INDIVIDUAL RISK ASSESSMENT

Hazard/threat category	**Sub-category**
Severe weather	Flooding (major fluvial, urban)
Hazard and threat description, plus scale	**Risk reference number**
Flooding: Major fluvial flooding affecting parts of more than two UK regions.	H21
Date of revision	**Next review**
Dec 07	December 08
Version	2
Author	Environment Agency

1. Overview of hazard or threat

This is the National picture to provide context for Local Risk assessment. A single massive fluvial event or multiple concurrent regional events following a sustained period of heavy rainfall extending over two weeks (perhaps combined with snow melt). The event would include major fluvial flooding affecting a large, single urban area. Closure of primary transport routes. Some infrastructure collapse. Sediment movement and contamination of water supplies. Loss of essential services (gas, electricity & telecommunications) to 0.2m homes for up to 14 days. Up to 5000 people needing assistance with sheltering for up to 12mths. Significant economic damage.

Urban area dimension:
- Flooding of up to 40,000 properties for up to 7 days.
- Up to 50 fatalities and 500 casualties.
- Up to 100,000 people evacuated. Up to 2,000 people in need of rescue.

Rural area dimension:
- Flooding of up to 10,000 properties for up to 2 days.
- Up to 20 fatalities and 300 casualties.
- Up to 50,000 people in rural villages and towns evacuated.
- People stranded over a large area and up to 2,500 in need of rescue.

(These figures are unconfirmed until the completion of reviews post the summer flood events).

Assumes
- Severe Flood Warnings in force for 2 days
- Hazard is not evenly distributed across the UK.
- Rescue can only be by boat, helicopter or high-clearance vehicles.
- Emergency services affected if located in the flood zone.
- Evacuation warnings given to emergency services (up to 12hrs lead time).
- Multiple failure of flood defence systems (overtopping).
- Damage or failure (at several sites) of telecommunications, power stations, hospitals, schools, shops and industrial/ commercial premises are in the flooded area(& possibly rest centres).
- Properties includes occupied mobile homes and caravans sites in the floodplain (summer tourists). Road and Rail links.
- Consequence management will not be achievable within a regional response capability.
- For evacuation and emergency sheltering and accommodation assume 60% leave the area, 30% use available hotels in safe areas, 10% needs assisted sheltering

Most commonly caused by intense rain causing surface water runoff or more likely prolonged rainfall on saturated ground in river catchments, which result in rivers or other watercourses overflowing their banks. May lead to a inundation of properties and road closures, or result in widespread loss of life and devastation of property necessitating the implementation of a co-ordinated recovery plan.

In July 2007 the TVLRF area saw almost 10,000 properties flood. The flood outlines suggest that the 1947 flood may have caused flooding on this scale. The Thames Corridor alone, from the source of the Thames in Cirencester to Bell Weir Lock has the highest number of properties at risk (based on the 1:1000 year floodplain) in the TVLRF area with approximately 35,936.

2. Key historical evidence

National events

- Summer 2007 floods – England and Wales - Exceptionally heavy rain culminated in two severe, disruptive flooding events covering Yorkshire and the Humber, Derbyshire, Lincolnshire and Worcestershire and then the Severn and its tributaries in Gloucestershire, Worcestershire, Herefordshire, Shropshire, and along the Thames and its tributaries in Wiltshire, Oxfordshire, Berkshire and Surrey. This resulted in approximately 55,357 business and residential properties flooding from both surface water and rivers. The cumulative rainfall total in the UK for May, June and July 2007 was unprecedented; Met Office records show that 414.1 mm of rain fell across England and Wales, making it the wettest May to July since the England and Wales Precipitation record began in 1766.
- 7, 8, 9 January 2005 - Floods in Cumbria affected more than 3,000 properties
- Autumn 2000 floods - United Kingdom – prolonged severe rainfall led to the flooding of 12,000 homes nationwide.
- March 1999 – North Yorkshire – River Derwent burst its banks and inundated Malton and Norton forcing 200 families to abandon their homes (recurred in November 2000)
- Easter 1998 floods - extensive flooding killed 5 in the Midlands and damaged 4,500 homes in Northamptonshire, Warwickshire and Oxfordshire.

