	Health hazard	Carc. 1A	Aquatic Acute	Aquatic Acute 1
Hydrochloric acid (conc 37%or greater)	7647-01-0	Acute Tox. 2, Acute Tox. 3, Repr. 1A, Repr. 1B, Resp. Sens. 1, Skin Corr. 1A, Skin Corr. 1B, Skin Corr. 1C, STOT RE 1, STOT RE 2, STOT SE 1, STOT SE 3, Flam. Liq. 2, Liq. Gas, Met. Corr. 1	**Liquid**	Corrosive	Skin Corr. 1A	-	

Fig 4.1: Substance Table

Hazard Entry Point (operation and/or substance)		Hazard Classification (priority responses)	Physical State (gas, liquid, solid)	Quantity [kg]	Receptor/s	Impact Zone [km]				
						Human		Environment		
Operation Type (and location)	Substance (and CAS #)					Lethal	Health	Soil	Lake	River
	Hydrazine	Carc. 1	Liquid							
		Aquatic acute 1								

Fig 4.2: Impact Table

Estimate the quantity

The earthquake made a small installation of the industrial facility fail. It is unknown if the installation was filled up and if all of the substance was dispersed or just part of it. To be on the safe side you assume the installation was full and completely disrupted. Using the **Quantity Table**, the capacity of a small industrial facility is established to be around 10,000 kg. Figure 4.3 provides you a visual instruction on the use of the typical unit sizing table. It was reported that approximately half of the content of the installation dispersed into the treatment plant and potentially the river. About 10,000/2= 5,000 kg of **hydrazine** may impact humans and the environment via water. 5,000 kg is the quantity used in the process to assess the impact.

Modality		Default	
		Instantaneous Release (Typical quantity) [kg]	Continuous Release [kg/s]
INDUSTRY			
	Storage tank – medium	10,000,000	**10**
	Storage tank – small	1,000,000	**1**
	Process installation - large: e.g. vessels	500,000	**10**
	Process installation - small: e.g. flanges	10,000	**1**
TRANSPORT RAIL/ROAD			
	Default: tank truck	25,000	**100**

Fig 4.3: Quantity Table

Define the actual possibilities of exposure

On Google maps you observe that there is a settlement within 2 km downstream of the industrial plant and a river is running next to it. The river leaves the small industrial zone and meanders into agricultural areas and estuaries. Knowing the potential health impact of **hydrazine** (carcinogenic), humans could possibly be impacted by the exposure via usage of the river water (bathing, drinking water, irrigation). The second hazard indicates the potential exposure and impacts to the aquatic environment, including livelihoods (hazards via fishing).

EXAMPLE **STEP 2**

To look up the exposure distances the following results obtained in Step 1 are used:

Hazard	Q [kg]	Receptor
Health; Carc. 1A	**5,000**	**human**
Aquatic acute 1	**5,000**	**Environment; river**

Exposure distance

Any amount of a Carc 1A substance can impact human health and the environment. The Carc 1A health hazard exposure distance is predicted to be >5 km posing a potential impact to humans (health and death) via exposure to contaminated water from the river.
The toxic impact to the aquatic environment is also possible up to more than 10km downstream of the incident.

Fig. 4.4 and 4.5 provide a visual instruction on using the Exposure Distance Table.

a. Acute tox 1

Hazard			Quantity	Priority Hazard [expert opinion]				
				Human		Environment		
GHS Hazard	Hazard Classification	Explanation	Kg	Lethal	Health	Soil	Lake	River
				km	km	km	km	km
Health Hazard	Carc. 1A, 1B Muta. 1A, 1B Repr. 1A, 1B	May cause carcinogenic, mutagenic, repotoxic mutation		> 5 km	> 5 km	> 10 km	> 4.5 km	> 10 km
	Resp. Sens. 1	Induces hypersensitivity of the airways		> 5 km	> 5 km	> 10 km	> 4.5 km	> 10 km
	Asp. Tox. 1	Severe acute effects		> 5 km	> 5 km	> 10 km	> 4.5 km	> 10 km

Fig 4.4: Exposure Distance Table

b. Aquatic acute 1

Hazard			Quantity	Priority Hazard [expert opinion]				
				Human		Environment		
GHS Hazard	Hazard Classification	Explanation	Kg	Lethal	Health	Soil	Lake	River
				km	km	km	km	km
Aquatic acute	Aquatic Acute 1	Causes serious injury to an aquatic organism in short period of time	100			2.8 km (0.1 - 11)	0.4 km (0 - 1.5)	10 km (0 - >10)
			1.000			8.9 km (0.4 - >10)	1.3 km (0.1 - 4.8)	>10 km (0.2 - >10)
			5.000			>10 km (0.8 - >10)	2.8 km (0.1 - 10)	>10 km (0.8 - >10)

Fig 4.5: Exposure Distance Table

EXAMPLE STEP 3

Reduction and mitigation measures

Stop the source

The storage installation is reported to be disrupted to the extent that no significant amount of substance is left. Confirm that the rest of the installation does not hold hydrazine. Also establish whether additional storages or substances are present and confirm that they are intact.

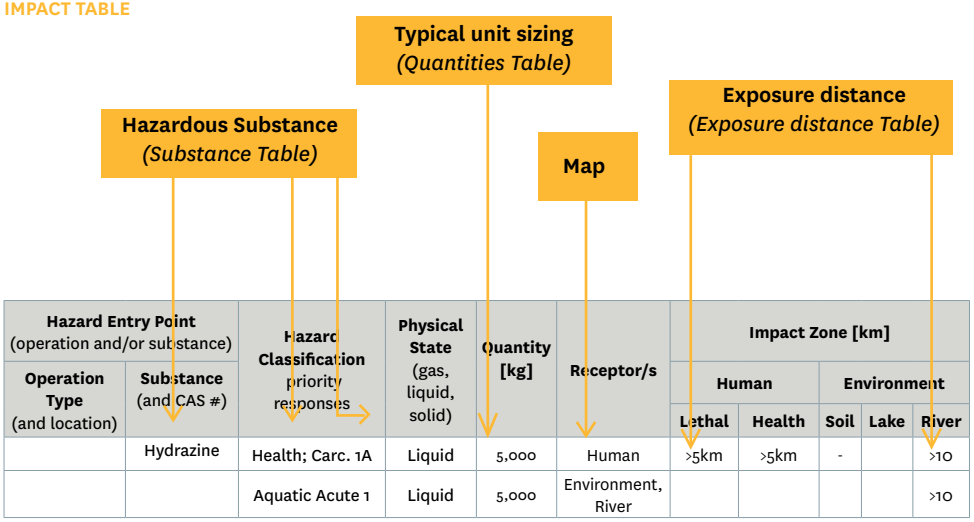
Reduce the impact determining factors where possible, with the focus on reducing exposure.

Although the initial source is stopped it might be possible to stop the dispersion of the substance into the river by closing the outlet of the water treatment plant into the river. If the river has been contaminated, the impact on the aquatic environment can no longer be easily prevented or mitigated. Actual exposure to humans can, however, be prevented by taking measures to prevent the intake of water for drinking and irrigation purposes and by ensuring humans and large animals have no contact with the water.

Communicate your findings to the relevant authorities and stakeholders and establish the need for additional assistance.

Discuss your findings with local stakeholders, assist them in taking measures, and assess whether additional capacity is needed to deal with the impact of the spill. For more information on follow up actions, you may contact the appropriate chemical emergency response center. The Organisation for Economic Co-operation and Development (OECD) International Directory of Emergency Response Centers for Chemical Accidents can be found at http://helid.digicollection.org/en/d/Js13467e/10.html

IMPACT TABLE



Hazard Entry Point (operation and/or substance)		Hazard Classification (priority responses)	Physical State (gas, liquid, solid)	Quantity [kg]	Receptor/s	Impact Zone [km]				
						Human		Environment		
Operation Type (and location)	Substance (and CAS #)					Lethal	Health	Soil	Lake	River
	Hydrazine	Health; Carc. 1A	Liquid	5,000	Human	>5km	>5km	-		>10
		Aquatic Acute 1	Liquid	5,000	Environment, River					>10

Fig 4.6: Impact table including references to sources of results.

5. TABLES

IMPACT TABLE

Area/Location:				**Quantity [kg]**	**Receptor/s**	**Impact zone [km]**				
Date/Time:						**Human**		**Environment**		
						Lethal	**Health**	**Soil**	**Lake**	**River**
Hazard Entry Point (operation and/or substance)		**Hazard Classification** (priority responses)	**Physical State** (gas, liquid, solid)							
Operation Type (and location)	**Substance** (and CAS #)									

The Impact Table is used to capture the findings during an impact assessment systematically and also serves as a format for reporting or handing over information to experts for follow up.

