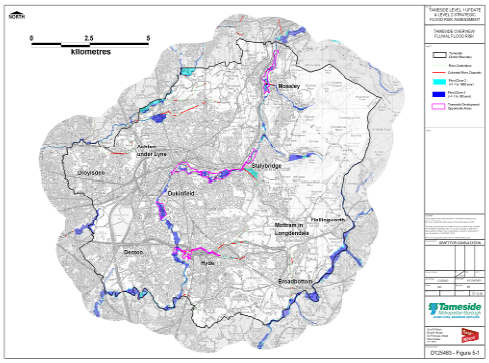
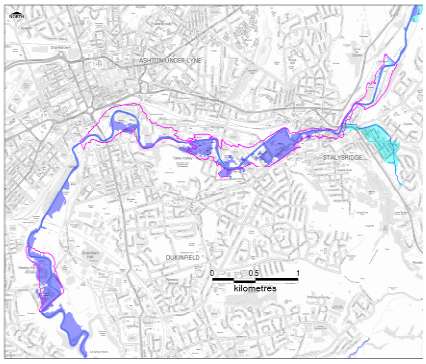
Tameside Metropolitan Borough Council

Tameside Level 1 Update and Level 2 Strategic Flood Risk Assessment

March 2011





Prepared for

Tameside

Revision Schedule

Tameside Level 1 Update and Level 2 Strategic Flood Risk Assessment
October 2010

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Abbreviations

ACRONYM	DEFINITION
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ASTSWF	Areas Susceptible To Surface Water Flooding
BGS	British Geological Survey
BW	British Waterways
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
DEM	Digital Elevation Model
DPD	Development Plan Documents
DTM	Digital Terrain Model
EA	Environment Agency
EP	English Partnerships
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
GIS	Geographical Information Systems
Ha	Hectares – $100m^2$ of land
IDB	Internal Drainage Board
LDDs	Local Development Documents
LDF	Local Development Framework
LDS	Local Development Scheme
LiDAR	Light Detection and Ranging
LPA	Local Planning Authority
NFCDD	National Fluvial and Coastal Defence Database
NLUD-PDL	National Land Use Database of Previously Developed Land and Buildings
ODPM	Office of the Deputy Prime Minister
OS	Ordnance Survey
PCPA	Planning and Compulsory Purchase Act 2004
PDA	Potential Development Area

ACRONYM	DEFINITION
PPG25	Planning Policy Guidance Note 25: Development and Flood Risk
PPS25	Planning Policy Statement 25: Development and Flood Risk
RFRA	Regional Flood Risk Assessment
RIM	Reservoir Inundation Map
RPG	Regional Planning Guidance
RSS	Regional Spatial Strategy
SA	Sustainability Assessment
SAR	Synthetic Aperture Radar
SFRA	Strategic Flood Risk Assessment
SMBC	Stockport Metropolitan Borough Council
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SSSI	Site of Special Scientific Interest
Stockport MBC	Stockport Metropolitan Borough Council
SFRM	Strategic Flood Risk Management Framework
SuDS	Sustainable Drainage Systems
SW	Scott Wilson
SWMP	Surface Water Management Plan
Tameside MBC	Tameside Metropolitan Borough Council
UDP	Unitary Development Plan
UU	United Utilities

Glossary

TERM	DEFINITION
Aquifer	A source of groundwater comprising water-bearing rock, sand or gravel capable of yielding significant quantities of water.
Aquitard	Geological formation that may contain groundwater but is not capable of transmitting significant quantities of it under normal hydraulic gradients
Catchment Flood Management Plan	A high-level planning strategy through which the EA works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Climate Change	Both natural and human actions causing long term variations in global temperature and weather patterns.
Culvert	A channel or pipe that carries water below the level of the ground.
DG5	Data collected by Water Companies regarding flooding from sewers. OFWAT use this data as a performance indicator.
Digital Terrain Model	A digital representation (map) of ground-surface topography or terrain.
Exception Test	Required where the vulnerability of a development type is not entirely compatible with the level of flood risk at a particular site, i.e., following application of the Sequential Test. In order to qualify for development, it must be demonstrated that the development passes all elements of the Exception Test.
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.
Flood Defence	Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Outline	The extent of the area that is determined to be at a potential risk of flooding during a flood event of a given magnitude.
Flood Risk Assessment	An assessment of the flood risk to and from a proposed new development to demonstrate how flood risk from all sources of flooding to the development itself and flood risk to others will be managed now and taking climate change into account.
Fluvial Flooding	Flooding by a river or a watercourse.
Fluvial Reach	A stretch of river that is not influenced by the tide.
Flood Storage	A temporary area that stores excess runoff or river flow, often ponds or reservoirs.
Flood Zone 1	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or tidal flooding in any year (<0.1%).
Flood Zone 2	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of tidal flooding (0.5% – 0.1%) in any year.
Flood Zone 3a	This zone comprises land assessed as having a 1 in 100 or greater annual

