AVON AND SOMERSET LOCAL RESILIENCE FORUM
INDIVIDUAL RISK ASSESSMENT (V2.0)

Avon and Somerset Local Resilience Forum Risk Assessment Working Group

Individual Risk Assessment Lead Agency:

Avon Fire & Rescue Service

Hazard / threat category:	**Sub-category:**
Industrial accidents and environmental pollution	Industrial explosions and major fires
Hazard and threat description, including scale:	**Risk reference no.:**
Industrial explosion and major fire: a) HL7 – up to 1km around site causing up to 20 casualties, some of a serious nature. Explosions would cause primarily crush / cuts and bruise-type injuries, as well as burns; b) L11 – effects confined to the site of the incident (and immediately surroundings) with few or no injuries.	IA/18
Date of revision:	**Next review date:**
January 2008	January 2009

1. Overview of hazard or threat

Hazards from such sites include fire/explosion and environmental pollution. Consequences may range from minor incidents dealt with in the routine activities of the emergency services and other supporting responding agencies to a large-scale incident requiring evacuation of large numbers of the general public and the combined resources of all responding agencies to deal with the incident and the threat of significant environmental damage.

Industrial explosions may be generated from a range of ignition sources and include gases or dusts. Overpressures generated by such explosions may significantly damage plant and equipment and lead to fires, releases of other materials such as stored toxic substances or cause secondary impacts leading to damage to remote industrial facilities some distance away.

Fires may involve a range of industrial premises and include the direct damage to buildings from the fire itself, the involvement of toxic materials giving rise to public health concerns and large-scale firefighting efforts leading to possible environmental concerns from the water run-off.

2. Key historical evidence

Flixborough Explosion, near Scunthorpe, Lincolnshire, 1 June 1974

On 1 June 1974 there was an explosion at the Nypro chemical plant at Flixborough. The plant, owned by the Dutch State Mines and the UK National Coal Board, was engaged in the production of nylon. The process involved oxidising cyclohexane with a mixture of air. Six reactors, each holding about 20 tonnes were involved in the process but one of the reactors, No. 5, developed a crack and was removed for repair. In order to continue with production, a temporary pipe was manufactured to link reactor four with reactor six. The temporary pipe held for two months but, at 17:00hrs. on a Saturday afternoon, it gave way and there was a massive explosion. Twenty nine people in the plant were killed and 40 were injured.

The explosion caused significant structural damage to properties in a wide area and environmental damage was caused to hundreds of acres of surrounding countryside. Following the incident, firefighting water lay in lagoons in the surrounding fields and was later found to be seriously contaminated with toxic chemical waste. Much of this liquid was later drained into the River Trent, only 90m from the plant: this led to serious pollution and threatened local wildlife.

Reference: Russell, H. (1998) *Fire Disasters – The Truth Behind the Tragedies*. pp 1-128. London: Brown Partworks Ltd. ISBN 0-86288-159-5.

Allied Colloids Ltd., Low Moor, Bradford, 21 July 1992

Thirty nine firefighters, one police officer and two civilians were injured at a chemical explosion and fire at Allied Colloids which made 1,100 specialised chemicals for use in agriculture and industry. Fire spread throughout the warehouse and smoke was blown towards nearby motorways. The fire was contained that day and the fire brigade was not stood down until 18 days later due to the risk of re-ignition during clean up. Considerable environmental damage to the Aire and Calder rivers resulted from the contaminated firewater run off causing large-scale effect in the local aquatic ecosystems.

Reference: Health and Safety Executive (1993) *The fire at Allied Colloids Limited. A report of the HSE's investigation into the fire at Allied Colloids Ltd., Low Moor, Bradford on 21 July 1992*. ISBN 0-71-760-707-0.

Hickson and Welch, Castleford, 21 September 1992

Five people died and 150 were injured as a result of a chemical factory explosion in Castleford. Large volumes of smoke from a burning office block led to people living nearby being warned to stay indoors.

GATX Terminals Ltd., Avonmouth, 4 August 1994

A serious fire followed the release and ignition of an atomised fuel vapour from a pipeline flange at a petrol storage depot in the Royal Edward Dock, Avonmouth. One worker died in the incident and subsequent firefighting operations involved 400 firefighters, 22 supervisory officers, 5,500 litres of foam compound and 4,000 tonnes of water in the production of foam, firefighting and cooling. Sixty firefighters were treated at the scene by ambulance crews and a hospital mobile medical team for the effects of skin irritation from various chemicals which contaminated the firefighting water run-off, with 38 subsequently being transported to hospital for further medical checks. The incident required the attendance of the (then) National Rivers Authority to counter possible environmental pollution to the River Severn and lasted 55 hours.