SUBSTANCE TABLE (1/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Acetylene	74-86-2	Flam. Gas 1	**Gas**	Flammable	Flam. Gas 1		
1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	57-14-7	Aquatic Chronic 2, Acute Tox. 3, Carc. 1B, Muta. 2, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Flammable	Flam. Liq. 1	Aquatic Chronic	Aquatic Chronic 2
Acrolein [2-Propenal]	107-02-8	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Carc. 2, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Chronic	Aquatic Chronic 1
Acrylonitrile [2-Propenenitrile]	107-13-1	Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Carc. 1B, Carc. 2, Eye Dam. 1, Repr. 2, Skin Irrit. 2, Skin Sens. 1, STOT SE 3, Flam. Liq. 2	**Liquid**	Health hazard	Carc. 1B	Aquatic Chronic	Aquatic Chronic 2
Acryloyl chloride [2-Propenoyl chloride]	814-68-6	Acute Tox. 1, Skin Corr. 1A, Skin Corr. 1B, Flam. Liq. 2, Met. Corr. 1	**Liquid**	Toxic liquid	Acute Tox. 1		
Allyl alcohol [2-Propen-1-ol]	107-18-6	Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Eye Irrit. 2, Eye Irrit. 2A, Skin Irrit. 2, STOT RE 1, STOT SE 3, Flam. Liq. 2, Flam. Liq. 3	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
Allylamine [2-Propen-l-amine]	107-11-9	Aquatic Chronic 2, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Skin Corr. 1A, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Chronic	Aquatic Chronic 2
Ammonia (anhydrous)	7664-41-7	Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 2	-	
Ammonia (conc 20% or greater)	7664-41-7	Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	**Liquid**	Toxic liquid	Acute Tox. 2	Aquatic Chronic	Aquatic Chronic 2
Ammonium nitrate	6484-52-2	STOT SE 1, Ox. Liq. 1, Ox. Liq. 3, Ox. Sol. 1, Ox. Sol. 2, Ox. Sol. 3	**Solid**	Explosive	Ox. Sol. 1	-	
Arsenic trichloride	7784-34-1	Acute Tox. 2, Carc. 1B, Skin Corr. 1B	**Liquid**	Health hazard	Carc. 1B	-	
Arsenic trihydride	7784-42-1	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 1, Acute Tox. 2, STOT RE 2, STOT SE 1, Flam. Gas 1, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	

SUBSTANCE TABLE (2/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Carbonyl dichloride [Phosgene]	75-44-5	Acute Tox. 1, Acute Tox. 2, Repr. 1A, Skin Corr. 1B, STOT RE 1, STOT RE 2, STOT SE 1, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	
Chlorine	7782-50-5	Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Eye Irrit. 2, Skin Irrit. 2, STOT RE 2, STOT SE 3, Liq. Gas, Ox. Gas 1	**Gas**	Toxic gas	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
Chlorine dioxide [Chlorine oxide (ClO_2)]	10049-04-4	Aquatic Acute 1, Acute Tox. 2, Acute Tox. 3, Skin Corr. 1B, Liq. Gas, Ox. Gas 1	**Gas**	Toxic gas	Acute Tox. 2	-	
Chloroform[Methane, trichloro-]	67-66-3	Aquatic Chronic 3, Acute Tox. 2, Acute Tox. 3, Acute Tox. 4, Carc. 2, Eye Irrit. 2, Muta. 2, Repr. 2, Skin Irrit. 2, STOT RE 1, STOT RE 2	**Gas**	Toxic gas	Acute Tox. 2	-	
Chloromethyl ether [Methane, oxybis[chloro-]	542-88-1	Acute Tox. 2, Acute Tox. 3, Acute Tox. 4, Carc. 1A, Flam. Liq. 2	**Liquid**	Health hazard	Carc. 1A	-	
Chloromethyl methyl ether [Methane, chloromethoxy-]	107-30-2	Acute Tox. 4, Carc. 1A, Flam. Liq. 2	**Liquid**	Health hazard	Carc. 1A	-	
Crotonaldehyde [2-Butenal]	4170-30-3	Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Carc. 2, Eye Dam. 1, Muta. 1B, Muta. 2, Skin Irrit. 2, STOT RE 2, STOT SE 3, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
Crotonaldehyde, (E)-[2-Butenal, (E)-]	123-73-9	Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Eye Dam. 1, Muta. 2, Skin Irrit. 2, STOT RE 2, STOT SE 3, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
Cyanogen chloride	506-77-4	Acute Tox. 1, Acute Tox. 2, Skin Corr. 1A, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	
Cyclohexylamine [Cyclohexanamine]	108-91-8	Aquatic Chronic 3, Acute Tox. 4, Repr. 2, Skin Corr. 1B, Flam. Liq. 2, Flam. Liq. 3, Met. Corr. 1	**Liquid**	Corrosive	Skin Corr. 1B	-	

SUBSTANCE TABLE (3/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
De-icing agents (representative): propane-1,2 diol (propylene glycol)	57-55-6	Aquatic Chronic 2	**Liquid**	Aquatic Chronic	Aquatic Chronic 2	-	-
Diborane	19287-45-7	Acute Tox. 1, Acute Tox. 2, Flam. Gas 1, Liq. Gas, Pres. Gas	**Gas**	Flammable	Flammable Gas 1	-	
Diesel	68334-30-5	Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 2, STOT RE 2, Flam. Liq 3	**Liquid**	Health hazard	Asp. Tox. 1	Aquatic Chronic	Aquatic Chronic 2
Dimethyldichlorosilane [Silane, dichlorodimethyl-]	75-78-5	Eye Irrit. 2, Skin Corr. 1A, Skin Corr. 1B, Skin Irrit. 2, STOT SE 3, Flam. Liq. 2	**Liquid**	Corrosive	Skin Corr. 1A	-	
Dinickel trioxide	1314-06-3	Aquatic Chronic 4, Carc. 1A, Skin Sens. 1, STOT RE 1	**Solid**	Health hazard	Carc. 1A	-	
Epichlorohydrin [Oxirane, (chloromethyl)-]	106-89-8	Aquatic Chronic 3, Acute Tox. 2, Acute Tox. 3, Carc. 1A, Carc. 1B, Repr. 2, Skin Corr. 1B, Skin Sens. 1, Flam. Liq. 3	**Liquid**	Health hazard	Carc. 1A	-	
Ethylene oxide [Oxirane]	75-21-8	Aquatic Chronic 3, Acute Tox. 2, Acute Tox. 3, Carc. 1B, Eye Irrit. 2, Eye Irrit. 2A, Muta. 1B, Skin Irrit. 2, STOT RE 1, STOT SE 3, Flam. Gas 1, Liq. Gas	**Gas**	Health hazard	Carc. 1B	-	
Ethylenediamine [1,2- Ethanediamine]	107-15-3	Aquatic Chronic 3, Acute Tox. 4, Repr. 1A, Resp. Sens. 1, Resp. Sens. 1B, Skin Corr. 1A, Skin Corr. 1B, Skin Sens. 1, STOT RE 2, Flam. Liq. 3, Met. Corr. 1	**Liquid**	Health hazard	Repr. 1A	-	
Ethyleneimine [Aziridine]	151-56-4	Aquatic Chronic 2, Acute Tox. 1, Acute Tox. 2, Carc. 1B, Muta. 1B, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Chronic	Aquatic Chronic 2
Fluorine	7782-41-4	Acute Tox. 1, Acute Tox. 2, Skin Corr. 1A, Liq. Gas, Ox. Gas 1	**Gas**	Toxic gas	Acute Tox. 1	-	
Formaldehyde (solution)	50-00-0	Acute Tox. 2, Acute Tox. 3, Carc. 1A, Carc. 2, Muta. 2, Resp. Sens. 1, Skin Corr. 1B, Skin Corr. 1C, Skin Sens. 1, STOT RE 1, STOT SE 1, STOT SE 2, Flam. Gas 1, Liq. Gas, Met. Corr. 1	**Liquid**	Health hazard	Carc. 1A	-	

SUBSTANCE TABLE (4/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Furan	110-00-9	Aquatic Chronic 3, Acute Tox. 1, Acute Tox. 4, Carc. 1B, Muta. 2, Skin Irrit. 2, STOT RE 2, Flam. Liq. 1	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Gasoline	86290-81-5	Flam.Liq. 2, skin Corr. 2, Muta 1B, Carc. 1B, Repr. 1A, STOT SE 3, STOT RE 1, Asp 1, Aquatic acute 3	**Liquid**	Flammable	Flam.Liq. 2		
Hydrazine	302-01-2	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 2, Acute Tox. 3, Carc. 1A, Carc. 1B, Skin Corr. 1B, Skin Sens. 1, Flam. Liq. 3	**Liquid**	Health hazard	Carc. 1A	Aquatic Acute	Aquatic Acute 1
Hydrochloric acid (conc 37%or greater)	7647-01-0	Acute Tox. 2, Acute Tox. 3, Repr. 1A, Repr. 1B, Resp. Sens. 1, Skin Corr. 1A, Skin Corr. 1B, Skin Corr. 1C, STOT RE 1, STOT RE 2, STOT SE 1, STOT SE 3, Flam. Liq. 2, Liq. Gas, Met. Corr. 1	**Liquid**	Corrosive	Skin Corr. 1A	-	
Hydrocyanic acid [Hydrogen cyanide]	74-90-8	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 1, Acute Tox. 2, STOT RE 1, STOT SE 1, Flam. Liq. 1	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
Hydrogen	1333-74-0	Carc. 1A, Muta. 1B, Resp. Sens. 1, Flam. Gas 1, Liq. Gas, Ox. Gas 1, Ref. Liq. Gas	**Gas**	Flammable	Flammable Gas 1	-	
Hydrogen chloride (anhydrous) [Hydrochloric acid]	7647-01-0	Acute Tox. 2, Acute Tox. 3, Repr. 1A, Repr. 1B, Resp. Sens. 1, Skin Corr. 1A, Skin Corr. 1B, Skin Corr. 1C, STOT RE 1, STOT RE 2, STOT SE 1, STOT SE 3, Flam. Liq. 2, Liq. Gas, Met. Corr. 1	**Gas**	Corrosive	Skin Corr. 1	-	
Hydrogen fluoride (conc 50%or greater) [Hydrofluoric acid]	7664-39-3	Acute Tox. 1, Acute Tox. 2, Skin Corr. 1A, Met. Corr. 1	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Hydrogen selenide	7783-07-5	Acute Tox. 2, Flam. Gas 1, Liq. Gas, Pres. Gas	**Gas**	Flammable	Flam. Gas 1	-	