TERM	DEFINITION
	probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Flood Zone 3b	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).
GIS Layer	Data that is presented in a spatial manner. Normally, each dataset constitutes one GIS layer. A number of GIS layers can be presented on a single map.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Inundation	Flooding.
Internal Drainage Board	Independent bodies with responsibility of ordinary watercourses within a specified district.
LiDAR	An airborne mapping technique that creates a topographic digital terrain model (DTM) by using a laser device to measure the distance between the aircraft and the ground below.
Local Development Framework	The core of the updated planning system (introduced by the Planning and Compulsory Purchase Act 2004). The LDF comprises the Local Development Documents, including the development plan documents that expand on policies and provide greater detail. The development plan includes a core strategy, site allocations and a proposals map.
Local Planning Authority	Body that is responsible for controlling planning and development through the planning system.
Main River	All watercourses shown as such on the statutory Main River maps held by the EA and the Department of Environment, Food and Rural Affairs, and can include any structure or appliance for controlling or regulating flow of water into, in or out of the channel. The EA has permissive powers to carry out works of maintenance and improvement on these rivers.
Mitigation Measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
NLUD-PDL	The National Land Use Database of Previously Developed Land and Buildings provides an inventory of the national stock of vacant and/or derelict land and buildings, and land and buildings in use either with planning consent/allocated or potential for redevelopment for the last ten years. It is the only countrywide source of information on brownfield land.
Ordinary Watercourse	An ordinary watercourse is every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a 'Main River'. The Local Authority or IDB where relevant, has powers for ordinary watercourses that are similar to those of the Environment Agency on Main Rivers.
Pitt Review	Sir Michael Pitt undertook an independent review of the Summer 2007 flood

TERM	DEFINITION
	events. The full title of the document is 'The Pitt Review: Lessons learned from the 2007 floods'.
Risk	The combination of probability and consequence of an event occurring.
Sequential Testing	A risk based approach to assessing flood risk, which gives priority in ascending order of flood risk, i.e. lowest risk first.
Sewer Flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Stakeholder	A person or organisation that has an interest in, or is affected by the decisions made relating to a site.
Strategic Flood Risk Assessment	A SFRA provides information on areas at risk from all sources of flooding that should form the basis for flood risk management decisions, and provides the basis from which to apply the Sequential Test and Exception Test (as defined in PPS25) in the development allocation and development control process.
Surface Water Management Plan	A Surface Water Management Plan (SWMP) is a plan which outlines the preferred surface water management strategy in a given location. In this context surface water flooding describes flooding from sewers, drains, groundwater, and runoff from land, small water courses and ditches that occurs as a result of heavy rainfall
Sustainability Appraisal	A process used to identify if policies, strategies or plans promote sustainable development and further used for improving policies. It is a requirement for Regional Spatial Strategies under the *Planning and Compulsory Purchase Act 2004.*
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Sustainable Drainage System (SuDS)	Drainage methods designed to mimic the natural system. Where practicable should be used in preference to traditional piped drainage systems.
X% Annual Exceedence Probability (AEP) event	Percentage annual exceedence probability (AEP) of occurrence in any one year. For example, a 1 in 200 annual probability flood event has a 0.5% AEP of occurring in any one year.
X% AEP Design Standard	Flood defence that is designed for to protect against a X% AEP event. In events more severe than this the defence would be expected to fail or to allow flooding. For example, defences may be constructed to a standard of protection of 1% AEP, (1 in 100 year).