Local events (Largest Flood Events affecting the TVLRF area).

In July 2007 there was significant flooding across the TVLRF area. There were approximately 9,930 properties flooded in the TVLRF area. This figure reflects the properties that were reported to us and the actual figure could be a lot higher, in the vicinity of 10,000+ properties flooded.

Flood outlines suggest that the 1947 flood may have caused flooding on the scale required by H211. The 1947 Flood event came near the scale of flooding that H21 is looking at.

- Summer 2007 floods – After an unusually wet spring and summer, widespread intense rainfall in July resulted in significant flooding across the TVLRF area. The flooding was caused by both surface water and subsequent high river levels. Particularly badly affected were Oxford, Abingdon, Witney, Pangbourne, Thatchham, Newbury, Wokingham, Maidenhead, Brackley, Buckingham and Stoney Stratford**..** Approximately 9,390 properties were flooded.

- March 1947 - Whole of the TVLRF area. The March 1947 flood outline suggests that the whole of the TVLRF area was affected by extensive flooding. The Thames Corridor from the source of the Thames in Cirencester to Bell Weir Lock has the highest number of properties at risk (based on the 1:1000 year floodplain) with approximately 35,936 properties.

- December 2002 / January 2003 – worst affected catchments, properties flooded - Thames corridor, Thame, Leach, Ock, Cherwell, Colne, Loddon. Most other catchments in TVLRF area had Flood Watches issued.
- December 2000 – worst affected catchments, properties flooded - Thames corridor, Churn, Coln, Windrush, Ock, Loddon, Kennet. Most other catchments in TVLRF area had Flood Watches issued.
- Easter 1998 floods - River Cherwell Catchment was affected by widespread flooding. Over 250 residential and business properties in Banbury suffered severe disruption and flooding. Serious but less extensive flooding also occurred in Kings Sutton and Cropredy. Over 100 properties were also flooded in Kidlington.

- Great Ouse – Flooding has been recorded in January 2003, April 2000, Autumn 2000, Easter 1998 (77 properties affected in Buckingham and 80 properties in Newport Pagnell. Peak flows were considered higher than those seen in 1947, October 1993, September 1992, May 1983, April 1981, December 1979, November 1974 and March 1947
- River Ouzel – Flooding has been recorded in January 2003, April 2000, Autumn 2000, September 1992,April 1981, November 1974 and March 1947.
- River Thames – Larger Flooding events have been recorded in November 1884, 1947, 1974, 1990, 1994, October, November, December 2000, January 2003.
- River Colne - Flooding has been recorded in 1988 with over 50 properties and gardens affected by flooding in Uxbridge, October, November 2000 and February 2001 when the river reached it's highest level since the record began in 1952.
- Colne Brook and Poyle Channel – the most severe flood event recorded was in 1988. In February 2001 approximately 200 properties were flooded from a tributary of the Colne Brook.
- River Loddon – Extreme catchment wide flooding recorded in 1968 and 1974, with less extensive but serious flooding in 1990, 1992, 2000 and 2003.
- River Whitewater – September 1968 extensive catchment wide flooding recorded in the area.
- River Blackwater - Extensive catchment wide flooding recorded in the area in September 1968 and November 1974.
- The Emm Brook - Extensive catchment wide flooding recorded in the area in September 1968 and November 1974.

More detailed flood history information is available in the Environment Agency Local Flood Warning Plans. These are produced per Country and outline flood history and flood risk management information eg Flood Alleviation Schemes, in detail on a river by river basis. Those plans covering TVLRF are Berkshire, Buckinghamshire, Oxfordshire and Wiltshire.

Flood Mapping

The Environment Agency provides flood mapping on its website at: http://www.environment-agency.gov.uk/subjects/flood/826674/829803/858477/?version=1&lang=_e.