SUBSTANCE TABLE (5/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Hydrogen sulfide	7783-06-4	Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Flam. Gas 1, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	
Iron, pentacarbonyl [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	13463-40-6	Acute Tox. 1, Acute Tox. 2, STOT RE 1, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Isobutyronitrile [Propanenitrile, 2-methyl-]	78-82-0	Acute Tox. 2, STOT SE 1, STOT SE 2, Flam. Liq. 2	**Liquid**	Health hazard	STOT SE1	-	
Isopropyl chloroformate [Carbonochloridic acid, 1- methylethyl ester]	108-23-6	Acute Tox. 1, Acute Tox. 2, Skin Corr. 1A, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Kerosene	8008-20-6	Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Flam. Liq. 3	**Liquid**	Flammable	Flam. Liq. 3	Aquatic Chronic	Aquatic Chronic 2
Liquefied Petroleum Gas (LPG)	68476-85-7	Flam. Gas 1, Gases under pressure, Compressed gas, Carc. 1B, Muta. 1B	**Gas**	Flammable	Flam.Gas 1		
Methacrylonitrile [2-Propenenitrile, 2-methyl-]	126-98-7	Acute Tox. 2, Acute Tox. 3, Skin Sens. 1, STOT SE 1, Flam. Liq. 2	**Liquid**	Health hazard	STOT SE1	-	
Methane	74-82-8	Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	**Gas**	Flammable	Flam. Gas 1	-	-
Methanol	67-56-1	Acute Tox. 2, Acute Tox. 3, Carc. 2, Repr. 1B, Repr. 2, Skin Corr. 1A, STOT RE 1, STOT RE 2, STOT SE 1, STOT SE 2, Flam. Liq. 2, Ox. Liq. 1	**Liquid**	Health hazard	STOT SE1	-	
Methyl chloride [Methane, chloro-]	74-87-3	Carc. 2, Repr. 2, Skin Corr. 1A, STOT RE 2, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 1, Liq. Gas	**Gas**	Flammable	Flam. Gas 1	-	
Methyl chloroformate [Carbonochloridic acid, methylester]	79-22-1	Acute Tox. 1, Acute Tox. 2, Acute Tox. 4, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Methyl hydrazine [Hydrazine, methyl-]	60-34-4	Aquatic Chronic 2, Acute Tox. 1, Acute Tox. 2, Carc. 1A, Carc. 1B, Carc. 2, Resp. Sens. 1, Skin Corr. 1B, STOT SE 1, Flam. Liq. 2	**Liquid**	Health hazard	Carc. 1A	Aquatic Chronic	Aquatic Chronic 2

SUBSTANCE TABLE (6/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Methyl isocyanate [Methane, isocyanato-]	624-83-9	Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Eye Dam. 1, Repr. 2, Resp. Sens. 1, Skin Irrit. 2, Skin Sens. 1, STOT SE 3, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Methyl mercaptan [Methanethiol]	74-93-1	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 3, Flam. Gas 1, Flam. Liq. 1, Liq. Gas	**Gas**	Flammable	Flam. Gas 1	-	
Methyl thiocyanate [Thiocyanic acid, methyl ester]	556-64-9	Acute Tox. 2, Flam. Liq. 2, Flam. Liq. 3	**Liquid**	Toxic liquid	Acute Tox. 2	-	
Methyltrichlorosilane [Silane, trichloromethyl-]	75-79-6	Eye Irrit. 2, Skin Corr. 1A, Skin Irrit. 2, STOT SE 3, Flam. Liq. 2	**Liquid**	Corrosive	Skin Corr. 1A	-	
Naptha	8030-30-6	Aquatic Chronic 2, Asp. Tox. 1, Carc. 1B, Muta. 1B, Repr. 2, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3	**Liquid**	Health hazard	Carc. 1B	Aquatic Chronic	Aquatic Chronic 2
Nickel carbonyl	13463-39-3	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 2, Carc. 2, Repr. 1B, Flam. Liq. 2	**Liquid**	Health hazard	Repr. 1B	Aquatic Acute	Aquatic Acute 1
Nickel oxide	1313-99-1	Aquatic Chronic 4, Carc. 1A, Carc. 1B, Resp. Sens. 1, Skin Sens. 1, STOT RE 1, STOT RE 2	**Solid**	Health hazard	Carc. 1A	-	
Nickel sulphide	16812-54-7	Aquatic Acute 1, Aquatic Chronic 1, Carc. 1A, Muta. 2, Resp. Sens. 1B, Skin Sens. 1, STOT RE 1, STOT RE 2	**Solid**	Health hazard	Carc. 1A	-	
Nitric acid (conc 80% or greater)	7697-37-2	Acute Tox. 1, Acute Tox. 2, Asp. Tox. 1, Skin Corr. 1A, Skin Corr. 1B, STOT RE 1, STOT SE 1, Met. Corr. 1, Ox. Liq. 1, Ox. Liq. 2, Ox. Liq. 3	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Nitric oxide [Nitrogen oxide (NO)]	10102-43-9	Acute Tox. 1, Acute Tox. 2, Skin Corr. 1B, STOT RE 2, Ox. Gas 1, Pres. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	

SUBSTANCE TABLE (7/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide] (1)	8014-95-7	Acute Tox. 1, Skin Corr. 1A, Met. Corr. 1	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Organosphosphate pesticides (representative): malathion (ISO)	121-75-5	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 1, Acute Tox. 4, Skin Sens. 1	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Chronic	Aquatic Chronic 1
Organosphosphate pesticides (representative): dichlorvos (ISO)	62-73-7	Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Skin Sens. 1	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
Oxygen	7782-44-7	Liq. Gas, Ox. Gas 1, Ref. Liq. Gas	**Gas**	Oxidizing	Ox. Gas 1	-	
Peracetic acid [Ethaneperoxoic acid]	79-21-0	Aquatic Acute 1, Acute Tox. 4, Skin Corr. 1A, Skin Corr. 1B, Flam. Liq. 3, Org. Perox. C, Org. Perox. D	**Liquid**	Explosive	Org. Perox. C	Aquatic Acute	Aquatic Acute 1
Perchloromethyl mercaptan [Methanesulfenyl chloride, trichloro-]	594-42-3	Acute Tox. 1, Skin Corr. 1B, STOT RE 1, STOT SE 1	**Liquid**	Health hazard	STOT SE1	-	
Phosgene [Carbonic dichloride]	75-44-5	Acute Tox. 1, Acute Tox. 2, Repr. 1A, Skin Corr. 1B, STOT RE 1, STOT RE 2, STOT SE 1, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	
Phosphine [Phosphorous trihydride]	7803-51-2	Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Skin Corr. 1B, Flam. Gas 1, Liq. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	
Phosphorus oxychloride [Phosphoryl chloride]	10025-87-3	Acute Tox. 1, Acute Tox. 2, Acute Tox. 4, Skin Corr. 1A, STOT RE 1, Met. Corr. 1	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Phosphorus trichloride	7719-12-2	Acute Tox. 2, Skin Corr. 1A, STOT RE 1, STOT RE 2, STOT SE 1, Water-React. 1	**Liquid**	Reactive with water	Water-React 1	-	
Propionitrile [Propanenitrile]	107-12-0	Acute Tox. 1, Acute Tox. 2, Repr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	-	

SUBSTANCE TABLE (8/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Piperidine	110-89-4	Acute Tox. 3, Skin Corr. 1B, Skin Corr. 1C, Flam. Liq. 2	**Liquid**	Corrosive	Skin Corr. 1B	-	
Potassium nitrate	7757-79-1	Repr. 2, STOT RE 2, STOT SE 2, Ox. Liq. 1, Ox. Liq. 2, Ox. Liq. 3, Ox. Sol. 1, Ox. Sol. 2, Ox. Sol. 3	**Solid**	Oxidizing	Ox. Sol. 1	-	
Propyl chloroformate [Carbonochloridic acid, propylester]	109-61-5	Acute Tox. 2, Acute Tox. 3, Skin Corr. 1B, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 2	-	
Propylene oxide [Oxirane, methyl-]	75-56-9	Aquatic Acute 3, Aquatic Chronic 3, Acute Tox. 4, Carc. 1B, Eye Irrit. 2, Muta. 1B, Skin Irrit. 2, STOT SE 3, Flam. Gas 1, Flam. Liq. 1	**Liquid**	Flammable	Flam. Liq. 1	-	
Propyleneimine [Aziridine, 2-methyl-]	75-55-8	Aquatic Chronic 2, Acute Tox. 1, Acute Tox. 2, Carc. 1B, Eye Dam. 1, Flam. Liq. 2	**Liquid**	Toxic liquid	Acute Tox. 1	Aquatic Chronic	Aquatic Chronic 2
Sulfur dichloride	10545-99-0	Aquatic Acute 1, Skin Corr. 1B, STOT SE 3	**Liquid**	Aquatic Acute	Aquatic Acute 1	Corrosive	Skin Corr. 1B
Sulfur dioxide (anhydrous)	7446-09-5	Acute Tox. 2, Acute Tox. 3, Skin Corr. 1B, STOT RE 1, STOT SE 1, Liq. Gas	**Gas**	Health hazard	STOT SE1	-	
Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	7783-60-0	Acute Tox. 1, Acute Tox. 2, Skin Corr. 1A, Skin Corr. 1B, Liq. Gas, Pres. Gas	**Gas**	Toxic gas	Acute Tox. 1	-	
Sulfur trioxide	7446-11-9	Acute Tox. 1, Acute Tox. 2, Carc. 1B, Skin Corr. 1A, Skin Corr. 1B, Ox. Liq. 1	**Gas**	Toxic gas	Acute Tox. 1	-	
Tetramethyllead [Plumbane, tetramethyl-]	75-74-1	Acute Tox. 1, Acute Tox. 2, Repr. 1A, STOT RE 2, Flam. Liq. 3	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Tetranitromethane [Methane, tetranitro-]	509-14-8	Acute Tox. 1, Carc. 2, Ox. Liq. 1	**Liquid**	Oxidizing	Ox. Liq. 1	-	

SUBSTANCE TABLE (9/9)