1 Introduction

1.1 Policy Context and Background

1.1.1 The Planning and Compulsory Purchase Act 2004 (PCPA) (HMSO, 2004) requires Local Planning Authorities (LPAs) to produce Local Development Frameworks (LDFs) to replace the system of Local, Structure and Unitary Development Plans (UDPs). LDFs are a portfolio of Local Development Documents (LDDs) that collectively deliver the spatial planning strategy for the Local Authority area. The PCPA requires LDDs to undergo a Sustainability Appraisal (SA), which assists Local Planning Authorities (LPAs) in ensuring their policies fulfil the principles of sustainability.

1.1.2 Planning Policy Statement 25: Development and Flood Risk (PPS25, 2006)[1] emphasises the active role that LPAs should have in ensuring that flood risk is considered in strategic land use planning. PPS25 encourages LPAs to undertake a Strategic Flood Risk Assessment (SFRA) as one of the documents to be used as the evidence base for strategic land use planning decisions as part of the LDF. SFRAs are also a component of the SA process and should be used in the review of LDDs or in their production.

1.1.3 The PPS25: Development and Flood Risk Practice Guide[2] recommends that SFRAs are completed in two consecutive stages:

- Level 1 SFRA,
- Level 2 SFRA.

1.1.4 Scott Wilson completed a Sub-Regional Strategic Flood Risk Assessment (SFRA) for Greater Manchester on behalf of the Association of Greater Manchester Authorities (AGMA). The Sub-Regional SFRA investigated and documented flood risk across all 10 AGMA districts primarily based on existing information obtained from key stakeholders. The current and future risks of flooding from all sources were highlighted in the Sub-Regional SFRA. The Sub-Regional SFRA also delivered District narratives specifically for each Local Authority.

1.1.5 The Sub-Regional SFRA highlighted a number of 'critical gaps' in the flood risk data available to the sub-region, especially with regard to flood risk from non-fluvial sources. It also made recommendations for detailed Level 2 SFRA to be undertaken in some areas to enable application of the Sequential Test and, where required, the Exception Test.

1.1.6 The Hybrid Approach was recommended in the AGMA Sub-Regional SFRA as a means of providing detailed flood risk data in instances where local authorities are aware of areas within their districts that are likely to come forward for development within their LDF prior to undertaking the PPS25 sequential test. Flood risk to these areas may have already been fully or partially defined within the sub-regional SFRA. There may also be instances where

[1] Planning Policy Statement 25: Development and Flood Risk. Department for Communities and Local Government. December 2006
[2] PPS25: Development and Flood Risk Practice Guide. Department for Communities and Local Government. June 2008.

the sub-regional SFRA has identified 'gaps' in the flood risk data for potential development areas.

1.1.7 Stockport Metropolitan Borough Council (MBC) and Tameside Metropolitan Borough Council (MBC) commissioned a Hybrid SFRA study to fill the Level 1 data gaps in the two neighbouring districts and to undertake a Level 2 SFRA in four key Potential Development Areas within the two districts. The joint commission makes it possible to investigate cross-district flood risk issues relevant to both councils as well as other neighbouring councils.

1.1.8 Upon completion of the commission a separate report has been produced for each district. This report documents the methodology and findings of the SFRA for Tameside MBC.

1.2 Study Area

1.2.1 In accordance with the Brief for Framework Consultants, the SFRA Level 1 update study area consists of the administrative area of Tameside (MBC) as shown in Figure 1-1, Appendix 1.

1.2.2 The Brief for Framework Consultants identified the following four key Potential Development Areas, on which to focus the Level 2 SFRA (See Figure 1-1, Appendix 1):

- **Mossley (Egmont Street to Manchester Road / Tame Street junction)**.
  Development is expected along Manchester Road to the north of Roaches Bridge, within the Mossley Mills area, at River Mill on Waggon Road and at the Glover Industrial Estate.
- **Ashton to Stalybridge Corridor (Portland Canal Basin, Ashton to North End Road, Stalybridge).**
  Possible development proposals include Stalybridge town centre and a large industrial corridor.
- **Dukinfield - Shepley Industrial Estates and adjoining / nearby land.**
  Development can be expected at existing industrial units, a site north of Shepley North Industrial Estate and a site off Gate Street.
- **Hyde - Sites at Watson Street, Denton, Manchester Road / Mill Lane, Hyde and adjoining Godley Brook / Wilson Brook.**
  Limited development is possible at a Green belt site at Watson Street, Denton. Development is expected in the Potential Development Area west of Hyde town centre, and at approved sites next to Halton Street. Development is also possible at sites off Clarendon Rd / Commercial St; Newton St; Manchester Road; and the Mill Lane / Frances St / Read St area.