The Flood Map is a multi-layered map which provides information on:

- Flooding from rivers or sea without defences: the natural flood plain area that could be affected in the event of flooding from rivers and the sea
  - For flooding from rivers the map indicates the extent of a flood with a 1% (1 in 100) chance of happening each year*

- Extent of extreme flood: a flood with a 0.1% (1 in 1000) chance of happening each year

- Flood defences: such as embankments, walls and flood storage areas (which are areas of land designed and operated to store flood water)

- Areas benefiting from flood defences: where possible the EA map out the areas that benefit from flood defences in the event of flooding from rivers or the sea (as described above*). If the defences were not there, these areas would flood. Note that the EA do not show all areas that benefit from flood defences.

The Flood Map does not provide information on flood depth, speed or volume of flow. It does not show flooding from other sources, such as groundwater, direct runoff from fields, or overflowing sewers.

Where possible, the Environment Agency will assist professional partners' by producing customised maps to assist their flood planning eg showing sites of Emergency Services, schools, COMAH sites etc.

3. Likelihood

Hazard	Outcome description	Likelihood
Severe weather TVLRF Area	Flooding: Major fluvial flooding affecting parts of more than two UK regions.	Unlikely (3)

4. Impact

Hazard	Outcome description	Impact				
Severe weather	Flooding: Major fluvial flooding affecting parts of more than two UK regions.	Health	Social	Env	Econ	Overall
		5	5	5	5	5

Details

Impacts
Primary
Drowning of people, pets and livestock
Pollution/health risks from sewerage systems, chemical stores, fuel storage tanks
Evacuation and temporary/long-term accommodation needs for large numbers of people.
Major damage to property and surrounding land
Closure, or washing away, of roads, bridges, railway lines. Disruption to infrastructure – road and rail travel and community services.
Disruption to infrastructure – road and rail travel, community and key services for a prolonged period.
Loss of (and possible damage to) telephone, electricity, gas and water supplies
Communities unable to function without significant support. Care required for vulnerable people.
Secondary
Need for recovery strategy in aftermath of major flood. Extensive clean up and recovery costs
Disruption of economic life and major costs of rebuilding infrastructure
Public need for information, advice, benefits/emergency payments
Insurance implications, including help for the uninsured
Safety assessments/possible demolition of damaged buildings and structures
Shortage/overstretch of key resources (equipment and personnel) and agencies
Overstretch of normal communication links, including mobile phones
Long-term displacement of people post flooding, accommodation problems

5. Vulnerability and resilience

Large Areas of the TVLRF Area are vulnerable to flooding because of the proportion of urbanisation within the river catchments.

Large areas of hard surfaces increase the speed that water enters drains and watercourses. This increases the rate of rise of the watercourse and the peak level reached.

Large urban areas are also prone to surface water flooding when drainage systems become quickly overwhelmed in storm conditions.

A degree of resilience to flooding has been achieved over many years by the large number of improvements to watercourses that have been constructed in some areas. However in most cases the river would still be unable to contain a large flood.

In addition, many communities are vulnerable to a blockage in any of the many culverts and grills in urban areas. An ongoing maintenance schedule reduces the risk of this occurring, however the risk in never completely removed. Emergency clearance is always dependent on the workforce being able to reach the site in time on congested roads.

The resilience of a community is improved when there is an awareness of the risk of flooding and the actions that can be taken to reduce damage. In many communities this awareness of the risk of flooding from rivers is low. Flooding may also occur at times when people are at work or asleep; therefore their ability to take appropriate action is delayed.

Within flood risk areas there are some groups of people that are particularly vulnerable. These groups included:

- Those that do not receive a warning;
- The elderly;
- Disabled;
- Non-English speakers;
- Single parent families, and those with young children;
- People new to the area;
- Visitor and tourists.

For details of the locations of Flood Risk Areas in the TVLRF Area, please refer to the Local Flood Warning Plan for the Berkshire, Buckinghamshire, Oxfordshire and Wiltshire Areas.