Checklist Priority Hazardous Substances				Entry point Exposure (FEAT-R) [default choice by expert opinion]			
				First Priority Response		Second Priority Response	
Hazardous Substance	**CAS Number**	**Hazard Classification**	**Physical State**	**GHS Hazard**	**Hazard Classification**	**GHS Hazard**	**Hazard Classification**
Titaniumtetrachloride [Titaniumchloride (TiCl4) (T-4)-]	7550-45-0	Acute Tox. 2, Skin Corr. 1B, STOT RE 1, STOT SE 1	**Liquid**	Health hazard	STOT SE1	-	
Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-]	584-84-9	Aquatic Chronic 3, Acute Tox. 1, Acute Tox. 2, Carc. 2, Eye Irrit. 2, Eye Irrit. 2A, Resp. Sens. 1, Skin Irrit. 2, Skin Sens. 1, STOT SE 2, STOT SE 3	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-]	91-08-7	Aquatic Chronic 3, Acute Tox. 1, Acute Tox. 2, Carc. 2, Eye Irrit. 2, Muta. 2, Resp. Sens. 1, Skin Irrit. 2, Skin Sens. 1, STOT SE 2, STOT SE 3	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Toluene diisocyanate (unspecified isomer) [Benzene,1,3-diisocyanatomethyl-]	26471-62-5	Aquatic Chronic 3, Acute Tox. 1, Acute Tox. 2, Carc. 2, Eye Irrit. 2, Eye Irrit. 2A, Resp. Sens. 1, Skin Corr. 1B, Skin Irrit. 2, Skin Sens. 1, STOT RE 1, STOT SE 1, STOT SE 3	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Trimethylchlorosilane [Silane, chlorotrime-thyl-]	75-77-4	Acute Tox. 1, Acute Tox. 2, Carc. 2, Skin Corr. 1A, Skin Corr. 1B, Skin Corr. 1C, Flam. Liq. 2, Met. Corr. 1	**Liquid**	Toxic liquid	Acute Tox. 1	-	
Trinickel disulphide	12035-72-2	Aquatic Acute 1, Aquatic Chronic 1, Carc. 1A, Muta. 2, Skin Sens. 1, STOT RE 1	**Solid**	Aquatic Acute	Aquatic Acute 1	-	
Vinyl acetate monomer [Acetic acid ethenyl ester]	108-05-4	Aquatic Chronic 3, Acute Tox. 4, Carc. 2, STOT SE 2, STOT SE 3, Flam. Liq. 2	**Liquid**	Health hazard	Carc. 2	-	

QUANTITY TABLE

Modality	Default
	Instantaneous Release (Typical Quantity) [kg]
INDUSTRY	
Default: large storage tank	100,000,000
Intermediate Bulk Container (IBC)	1,000
Drum	200
Gas bottle	50
Storage hazardous substances (mixed)	20,000
Ship (un)loading	100,000,000
Storage tank– large	100,000,000
Storage tank – medium	10,000,000
Storage tank – small	1,000,000
Process installation - large: e.g. vessels	500,000
Process installation - small: e.g. flanges	10,000
TRANSPORT RAIL/ROAD	
Default: tank truck	25,000
Tank truck (default)	25,000
Instantaneous	25,000
Large leak	5,000
Small leak	1,000
Rail wagon (default)	60,000
Packed unit	10,000
Container (default)	50,000
Container small	25,000
Container large	50,000
Tank container	50,000
Truck (toppled)	20,000
Estimate for airplanes is the quantity of the kerosene refueling tankwagon	50,000

	Unit Conversions
Continuous Release [kg/s]	
	Weight
100	1 kilogram (kg) = 2.2 pounds (lbs)
1	1 pound (lb) = 454 grams (g) = 0.454 kilograms (kg)
1	1 metric tonne = 1,000 kilograms (kg)
1	1 metric tonne = 1.1023 short tons
0.5	1 short ton = 0.907 metric tonnes
100	1 short ton = 2,000 pounds
100	
10	**Distance**
1	1 kilometer (km) = 0.621 miles
10	1 mile = 1.61 kilometers (km)
1	1 meter (m) = 3.281 feet (ft)
	1 meter (m) = 1.094 yards (yd)
100	1 yard (yd) = 0.914 meters (m)
100	1 yard (yd) = 3 feet (ft)
100	1 foot (ft) = 0.305 meters (m)
100	
10	
100	
100	
100	
100	
100	
10	
100	

HAZARDOUS OPERATIONS TABLE (1/6)

Hazardous Operation		Hazard		
		Hazardous Substance		
Facility type	**Operation type**	**Examples of most common hazardous substances at facility**	**Most common substance**	**Physical State**
Agriculture and food production	**Aquaculture**	Disease control, oil, fertilizers, aquatoxic chemicals, antifoulants	antibiotics (veterinary drugs)	solid
	Beer production (brewery)	ammonia, solvents, acid, alkalis, neutral detergents, disinfectants, (chlorine compounds), hydrogen peroxide, formaldehyde	ammonia	gas
	Food processing (poultry, meat, fish and dairy)	ammonia, solvents, acid, alkalis, neutral detergents, disinfectants, (chlorine compounds), hydrogen peroxide, formaldehyde, hydrogen	ammonia	gas
	Livestock and poultry	disinfecting agents, antibiotic and hormonal products, pesticides	carbamate pesticide	solid
	Plantation and annual crop production	pesticides	organo-phosphate	liquid
	Sugar manufacturing	ethanol, organic chemicals	ethanol	liquid
	Vegetable oil processing	acids, alkalis, solvents, hydrogen, (n-)hexane	(n-)hexane	liquid
Chemicals production	**Coal processing**	ammonia, fuel, synthetic gas, liquid hydrocarbons, methanol, coal, gasoline	ammonia	gas
	Fireworks manufacturing and warehousing	ammoniumnitrate and ammonia, oxidizing agents and metal salts	ammonium-nitrate	solid
	Large volume petroleum-based organic chemicals manufacturing	liquefied petroleum gas (LPG), gasoline, kerosene, diesel oil, heating oil, fuel oil, bitumen, asphalt, sulfur, propane/propylene mixtures, naphtha	petroleum	liquid

	Entry Point Exposure Distance Table (FEAT-R) *[default choice by expert opinion]*			
Hazard Classification	**First Priority Response**		**Second Priority Response**	
Abbreviation according to GHS	**GHS Hazard**	**Hazard classification**	**GHS Hazard**	**Hazard classification**
Carc. 1A, Carc. 1B, Carc. 2, Lact., Muta. 1B, Muta. 2, Repr. 1B, Repr. 2, Resp. Sens. 1, STOT RE 1, STOT RE 2, STOT SE 1	Health hazard	Muta 1B		
Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	Toxic gas	Acute Tox. 2		
Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	Toxic gas	Acute Tox. 2		
Aquatic Acute 1, Aquatic Acute 4, Acute Tox. 4, Carc. 2	Aquatic Acute	Aquatic Acute 1		
Acute Tox. 1, Acute Tox. 2, Eye Irrit. 2A, Muta. 2, Repr. 1B, Repr. 2, Skin Corr. 1B, STOT RE 1	Toxic liquid	Acute Tox. 1		
Muta. 1B, Repr. 1A, Repr. 2, Skin Corr. 1B, STOT RE 1, STOT SE 1, Flam. Liq. 2, Met. Corr. 1	Flammable	Flam. Liq. 2		
Aquatic Chronic 2, Asp. Tox.1, Repr. 2, Skin Irrit. 2, STOT RE 1, STOT RE 2, STOT SE 2, STOT SE 3, Flam. Liq. 2	Flammable	Flam. Liq. 2	Aquatic chronic	Aquatic chronic 2
Aquatic Acute 1, Aquatic Chronic 2, Acute Tox.2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam.Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	Toxic gas	Acute Tox. 2		
STOT SE 1, Ox. Liq. 1, Ox. Liq. 3, Ox. Sol. 1, Ox. Sol. 2, Ox. Sol. 3	Explosive	Ox. Sol. 1		
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox.1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam.Liq. 2, Flam. Liq. 3	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2

HAZARDOUS OPERATIONS TABLE (2/6)

Hazardous Operation		Hazard		
		Hazardous Substance		
Facility type	Operation type	Examples of most common hazardous substances at facility	Most common substance	Physical State
Chemicals production	**Large volume compounds manufacturing and coal tar distillation**	acids (nitric, hydrochloric, sulfuric, hydrofluoric, phosphoric acid), chloralkalis (e.g. chlorine, caustic soda, soda ash, etc.), carbon black, and coal tar distillation (naphthalene, phenanthrene, anthracene)	acrylic acid	liquid
	Natural gas processing	natural gas, liquid hydrocarbons, methanol	natural gas	gas
	Nitrogenous fertilizer manufacturing	ammonia (NH_3), urea, nitric acid (HNO_3), ammonium nitrate, ammonium sulfate, urea-ammonium sulfate (UAS), urea ammonium nitrate (UAN) liquid fertilizers	ammonia	gas
	Oleochemicals manufacturing	acids, glycerin, biodiesel	biodiesel	liquid
	Pesticide production and warehousing	insecticides, fungicides, acaricides (or miticides), nematicides and rodenticides	carbamate pesticide	solid
	Petroleum based manufacturing	hydrocarbons, Vinyl Chloride Monomer (VCM), ethylbenzene	ethylbenzene	liquid
	Petroleum refining	petroleum	petroleum	liquid
	Pharmaceutical and biotechnology processing	solvents, acids, mixed chemicals, natural gas, methanol, isopropyl alcohol	medicine	Mixed
	Phosphate fertilizer manufacturing and warehousing	phosphoric acid, single superphosphate (SSP), triple superphosphate (TSP), and compound fertilizers (NPK)	phosphoric acid	liquid

	Entry Point Exposure Distance Table (FEAT-R) [*default choice by expert opinion*]			
Hazard Classification	First Priority Response		Second Priority Response	
Abbreviation according to GHS	GHS hazard	Hazard classification	GHS hazard	Hazard classification
Aquatic Acute 1, Aquatic Acute 4, Aquatic Chronic 2, Acute Tox. 4, Skin Corr. 1A, Skin Corr. 1C, STOT RE 1, STOT SE 1, Flam. Liq. 3	Corrosive	Skin Corr. 1A	Aquatic chronic	Aquatic chronic 2
Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Flammable	Flam. Gas 1	-	
Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	Toxic gas	Acute Tox. 2	-	
Flam. Liq. 2, Acute Tox. 4, Asp. Tox. 1, Carc. 2, Skin Irrit. 2, STOT RE 2, Aquatic Acute 2, Aquatic Chronic 2	Flammable	Flam. Liq. 2	-	
Aquatic Acute 1, Aquatic Acute 4, Acute Tox. 4, Carc. 2	Aquatic Acute	Aquatic Acute 1	-	
Aquatic Acute 4, Aquatic Chronic 3, Acute Tox. 4, Asp. Tox. 1, Asp. Tox. 2, Carc. 2, STOT RE 2, Flam. Liq. 2	Flammable	Flam. Liq. 2	-	
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE 1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 2, Carc. 2, Lact., Repr. 1A, Repr. 1B, Repr. 2, STOT RE 1, STOT RE 2	Health hazard	Repr. 1A	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 3, Skin Corr. 1B, Skin Corr. 1C, Met. Corr. 1	Corrosive	Skin Corr. 1B	-	