1.3 Aims and Objectives of the Level 1 SFRA Update and Level 2 SFRA

1.3.1 The aim of the Level 1 SFRA update and Level 2 SFRA is to provide Tameside MBC with adequate flood risk information to inform the sequential approach (as defined in PPS25) across the District and detailed information for the application of the PPS25 Exception Test in the Level 2 SFRA areas.

1.3.2 The following objectives were defined in the study brief:

a. A schedule of the current condition of flood defence infrastructure, cross-referenced to specified policies in the Environment Agency (EA) Catchment Flood Management Plan (CFMP) for the Rivers Tame, Mersey and Goyt (insofar as it impacts upon the four key POTENTIAL DEVELOPMENT AREAs identified within Tameside) with regard to its maintenance and upgrade. Supporting material for the schedule to be provided will include walk-over survey records, as-built records where available, a directory of photos and location plans;

b. An appraisal of the probability, return period and consequences of overtopping or failure of flood risk management infrastructure, including appropriate allowance for climate change. This should include determining the standard of protection of existing flood defences, the rate and onset of flooding, velocities, creation of hazard maps and emergency planning;

c. A revisiting of the concept of the functional flood plain within the study area and a review of Flood Zone 3b drawn in the AGMA sub-regional SFRA, concentrating on the areas defined using professional judgement rather than modelled outlines;

d. Maps showing the distribution of flood risk across all Flood Zones from all sources of flooding taking climate change into account, using the latest climate change data sources;

e. Guidance on strategic flood risk assessment and management issues to be considered in policy development;

f. Guidance on the preparation of FRAs for sites of varying risk across the Flood Zones. Provide spatial recommendations that go beyond the general guidance in PPS25 to inform the preparation of FRAs, including:
   - Recommended development approach and potential end use;
   - Proposed development control and technical issues to be resolved to permit development;
   - Mitigation options required to permit development;
   - Supplementary design guidance including minimum floor levels, access and egress, site layout recommendations in relation to vulnerability, building materials and flood resilient construction,
   - Residual risk management;
   - Advice on the use of sustainable drainage techniques (SuDS);
   - Overall site-by-site summary guidance suitable for issuing to potential developers; and
   - Advice on how to address windfall developments in line with paragraphs 4.30 to 4.32 of the Planning Policy Statement 25 Practice Guide.

g. Identification of the location of critical drainage areas and identification of the need for Surface Water Management Plans;

h. Identification of any linkages to other relevant studies, such as the Greater Manchester Water Cycle Study and the Greater Manchester Green Infrastructure Study reference these in report;

i. Guidance on the application of the Exception Test, which will assist planners in taking a sustainable and safe approach when allocating development;

j. Identification of surface water and drainage flood risk issues (e.g. potential ponded areas and overland flood routes where sewer system capacity is exceeded);

k. Implications of how canals and reservoirs interact with local rivers and watercourse and the resultant risk that follows from these connections, as well as any overflow weirs, sluice gates and low points and areas where the canal is raised; and

l. Presentation of mitigation options and potential delivery mechanisms.

2 Sequential Approach to Site Allocation

2.1 The Sequential Test

2.1.1 The Sequential Test is a simple decision making tool designed to ensure that sites at little or no risk of flooding are developed in preference to sites at higher risk. LPAs should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

2.1.2 New development should be directed to sites with the lowest probability of fluvial and/or tidal flooding (Flood Zone 1) before considering sites with higher probability of flooding (Flood Zones 2 and 3). The flood vulnerability of the intended land use should be matched to the flood risk of the site, e.g. higher vulnerability uses should be located on parts of the site with the lowest probability of flooding.

2.1.3 Within each Flood Zone, new development should be directed to sites at the lowest probability of flooding from all sources. A sequential approach should be used in areas known to be at risk from other sources of flooding. The Sequential Test is the first stage of the site allocation process.

2.2 Development Vulnerability

2.2.1 In order to determine the suitability of land for development in flood risk areas, the development vulnerability must first be established. Flood Risk Vulnerability Classifications, as set out in Appendix D, Table D2 of PPS25 are shown in Table 2-1.