6. Overall assessment

Category	Sub-category		
Severe weather	Flooding: Major fluvial flooding affecting parts of more than two UK regions.		
Outcome description	**Impact**	**Likelihood**	**Risk**
This is the National picture to provide context for Local Risk assessment. A single massive fluvial event or multiple concurrent regional events following a sustained period of heavy rainfall extending over two weeks (perhaps combined with snow melt). The event would include major fluvial flooding affecting a large, single urban area. Closure of primary transport routes. Some infrastructure collapse. Sediment movement and contamination of water supplies. Loss of essential services (gas, electricity & telecommunications) to 0.2m homes for up to 14 days. Up to 5000 people needing assistance with sheltering for up to 12mths. Significant economic damage			
TVLRF area	**Catastrophic (5)**	**Unlikely (3)**	**Very High**

Controls in place

- Environment Agency Incident Management Plans
- Environment Agency 24/7 incident response
- Environment Agency Issued Flood Warnings primarily using Floodline Warnings Direct
- Environment Agency Memorandum of Understanding with Fire Brigades, Police, Local Authorities, Highways Agency, Health Protection Agency and Health Authority.
- Environment Agency Local Flood Warning Plans for Oxfordshire, Buckingham and Berkshire.
- Oxfordshire County Council Emergency Plan Part 3, Section 4
- Buckinghamshire County Flood Plan
- Milton Keynes Council Flood Plan
- Buckinghamshire County Council Emergency Plan
- Aylesbury Vale District Council Emergency Plan
- Chiltern District Council Emergency Plan
- South Bucks District Council Emergency Plan
- Wycombe District Council Emergency Plan
- South Central Ambulance Service NHS Trusts Major Incident Plan and Business Continuity Plans
- Royal Borough of Windsor and Maidenhead Flood section,
- Wokingham District Council Flood plan
- Reading Borough Council flood plan
- Slough Borough Council emergency plan flood section
- Bracknell EP
- West Berkshire Council Flooding Section in MIP
- Royal Berkshire Hospital NHS Trust Major Incident Plan
- Heatherwood and Wexham Park Hospitals NHS Trust Major Incident Plan and Business Continuity Plans
- Berkshire Primary Care Organisations Major Incident Plan and Operational Response Manuals and Business Continuity Plans
- Berkshire Healthcare Trust Major Incident Plan and Business Continuity Plans
- Buckinghamshire Hospitals NHS Trust Major Incident Plan and Business Continuity Plans
- Milton Keynes Hospital NHS Trust Major Incident Plan and Business Continuity Plans
- Buckinghamshire Mental Health Trust Major Incident Plan and Business Continuity Plans
- Buckinghamshire Primary Care Organisations Major Incident Plan and Business Continuity Plans
- Oxford Radcliffe Hospitals NHS Trust Major Incident Plan and Business Continuity Plans
- Oxford Mental Health Trust Major Incident Plan and Business Continuity Plans
- Nuffield Orthopaedic Clinic Major Incident Plan and Business Continuity Plans.

- Oxfordshire Primary Care Organisations Major Incident Plan and Business Continuity Plans
- South Central Strategic Health Authority Major Incident Plan and Business Continuity Plans
- Berkshire Integrated Emergency Planning Structure
- Wokingham District Council Emergency Plan
- Reading Borough Council Emergency Plan
- West Berkshire Council Emergency Plan
- Bracknell Forest Borough Council Emergency Plan
- Royal Borough Council of Windsor and Maidenhead Emergency Plan
- Slough Borough Council Emergency Plan
- BFRS : OC 15/1/1, Spate Conditions
- BFRS : OC 85/5, Waterborne & unstable surfaces response
- BFRS : GRA 2.08, Rescues involving flooding
- ACPO Emergency Procedures Manual
- Thames Valley Police Emergency Procedures Manual

Additional risk treatment required

- Regular exercising of emergency plans.
- Regular training of duty officers and staff involved in flooding events.
- Encourage further take up of Flood Warning service in areas at risk of flooding and better flood preparedness in local communities.