HAZARDOUS OPERATIONS TABLE (3/6)

Hazardous Operation		Hazard		
		Hazardous Substance		
Facility type	Operation type	Examples of most common hazardous substances at facility	Most common substance	Physical State
Forestry	Boards and particle based products	resins, formaldehyde, pesticides and fungicides	formalde-hyde	liquid
	Harvesting	fuels and lubricants, pesticides	gasoline	liquid
	Pulp and paper mills	PCDD (poly chlorinated dibenzodioxins) and PCDF (poly chlorinated dibenzofurans) Gas: sulfur dioxide, chlorine, chlorine dioxide, terpenes, oxygen Liquid: sodium hydroxide, sulfuric acid, turpentine, sodium hypochlorite, aqueous solution of chlorine dioxide, hydrogen peroxide, biocides, solvents	chlorine	liquid
	Saw-milling and wood based products	polynuclear aromatic hydrocarbons, pentachlorophenol, compounds of chrome, copper and arsenic toxic, phenols, resins, acids, solvents, pesticides, chromated copper arsenate (CCA), copper oxide and quaternary ammonium (ACQ), copper azole and borates	benzene	liquid
General ma-nufacturing	Base metal melting and refining	acids, alkalis, chemical reagents, process gases (e.g. oxygen, carbon dioxide, argon, nitrogen, chlorine, hydrogen)	nitric acid	liquid
	Cement & lime manufacturing	fuel (coal, cokes, natural gas), acids	natural gas	gas
	Ceramic tile & sanitary ware manufacturing	fuel (coal, cokes, natural gas), acids	natural gas	gas
	Construction materials extraction	fuels, lubricants, explosives, acids	petroleum	liquid
	Foundries	isopropyl alcohol, resins, solvents, organic based coatings	isopropyl alcohol	liquid

	Entry Point Exposure Distance Table (FEAT-R) [*default choice by expert opinion*]			
Hazard Classification	First Priority Response		Second Priority Response	
Abbreviation according to GHS	GHS hazard	Hazard classification	GHS hazard	Hazard classification
Acute Tox. 2, Acute Tox. 3, Carc. 1A, Carc. 2, Muta. 2, Resp. Sens. 1, Skin Corr. 1B, Skin Corr. 1C, Skin Sens. 1, STOT RE 1, STOT SE 1, STOT SE 2, Flam. Gas 1, Liq. Gas, Met. Corr. 1	Health hazard	Carc. 1A	-	
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1B, Muta. 1B, Repr. 2, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Aquatic Acute 1, Aquatic Chronic 2, Aquatic Chronic 3, Skin Corr. 1A, Skin Corr. 1B, STOT SE 1, Met. Corr. 1, Ox. Gas 1	Health hazard	STOT SE 1	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Eye Irrit. 2, Muta. 1B, Skin Irrit. 2, STOT RE 1, Flam. Liq. 2, Pres. Gas	Flammable	Flam. Liq. 2	-	
Acute Tox. 1, Acute Tox. 2, Asp. Tox. 1, Skin Corr. 1A, Skin Corr. 1B, STOT RE 1, STOT SE 1, Met. Corr. 1, Ox. Liq. 1, Ox. Liq. 3	Toxic liquid	Acute Tox. 1	-	
Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Flammable	Flam. Gas 1	-	
Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Flammable	Flam. Gas 1	-	
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE 1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3,	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Eye Irrit. 2, Eye Irrit. 2A, Repr. 2, STOT RE 2, STOT SE 1, STOT SE 3, Flam. Liq. 2	Flammable	Flam. Liq. 2	-	

HAZARDOUS OPERATIONS TABLE (4/6)

Hazardous Operation		Hazard		
		Hazardous Substance		
Facility type	Operation type	Examples of most common hazardous substances at facility	Most common substance	Physical State
General manufacturing	Glass manufacturing	syngas, natural gas, oil, solvents, liquid petroleum products (methanol, naphtha, gasoline, kerosene, diesel fuel)	natural gas	gas
	Integrated steel milling	naphthalene, heavy oil compounds, aromatic hydrocarbons, oxygen, acids, solvents, flammable gas (oxigas), isopropyl alcohol, resins, coal	acetylene	gas
	Metal, plastic, rubber products manufacturing	acids, solvents, pentane, black acrid smoke and carbon monoxide (at rubber fire), acids and alkalis (e.g. hydrochloric, sulfuric, and nitric acids), organics (e.g. ethylene glycol, acetic aldehyde and formaldehyde, straight oils, soluble oils, semi-synthetic fluids, synthetic fluids	isopropyl alcohol	liquid
	Printing	nitric acid, phosphoric acid, solvents, ammonia, ink solvent, lacquers, glues, adhesives, urethane	benzene	liquid
	Semiconductors and electronics manufacturing	gallium arsenide (GaAs), acids, solvents (isopropyl alcohol), developers (e.g., isoparaffinic hydrocarbons), cleaning solutions, cyanide solutions	gallium arsenide	solid
	Tanning and leather finishing	biocides/antiseptics/fungicides, deliming chemicals, solvents, aromatic substances: dyes	chromium (III) salts	solid
	Textiles manufacturing	hydrogen peroxide, sodium hypochlorite, sodium chlorite, sulfur dioxide gas, ammonia, caustic soda, solvents, lubricants, toxic and persistent organic and inorganic textile preservation chemicals (e.g. brominated and chlorinated compounds, dieldrin, arsenic, and mercury)	benzene	liquid
Infrastructure and transport	Drinking water production	sulphate, hypochlorites, sodium dioxide	chlorine	gas

	Entry Point Exposure Distance Table (FEAT-R) [*default choice by expert opinion*]			
Hazard Classification	First Priority Response		Second Priority Response	
Abbreviation according to GHS	GHS hazard	Hazard classification	GHS hazard	Hazard classification
Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Flammable	Flam. Gas 1	-	
Diss. Gas, Flam. Gas 1	Flammable	Flam. Gas 1	-	
Eye Irrit. 2, Eye Irrit. 2A, Repr. 2, STOT RE 2, STOT SE 1, STOT SE 3, Flam. Liq. 2	Flammable	Flam. Liq. 2	-	
Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Eye Irrit. 2, Muta. 1B, Skin Irrit. 2, STOT RE 1, Flam. Liq. 2, Pres. Gas	Flammable	Flam. Liq. 2	-	
Aquatic Chronic 3, Carc. 1A, Carc. 1B, Repr. 1A, STOT RE 1, STOT RE 2	Health hazard	Carc. 1A	-	
Carc. 1B, Carc. 2, Muta. 2, Resp. Sens. 1, STOT RE 2, STOT SE 2, Flam.Sol. 1, Flam.Sol. 2	Health hazard	Carc. 1B	-	
Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Eye Irrit. 2, Muta. 1B, Skin Irrit. 2, STOT RE 1, Flam. Liq. 2, Pres. Gas	Flammable	Flam. Liq. 2	-	
Aquatic Acute 1, Acute Tox. 1, Acute Tox. 2, Acute Tox. 3, Eye Irrit. 2, Skin Irrit. 2, STOT RE 2, STOT SE 3, Liq. Gas, Ox. Gas 1	Toxic Gas	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1

HAZARDOUS OPERATIONS TABLE (5/6)

Hazardous Operation		Hazard		
		Hazardous Substance		
Facility type	Operation type	Examples of most common hazardous substances at facility	Most common substance	Physical State
Infra-structure and transport	Gas distribution	natural gas	natural gas	gas
	Health care operations (incl. hospitals)	ethylene oxide, (compressed) toxic, liquid or gas (in bottles) including compressed and/or liquified Oxygen, laboratory (mixed) chemicals, acids, cleaning agents	ethylene oxide	gas
	Retail petroleum distribution	petroleum, LPG	LPG	gas
	Storage at ports harbours and terminals	flammable liquid	petroleum	liquid
	Storage at airports	jet fuel, diesel, and gasoline, de-icing fluids (e.g. propylene glycol)	kerosene	liquid
	Storage crude oil and petro-leum products	flammable liquid	petroleum (crude oil)	liquid
	Transport by air	dangerous cargo, fuel, de-icing fluids (e.g. propylene glycol)	kerosene	liquid
	Transport by rail	flammable liquid	petroleum	liquid
	Transport by road	flammable liquid	petroleum	liquid
	Transport by water	flammable liquid	petroleum	liquid
	Waste storage and processing	several types of hazardous chemicals, methane storage and contaminants found in industrial sites (e.g. heavy metals)	benzene	liquid

	Entry Point Exposure Distance Table (FEAT-R) [*default choice by expert opinion*]			
Hazard Classification	First Priority Response		Second Priority Response	
Abbreviation according to GHS	GHS hazard	Hazard classification	GHS hazard	Hazard classification
Flam. Gas 1, Liq. Gas, Ref. Liq. Gas,	Flammable	Flam. Gas 1	-	
Aquatic Chronic 3, Acute Tox. 2, Acute Tox. 3, Carc. 1B, Eye Irrit. 2, Eye Irrit. 2A, Muta. 1B, Skin Irrit. 2, STOT RE 1, STOT SE 3, Flam. Gas 1, Liq. Gas	Health hazard	Carc. 1B	-	
Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Gas under pressure	Liq. Gas 1	-	
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE 1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3,	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Flam. Liq. 3	Flammable	Flam. Liq. 3	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 3, Asp. Tox. 1, Flam. Liq. 1	Flammable	Flam. Liq. 1	-	
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Flam. Liq. 3	Flammable	Flam. Liq. 3	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE 1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE 1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 2, Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Muta. 1B, Repr. 2, STOT RE 1, STOT RE 2, Flam. Gas 1, Flam. Liq. 1, Flam. Liq. 2, Flam. Liq. 3	Flammable	Flam. Liq. 1	Aquatic chronic	Aquatic chronic 2
Aquatic Chronic 3, Asp. Tox. 1, Carc. 1A, Carc. 1B, Eye Irrit. 2, Muta. 1B, Skin Irrit. 2, STOT RE 1, Flam. Liq. 2, Pres. Gas	Flammable	Flam. Liq. 2	-	