Reference: Avon Fire Brigade (1994) *Report for HM Coroner – Incident – GATX Terminals Ltd., Royal Edward Docks, Avonmouth, Bristol BS11 9BT*. pp 1-11 plus appendices. Bristol: Avon Fire Brigade.

In general, any typical shire (ie non-metropolitan) Fire and Rescue Service may expect to attend particularly large industrial fires (eg 10 pumps or more – plus special appliances – required to deal with the incident) every 2-4 years.

3. Likelihood

Hazard	Outcome description	Likelihood
Industrial explosion and major fire	Up to 1km around site causing up to 20 casualties, some of a serious nature. Explosions would cause primarily crush / cuts and bruise-type injuries, as well as burns.	Rare (2) (National assessment – Health and Safety Executive)
Industrial explosion and major fire	Effects confined to the site of the incident (and immediately surroundings) with few or no injuries.	Possible (4)

4. Impact

Summary

Hazard	Outcome description	Impact	
Industrial explosion and major fire	Up to 1km around site causing up to 20 casualties, some of a serious nature. Explosions would cause primarily crush / cuts and bruise-type injuries, as well as burns.	Health:	Moderate (3)
		Social:	Moderate (3)
		Economic:	Significant (4)
		Environment:	Catastrophic (5)
		Overall:	**Significant (4)**
Industrial explosion and major fire	Effects confined to the site of the incident (and immediately surroundings) with few or no injuries.	Health:	Minor (2)
		Social:	Moderate (3)
		Economic:	Moderate (3)
		Environment:	Moderate (3)
		Overall:	**Moderate (3)**

Details

Impacts associated with fire/explosion:

Primary:

Physical harm and injury: burns, smoke inhalation, hearing damage (varying degrees of severity, including death).
Damage to property.
Disruption to routine supply chains.
Evacuation and temporary accommodation needs.
Environmental pollution from products of combustion or escaping unburned product (eg airborne, aquatic, ground water).
Environmental pollution from firefighting operations (eg foam, firefighting water run-off).

Secondary:

Loss of economic income.
Safety assessments, possible demolition of damaged buildings and structures.
Environmental remediation and clean-up.
Temporary impact on transport infrastructure (eg road closures or restrictions on use of railways as safety precautions).
Need for public information.
Reduced availability of fire and rescue resources for routine emergency cover.

5. Vulnerability and resilience

There are a large number of industrial premises ranging from the very small to the very large across the Avon and Somerset Local Resilience Forum area.

Industrial premises may be protected from fire and explosion through a variety of methods, including: (a) passive fire protection methods used in the building construction; (b) active fire protection systems such as remotely monitored automatic fire detection and alarm systems and sprinkler systems; (c) regular security inspections; (d) good housekeeping and premises management; (e) explosion venting to prevent the generation of damaging overpressures; (f) fire safety inspections (both by the company and the Fire and Rescue Service) to reduce likelihood; and (g) s.7(2)(d) risk inspections under the Fire and Rescue Services Act 2004 to reduce impact.

6. Overall assessment

Category:	**Sub-category:**		
Industrial accidents and environmental pollution	Industrial explosions and major fires		
Outcome description	**Impact**	**Likelihood**	**Risk**
Up to 1km around site causing up to 20 casualties, some of a serious nature. Explosions would cause primarily crush / cuts and bruise-type injuries, as well as burns.	Significant (4)	Rare (2)	**HIGH**
Effects confined to the site of the incident (and immediately surroundings) with few or no injuries.	Moderate (3)	Possible (4)	**HIGH**

Controls in place:

- Legislation: Control of Major Accident Hazards (COMAH) Regulations 1999; Regulatory Reform (Fire Safety) Order 2005; Fire and Rescue Services Act 2004 s.7(2)(d).
- Building design and active fire protection systems to prevent or limit the spread of fire.
- Fire and Rescue Service: including fire wallet scheme, bulk foam plans, Environment Agency ‘grab-packs’ and Environmental Protection Unit for pollution control, Environment Agency-Fire and Rescue Service Memoranda of Understanding on environmental protection, mutual aid reinforcement schemes.

Additional risk treatment required:

- None identified.