HAZARDOUS OPERATIONS TABLE (6/6)

Hazardous Operation		Hazard			Entry Point Exposure Distance Table (FEAT-R) [default choice by expert opinion]			
		Hazardous Substance			Hazard Classification	First Priority Response		Second Priority Response	
Facility type	Operation type	Examples of most common hazardous substances at facility	Most common substance	Physical State	Abbreviation according to GHS	GHS hazard	Hazard classification	GHS hazard	Hazard classification
Infrast. and transport	Waste water treatment	flammable liquid, acids, solvents	methanol	liquid	Acute Tox. 2, Acute Tox. 3, Carc. 2, Repr. 1B, Repr. 2, Skin Corr. 1A, STOT RE 1, STOT RE 2, STOT SE 1, STOT SE 2, Flam. Liq. 2, Ox. Liq. 1	Flammable	Flam. Liq. 2	-	
Mining	Mining (non-oil and gas, incl ore processing)	(sodium) cyanide, solvents, (sulphuric and nitric) acid, explosives, sodium hydroxide, hydrogen peroxide, mercury, waste from tailings, chemical or physical treatment of ore	cyanide	liquid	Aquatic Acute 1, Aquatic Chronic 1, Acute Tox. 1, Acute Tox. 2, STOT RE 1, STOT SE 1, Flam. Liq. 1	Toxic liquid	Acute Tox. 1	Aquatic Acute	Aquatic Acute 1
	(Natural) Gas production (incl LNG & LPG)	LPG, LNG, CNG, condensate	LPG	gas	Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Gas under pressure	Liq. Gas 1	-	
	Oil production	liquid hydrocarbons, condensate, drilling fluids, chemicals, Naturally Occurring Radioactive Materials (NORM)	petroleum (crude oil)	liquid	Aquatic Chronic 3, Asp. Tox. 1, Flam. Liq. 1	Flammable	Flam. Liq. 1	-	
Pipelines	Transfer gas by long distance pipeline	natural gas	natural gas	gas	Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Flammable	Flam. Gas 1	-	
	Transfer liquids by long distance pipeline	oil	petroleum (crude oil)	liquid	Aquatic Chronic 3, Asp. Tox. 1, Flam. Liq. 1	Flammable	Flam. Liq. 1	-	
Power	Electric power transmission & distribution	oil and fuel, (oil-based) pesticides (creosote, pentachlorophenol, chromated copper arsenate, PCB's	oil and solvents	liquid	Asp. Tox. 1, Muta. 2, Resp. Sens. 1, STOT RE 1, STOT RE 2, STOT SE 2, Flam. Liq. 3	Flammable	Flam. Liq. 3	-	
	Power generation	coal, cokes, oil, natural gas, liquefied ammonia, chlorine, sodium hypochlorite	ammonia	gas	Aquatic Acute 1, Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Asp. Tox. 1, Skin Corr. 1B, Flam. Gas 1, Flam. Gas 2, Flam. Liq. 3, Liq. Gas	Toxic gas	Acute Tox. 2	-	
	Wind energy, geothermal power generation	flammable gas, oil-based drilling fluids	methane	gas	Flam. Gas 1, Liq. Gas, Ref. Liq. Gas	Flammable	Flam. Gas 1	-	
Transport interfaces	Loading or transfer operations: tanktruck, hopper, intermodal trailer and containers, portable tank	toxic liquid	acrylonitrile	liquid	Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Carc. 1B, Carc. 2, Eye Dam. 1, Repr. 2, Skin Irrit. 2, Skin Sens. 1, STOT SE 3, Flam. Liq. 2	Health hazard	Carc. 1B	Aquatic chronic	Aquatic chronic 2
	Marshalling yard (temporary storage): transfer by intermodal trailer (e.g. tankcontainer)	toxic liquid	acrylonitrile	liquid	Aquatic Chronic 2, Acute Tox. 2, Acute Tox. 3, Carc. 1B, Carc. 2, Eye Dam. 1, Repr. 2, Skin Irrit. 2, Skin Sens. 1, STOT SE 3, Flam. Liq. 2	Health hazard	Carc. 1B	Aquatic chronic	Aquatic chronic 2
Small & medium enterprises	Several types of facilities	Several types of hazardous chemicals	Several types of hazardous chemicals	Mixed	Several types of hazardous chemicals				

PICTOGRAM TABLE (1/2)

Hazard Pictograms			
GHS Hazard	**GHS Pictogram**	**Example UN Transport pictogram**	**Old Symbols**
Physical hazard			
Explosive			
Flammable			
Oxidizing			
Gas under pressure			no classification
Health hazard			
Toxic gas			
Toxic liquid			
Corrosive			

The UN Transport pictograms provided are examples of those that fit the organization of FEAT.
Note: not all of the UN Transport pictograms are provided here.

	Priority Hazard classification [expert opinion]		
Hazard Classification	**Physical State** (gas, liquid, solid)	**Hazard Classification**	**Hazard Description**
Category 1.1, 1.2, 1.5, Unst. Expl Self react. A, B, C Org. Perox. A, B, C	Solid or Liquid	Explosive Category 1.1	Overpressure
Flam. Gas 1 Flam. Liq. 1, 2 Flam. Aerosol 1 Pyr. Liq. 1 Water-react. 1	Liquid	Flam. Liq. 1	Heat radiation
Ox. Gas 1, Ox. Sol. 1 and Ox. Liq. 1	Gas	Ox. Gas 1	Fire propagating
Press. Gas Ref. Liq. Gas	Gas	Gas under pressure	Fragments
Acute Tox. 1, 2, 3 Aquatic Toxic gas	Gas	Acute Tox. 1	Intoxication
Acute Tox. 1, 2, 3	Liquid	Acute Tox. 1	Intoxication
Skin Corr. 1A, 1B, 1C Eye Dam. 1 Skin Sens. 1	Liquid	Skin Corr. 1A	Corrosive

PICTOGRAM TABLE (2/2)

Hazard Pictograms			
GHS Hazard	**GHS Pictogram**	**Example UN Transport pictogram**	**Old Symbols**
Health hazard			
Irritant			
Health Hazard			
Environmental hazard			
Hazardous to the Aquatic Environment			
Reactive with water (No GHS hazard)	No pictogram		
Forms toxic gas in contact with water (No GHS hazard)	No pictogram		

	Priority Hazard classification [expert opinion]		
Hazard Classification	**Physical State** (gas, liquid, solid)	**Hazard Classification**	**Hazard Description**
Acute Tox. 4 Skin Irrit. 2; Eye Irrit. 2 STOT SE 2; STOT RE 2	Gas	Skin Irr. 2	Irritant
Carc. 1A, 1B Muta. 1A, 1B Repr. 1A, 1B Resp. Sens. 1 Asp. Tox. 1 STOT SE 1, STOT RE 1	Gas, Liquid, Solid	Carc. 1A	May cause carcinogenic, mutagenic, repotoxic mutation, induce hypersensitivity of airways, or other severe acute/health effects
Aquatic Chronic 1, 2, 3 Aquatic Acute 1, 2, 3	Liquid	Aquatic Chronic 1	Significant health effects
Reactive with water	Liquid	Reactivity	Reacts violently with water
Forms toxic gas when in contact with water	Liquid	Acute Tox. Gas 1	Formation and release of toxic gas

The UN Transport pictograms provided are examples of those that fit the organization of FEAT.
Note: not all of the UN Transport pictograms are provided here.

EXPOSURE DISTANCE TABLE (1/5)

Hazard			Quantity
GHS Hazard	Hazard Classification	Explanation	kg
Physical hazard			
Explosive	Category 1.1, 1.2, 1.5, Unst. Expl	Mass explosion, fragments	1,000
	Self react. A, B, C	Explosive when heated	10,000
	Org. Perox. A, B, C	Explosive when heated	100,000
			1,000,000
Flammable	Flam. Gas 1	Extremely flammable	1,000,000
	Flam. Liq. 1, 2, 3	Flashpoint < 23 °C	10,000,000
	Flam. Aerosol 1	Extremely flammable	100,000,000
	Pyr. Liq. 1	Ignites < 5 minutes	
	Water-react. 1	Reactive, spontaneous ignition, formation gas	
Oxidizing	Ox. Gas 1	Fire propagating	1,000
	Ox. Liq. 1	Fire propagating	10,000
	Ox. Sol. 1	Explosive solid	100,000
Gas under pressure	Press. Gas	Pressurized, liquified	1,000
	Ref. Liq. Gas (Liq Gas)	Refridgerated, pressurized, liquified	10,000
			50,000

Priority Hazard [expert opinion]				
Human		Environment		
Lethal	Health	Soil	Lake	River
km	km	km	km	km
0.2 km	**0.4 km**			
0.3 km	**0.7 km**			
0.6 km	**1.5 km**			
1.3 km	**3.2 km**			
0.2 km	**0.3 km**			
0.4 km	**0.6 km**			
1.2 km	**1.8 km**			
< 0.1 km	**0 km**			
< 0.1 km	**0 km**			
0.2 km	**0 km**			
< 0.1 km	**< 0.1 km**			
0.2 km	**0.3 km**			
0.4 km	**0.6 km**			

EXPOSURE DISTANCE TABLE (2/5)

Hazard			Quantity
GHS Hazard	Hazard Classification	Explanation	kg
Health hazard			
Toxic gas	Acute Tox. 1	Fatal when inhaled	10,000
			100,000
			1,000,000
			> 1,000,000
	Acute Tox. 2	Fatal/toxic when inhaled	10,000
			100,000
			1,000,000
			> 1,000,000
	Acute Tox. 3	Toxic when inhaled	10,000
			100,000
			1,000,000
			> 1,000,000
Toxic liquid	Acute Tox. 1	Fatal when swallowed	20
			100
			1,000
			5,000
	Acute Tox. 2	Fatal/toxic when swallowed	100
			1,000
			5,000
	Acute Tox. 3	Toxic when swallowed	1,000
			10,000
			50,000

Priority Hazard [expert opinion]				
Human		Environment		
Lethal	Health	Soil	Lake	River
km	km	km	km	km
0.4 km	**2 km**			
0.5 km	**3 km**			
0.8 km	**4 km**			
1.3 km	**5 km**			
< 0.1 km	**0.8 km**			
< 0.1 km	**1 km**			
0.1 km	**2 km**			
0.2 km	**3 km**			
< 0.1 km	**0.5 km**			
0.1 km	**0.7 km**			
0.1 km	**1 km**			
0.2 km	**1.7 km**			
1 km	**> 5 km**	2 km (0.1 - 4.1)	0.3 km (0 - 0.6)	5 km (0 - >10)
1.6 km	**> 5 km**	4.5 km (0.1 - 9.2)	0.6 km (0 - 1.3)	>10 km (0 - >10)
5 km	**> 5 km**	>1 km (0.4 - >10)	2 km (0.1 - 4.1)	>10 km (0.2 - >10)
> 5 km	**> 5 km**	>10 km (0.9 - >10)	4.5 km (0.1 - 9.2)	>10 km (1 - >10)
0.3 km	**2 km**	4.3 km (0.2 - >10)	0.6 km (0 - 2.2)	>10 km (0 - >10)
0.4 km	**3 km**	10 km (0.5 - >10)	1.9 km (0.1 - 6.8)	>10 km (0.3 - >10)
> 5 km	**> 5 km**	10 km (1.2 - >10)	4.3 km (0.2 - >10)	>10 km (1.7 - >10)
0.5 km	**1.5 km**	0.3 km (0.2 - 0.3)	0 km (0 - 0)	0.1 km (0 - 0.1)
0.8 km	**2 km**	0.8 km (0.5 - 0.9)	0.1 km (0.1 - 0.1)	0.8 km (0.4 - 1.1)
5 km	**> 5 km**	1.8 km (1.2 - 2.1)	0.3 km (0.2 - 0.3)	4.1 km (1.8 - 5.6)

EXPOSURE DISTANCE TABLE (3/5)

Hazard			Quantity
GHS Hazard	**Hazard Classification**	**Explanation**	**kg**
Health hazard			
Corrosive	Skin Corr. 1A, 1B, 1C	Corrosive for skin	1,000
	Eye Dam. 1	Eye damaging	10,000
	Skin Sens. 1	Irreversible damage to skin	100,000
Irritant	Acute Tox. 4	Slightly toxic	1,000
	Skin Irrit. 2; Eye Irrit. 2	Irritating	10,000
	STOT SE 2; STOT RE 2	Temporary adverse effect	50,000
Health hazard	Carc. 1A, 1B Muta. 1A, 1B Repr. 1A, 1B	May cause carcinogenic, mutagenic, repotoxic mutation	No threshold. Any quantity has impact potential.
	Resp. Sens. 1	Induces hypersensitivity of the airways	
	Asp. Tox. 1	Severe acute effects	
	STOT SE 1, STOT RE 1	Significant health effects	

Priority Hazard [expert opinion]				
Human		Environment		
Lethal	**Health**	**Soil**	**Lake**	**River**
km	km	km	km	km
contact	**contact**	1.3 km (1 - 1.5)	0.2 km (0.2 - 0.2)	2 km (1.3 - 2.7)
contact	**contact**	4 km (3.3 - 4.6)	0.6 km (0.5 - 0.7)	>10 km
contact	**contact**	>10 km	1.8 km (1.5 - 2.1)	>10 km
< 0.1 km	**0.1 km**	0.1 km (0.1 - 7.3)	0 km (0 - 1)	0 km (0 - >10)
< 0.1 km	**0.2 km**	0.3 km (0.3 - >10)	0 km (0 - 3.3)	0.1 km (0.1 - >10)
< 0.1 km	**0.3 km**	0.7 km (0.6 - >10)	0.1 km (0.1 - 7.3)	0.6 km (0.5 - >10)
> 5 km	**> 5 km**	> 10 km	> 4.5 km	> 10 km
> 5 km	**> 5 km**	> 10 km	> 4.5 km	> 10 km
> 5 km	**> 5 km**	> 10 km	> 4.5 km	> 10 km
> 5 km	**> 5 km**	> 10 km	> 4.5 km	> 10 km

EXPOSURE DISTANCE TABLE (4/5)

Hazard			Quantity
GHS Hazard	Hazard Classification	Explanation	kg
Environmental hazard			
Aquatic chronic	Aquatic Chronic 1	Extremely acute adverse effects to aquatic organisms	1,000
			10,000
			50,000
Aquatic acute	Aquatic Acute 1	Causes serious injury to an aquatic organism in short period of time	100
			1,000
			5,000
Aquatic chronic	Aquatic Chronic 2	Acute adverse effects to aquatic organisms	1,000
			10,000
			50,000
Aquatic acute	Aquatic Acute 2	Causes serious injury to an aquatic organism in short period of time	100
			1,000
			5,000
Aquatic chronic	Aquatic Chronic 3	Reversible adverse effects to aquatic organisms	1,000
			10,000
			50,000
Aquatic acute	Aquatic Acute 3	Causes injury to an aquatic organism in short period of time	100
			1,000
			5,000

Priority Hazard [expert opinion]				
Human		Environment		
Lethal	Health	Soil	Lake	River
km	km	km	km	km
		>10 km (2 - >10)	3.6 km (0.3 - >10)	>10 km
		>10 km (6.3 - >10)	>10 km (0.9 - 10)	>10 km
		>10 km	>10 km (2 - >10)	>10 km
		2.8 km (0.1 - 11)	0.4 km (0 - 1.5)	10 km (0 - >10)
		8.9 km (0.4 - >10)	1.3 km (0.1 - 4.8)	>10 km (0.2 - >10)
		>10 km (0.8 - >10)	2.8 km (0.1 - 10)	>10 km (0.8 - >10)
		1 km (0.6 - >10)	0.1 km (0.1 - 5.8)	1.3 km (0.4 - >10)
		3.3 km (1.8 - >10)	0.5 km (0.3 - >10)	>10 km
		7.3 km (4 - >10)	1 km (0.6 - >10)	>10 km
		0.3 km (0.2 - >10)	0 km (0 - 1.8)	0.1 km (0 - >10)
		1 km (0.0 - >10)	0.1 km (0.1 - 5.8)	1.3 km (0.4 - >10)
		2.3 km (1.2 - >10)	0.3 km (0.2 - >10)	6.7 km (2 - >10)
		0.5 km (0.3 - >10)	0.1 km (0 - 3.3)	0.1 km (0 - >10)
		1.5 km (0.9 - >10)	0.2 km (0.1 - 10)	2.7 km (1.1 - >10)
		3.3 km (2.1 - >10)	0.5 km (0.3 - >10)	>10 km
		0.2 km (0.1 - 1)	0 km (0 - 0.1)	0 km (0 - 1.2)
		0.5 km (0.2 - 3.1)	0.1 km (0 - 0.4)	0.3 km (0 - 12)
		1.1 km (0.4 - 6.8)	0.2 km (0.1 - 1)	1.5 km (0.2 - >10)

EXPOSURE DISTANCE TABLE (5/5)

Hazard			Quantity
GHS Hazard	**Hazard Classification**	**Explanation**	**kg**
Environmental hazard			
Reactive with water (No GHS Hazard)	Water reactive 1, water reactive 2	Reacts violently with water	1,000
			10,000
			50,000
Forms toxic gas when in contact with water (No GHS Hazard)	Aquatic Toxic gas	Formation and release of toxic gas Fatal when inhaled	1,000
			10,000
			50,000

Priority Hazard [expert opinion]				
Human		**Environment**		
Lethal	**Health**	**Soil**	**Lake**	**River**
km	km	km	km	km
		0	0	0
		0	0	0
		0	0	0
Estimate human impact distances using the worst case category of toxic gas; acute toxic 1		1.3 km (0.2 - >10)	0.2 km (0 - 2.2)	2 km (0 - >10)
		4 km (0.5 - >10)	0.6 km (0.1 - 6.8)	>10 km (0.3 - >10)
		8.9 km (1.2 - >10)	1.3 km (0.2 - >10)	>10 km (1.7 - >10)

CHECKLIST: UNDERSTANDING IMPACT

Hazard	Exposure									
	Pathway				Receptor					
GHS Hazard	Air	Soil, Groundwater	Lake	River	Human	Fishing Area	Soil, Groundwater	Agricultural Area	Nature Reserve	(Critical) Infrastructure
Physical hazard										
Explosive	X				X					X
Flammable	X				X					X
Oxidizing	X				X					X
Gases under pressure	X				X					X
Health hazard										
Toxic gas	X				X				X	
Toxic liquid (volatile)	X	X	X	X	X	X	X	X	X	
Toxic liquid (not volatile)		X	X	X		X	X	X	X	
Corrosive	X				X					X
Irritant	X				X					
Health hazard	X	X	X	X	X	X	X	X	X	
Environmental hazard										
Hazards for aquatic environment		X	X	X		X	X	X	X	

Note: Volatile liquids produce hazardous vapors which can affect human health by air exposure. Assume a toxic liquid is volatile if unsure.

DEFINITIONS OF GHS HAZARD CLASSIFICATIONS (1/4)

GHS Hazard	Hazard Classification	Definition
Physical hazard		
Explosive	**Expl. 1.1**	An explosive is a reactive substance that contains a great amount of potential energy that can produce an explosion if released suddenly, usually accompanied by the production of light, heat, sound, and pressure. Pyrotechnic substances are included even when they do not evolve gases. A pyrotechnic substance (or mixture) is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative, self-sustaining, exothermic chemical reactions.
	Expl. 1.2	
	Expl. 1.3	
	Expl. 1.4	
	Expl. 1.5	
	Expl. 1.6	
	Unst. Expl	
Flammable gas	**Flam. Gas 1**	Flammable gas means a gas having a flammable range in air at 20°C and a standard (ambient) pressure of 101.3 kPa. Substances and mixtures of this hazard class are assigned in two hazard categories.
	Flam. Gas 2	
Flammable aerosol	**Flam. Aerosol 1**	An aerosol is a colloid of fine solid particles or liquid droplets, in air or another gas. An aerosol often is a compressed gas, liquefied or dissolved under pressure within a non-refillable container made of metal, glass or plastic, with or without a liquid, paste or powder. The container is fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid or gaseous state. Aerosols should be considered for classification as either a Category 1 or Category 2 Flammable Aerosol if they contain any component classified as flammable according to the GHS criteria for flammable liquids, flammable gases, or flammable solids.
	Flam. Aerosol 2	
Oxidizing gas	**Ox. Gas 1**	An oxidizing gas is any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. Substances and mixtures of this hazard class are assigned to a single hazard category on the basis that, generally by providing oxygen, they cause or contribute to the combustion of other material more than air does.

GHS Hazard	Hazard Classification	Definition
Physical hazard		
Gas under pressure	**Press. Gas**	A gas under pressure is a gas contained in a containment at a pressure not less than 200 kPa at 20°C or as a refrigerated liquid. This endpoint covers four types of gases or gaseous mixtures to address the effects of sudden release of pressure or freezing which may lead to serious damage to people, property, or the environment independent of other hazards the gases may pose.
	Ref. Liq. Gas	
Flammable liquid	**Flam. Liq. 1**	A flammable liquid means a liquid having a flash point of not more than 93°C. Substances and mixtures of this hazard class are assigned to one of four hazard categories on the basis of the flash point and boiling point.
	Flam. Liq. 2	
	Flam. Liq. 3	
	Flam. Liq. 4	
Flammable solid	**Flam. Sol. 1**	A flammable is readily combustible, or may cause or contribute to fire through friction. Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.
	Flam. Sol. 2	
Self-reactive substance	**Self-react. A**	A self-reactive substance is an unstable liquid or solid liable to undergo a strong reaction (such as exothermic thermal decomposition), even without participation of oxygen (air). This definition excludes materials classified under the GHS as explosive, organic peroxides or as oxidizing. These materials may have similar properties, but such hazards are addressed in their specific endpoints.
	Self-react. B	
	Self-react. C	
	Self-react. D	
	Self-react. E	
	Self-react. F	
	Self-react. G	
Self-heating substance	**Self-heat. 1**	A self-heating substance is a solid or liquid, other than a pyrophoric substance, which, by reaction with air and without energy supply, is liable to self-heat. This endpoint differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days). Substances and mixtures of this hazard class are assigned to one of two hazard categories.
	Self-heat. 2	

DEFINITIONS OF GHS HAZARD CLASSIFICATIONS (2/4)

GHS Hazard	Hazard Classification	Definition
Physical hazard		
Oxidizing liquid	**Ox. Liq. 1**	An oxidizing liquid is a liquid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material. Substances and mixtures of this hazard class are assigned to one of three hazard categories.
	Ox. Liq. 2	
	Ox. Liq. 3	
Oxidizing solid	**Ox. Sol. 1**	An oxidizing solid is a solid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material. Substances and mixtures of this hazard class are assigned to one of three hazard categories.
	Ox. Sol. 2	
	Ox. Sol. 3	
Organic peroxide	**Org. Perox. A**	An organic peroxide can cause fire and explosion. An organic peroxide may also be toxic or corrosive. Depending on the material, route of exposure (inhalation, eye or skin contact, or swallowing) and dose or amount of exposure, they could harm the body. Corrosive organic peroxides can also attack and destroy metals. Organic peroxides are available as solids (usually fine powders), liquids or pastes.
	Org. Perox. B	
	Org. Perox. C	
	Org. Perox. D	
	Org. Perox. E	
	Org. Perox. F	
	Org. Perox. G	
Substance corrosive to metal	**Met. Corr. 1**	A substance is termed 'corrosive to metal' if it can - by oxidation or dissolution - attack metals. These substances or mixtures are classified in a single hazard category.

GHS Hazard	Hazard Classification	Definition
Health Hazard		
Acute Toxic	**Acute Tox. 1**	Five GHS categories have been included in the GHS Acute Toxicity scheme from which the appropriate elements relevant to transport, consumer, worker and environment protection can be selected.
	Acute Tox. 2	
	Acute Tox. 3	
	Acute Tox. 4	
	Acute Tox. 5	
Skin Corrosion Skin Irritation	**Skin Corr. 1A**	Skin corrosion means the production of irreversible damage to the skin following the application of a test substance for up to 4 hours. Substances and mixtures in this hazard class are assigned to a single harmonized corrosion category. Skin irritation means the production of reversible damage to the skin following the application of a test substance for up to 4 hours. Substances and mixtures in this hazard class are assigned to a single irritant category. For those authorities, such as pesticide regulators, wanting more than one designation for skin irritation, an additional mild irritant category is provided.
	Skin Corr. 1B	
	Skin Corr. 1C	
	Skin Irrit. 2	
	Skin Mild Irrit. 3	
Serious Eye Damage	**Eye Dam. 1**	Serious eye damage means the production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the front surface of the eye, which is not fully reversible within 21 days of application. Substances and mixtures in this hazard class are assigned to a single harmonized category. Eye irritation means changes in the eye following the application of a test substance to the front surface of the eye, which are fully reversible within 21 days of application. Substances and mixtures in this hazard class are assigned to a single harmonized hazard category. For authorities, such as pesticide regulators, wanting more than one designation for eye irritation, one of two subcategories can be selected, depending on whether the effects are reversible in 21 or 7 days.
Eye Irritation	**Eye Irrit. 2**	
	Eye Irrit. 2A	
	Eye Irrit. 2B	

DEFINITIONS OF GHS HAZARD CLASSIFICATIONS (3/4)

GHS Hazard	Hazard Classification	Definition
Health Hazard		
Respiratory Sensitization	**Resp. Sens. 1**	Respiratory sensitizer means a substance that induces hypersensitivity of the airways following inhalation of the substance. Substances and mixtures in this hazard class are assigned to one hazard category.
	Resp. Sens. 1A	
	Resp. Sens. 1B	
Skin Sensitization	**Skin Sens. 1**	Skin sensitizer means a substance that will induce an allergic response following skin contact. The definition for "skin sensitizer" is equivalent to "contact sensitizer". Substances and mixtures in this hazard class are assigned to one hazard category. Consideration should be given to classifying substances which cause immunological contact urticaria (an allergic disorder) as contact sensitizers.
	Skin Sens. 2	
	Skin Sens. 3	
Germ Cell Mutagenicity	**Muta. 1A**	Mutagen means an agent giving rise to an increased occurrence of mutations in populations of cells and/or organisms. Substances and mixtures in this hazard class are assigned to one of two hazard categories.
	Muta. 1B	
	Muta. 2	
Carcinogenicity	**Carc. 1A**	Carcinogen means a chemical substance or a mixture of chemical substances which induce cancer or increase its incidence. Substances and mixtures in this hazard class are assigned to one of two hazard categories.
	Carc. 1B	
	Carc. 2	
Reproductive Toxicology	**Repr. 1A**	Reproductive toxicity includes adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in offspring. Substances and mixtures with reproductive and/or developmental effects are assigned to one of two hazard categories, 'known or presumed' and 'suspected'.
	Repr. 1B	
	Repr. 2	
	Lact.	

GHS Hazard	Hazard Classification	Definition
Health Hazard		
System Target Organ Toxicity Single Exposure	**STOT SE 1**	The GHS distinguishes between single and repeat exposure for Target Organ Effects. Some existing systems distinguish between single and repeat exposure for these effects and some do not. All significant health effects, not otherwise specifically included in the GHS, that can impair function, both reversible and irreversible, immediate and/or delayed are included in the non-lethal Systemic Target Organ Toxicity class (STOT). Narcotic effects and respiratory tract irritation are considered to be target organ systemic effects following a single exposure.
	STOT SE 2	
	STOT SE 3	
System Target Organ Toxicity Repeated Exposure	**STOT RE 1**	
	STOT RE 2	
Aspiration Toxicity	**Asp. Tox. 1**	Aspiration toxicity includes severe acute effects such as chemical pneumonia, varying degrees of pulmonary injury or death following aspiration. Aspiration is the entry of a liquid or solid directly through the oral or nasal cavity, or indirectly from vomiting, into the trachea and lower respiratory system.
	Asp. Tox. 2	

DEFINITIONS OF GHS HAZARD CLASSIFICATIONS (4/4)

GHS Hazard	Hazard Classification	Definition
Environmental Hazard		
Hazardous to the aquatic environment: Acute aquatic toxicity	**Aquatic Acute 1**	Acute aquatic toxicity means the intrinsic property of a material to cause injury to an aquatic organism in a short-term exposure. Substances and mixtures of this hazard class are assigned to one of three toxicity categories.
	Aquatic Acute 2	
	Aquatic Acute 3	
Hazardous to the aquatic environment: Chronic aquatic toxicity	**Aquatic Chronic 1**	Chronic aquatic toxicity means the potential or actual properties of a material to cause adverse effects to aquatic organisms during exposures that are determined in relation to the lifecycle of the organism. Substances and mixtures in this hazard class are assigned to one of four toxicity categories on the basis of acute data and environmental fate data.
	Aquatic Chronic 2	
	Aquatic Chronic 3	
	Aquatic Chronic 4	
Reactive with water (no GHS Hazard)	**Water Reactive 1,2**	Substances and mixtures which react violently with water, such as acetyl chloride, titanium tetrachloride.
Forms toxic gas when in contact with water (no GHS Hazard)	**Aquatic Toxic gas**	Substances and mixtures which in contact with water liberate toxic gas (substances and mixtures which in contact with water or damp air evolve gases classified for acute toxicity in category 1, 2 or 3, such as aluminium phosphide or phosphorus pentasulphide).



UN environment

OCHA