Table 2-1: Flood Risk Vulnerability Classification

Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes), which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).
Water-Compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

2.2.2 Table 2-2 replicates Table D.3 from Annex D of PPS25 (and illustrates a matrix of 'Flood Risk Vulnerability' of a proposed development against 'Flood Zone Compatibility)'.

Table 2-2: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test required	✓	✓
	3a	Exception Test required	✓	×	Exception Test required	✓
	3b	Exception Test required	✓	×	×	×

✓ Development is appropriate × Development should not be permitted

2.3 Flood Zone Definition

Flood Zone 1

2.3.1 Flood Zone 1 comprises land assessed as having an Annual Exceedence Probability (AEP) of river or tidal flooding of less than 0.1% in any year (<1 in 1000 year) (low probability). All uses of land for development are considered appropriate in this zone.

Flood Zone 2

2.3.2 Flood Zone 2 comprises land assessed as having between a 1% and 0.1% AEP (1 in 100 and 1 in 1000 year respectively) of river flooding, or between a 0.5% and 0.1% AEP of tidal flooding in any year (1 in 200 and 1 in 1000 respectively) (medium probability).

2.3.3 As defined in Table 2-2, 'Water-Compatible', 'Less Vulnerable', 'More Vulnerable' and 'Essential Infrastructure' land uses are considered appropriate in this Flood Zone. Subject to the application of the Sequential Test, 'Highly Vulnerable' uses are only appropriate in this zone if the Exception Test is also passed. All development proposals in this zone should be accompanied by a detailed site specific FRA.

Flood Zone 3a

2.3.4 Flood Zone 3a comprises land assessed as having a 1% or greater AEP of river flooding (>=1 in 100 year) or a 0.5% or greater AEP of flooding from the sea in any year (>=1 in 200 year) (high probability).

2.3.5 As defined in Table 2-2, 'Water-Compatible' and 'Less Vulnerable' land uses are appropriate in this zone. 'Highly Vulnerable' land uses should not be permitted in this zone. 'More Vulnerable' and 'Essential Infrastructure' uses should only be permitted in this zone if the Exception Test is passed. 'Essential Infrastructure' permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood. All development proposals in this zone should be accompanied by a detailed site specific FRA.

Flood Zone 3b – Functional Floodplain

2.3.6 Flood Zone 3b comprises land where water has to flow or be stored in times of flood with a 5% or greater AEP of river flooding in any year (>=1 in 20 year) or is designed to flood in an extreme flood (0.1% AEP), or at another probability to be agreed between the LPA and the EA.

2.3.7 As defined in Table 2-2, only the 'Water-Compatible' and 'essential Infrastructure' land uses should be permitted in this zone. Any permitted development within Flood Zone 3b should be designed and constructed to:

- Remain operational and safe for users in times of flood,
- Result in no net loss of floodplain storage,

- Not impede water flows,
- Not increase flood risk elsewhere.

2.3.8 'Essential Infrastructure' in this zone should also pass the Exception Test. All development proposals in this zone should be accompanied by a detailed site specific FRA.

2.4 The Exception Test

2.4.1 The rationale of the Exception Test is that development is only permissible in areas at higher risk of flooding where it can be demonstrated that there are no reasonably available sites in areas of lower risk and that the benefits outweigh the risks from flooding. As such, the development must pass the Exception Test (applied by the LPA using evidence supplied by either the Level 2 SFRA or a site specific FRA). The Exception Test is a vehicle for managing flood risk while still allowing necessary development to occur and should only be applied where the Sequential Test has been passed.

2.4.2 Where there are no available sites in Flood Zone 1, decision makers should consider reasonably available sites in Flood Zone 2 taking into account the flood risk vulnerability of land uses and applying the Exception Test if required (e.g. Highly Vulnerable development in Flood Zone 2). Only where there are no reasonably available sites in Flood Zone 1 or Flood Zone 2 should decision makers consider sites in Flood Zone 3, taking into account flood risk vulnerability and applying the Exception Test if required (e.g. More Vulnerable development in Flood Zone 3a).

2.4.3 'More Vulnerable' land uses within Flood Zone 3a and 'Highly Vulnerable' land uses within Flood Zone 2 should only be permitted if an Exception Test has been passed.

2.4.4 PPS25 paragraph D9 states that for the Exception Test to be passed, three main criteria must be satisfied in order for the development to be considered acceptable:

- Part a) - *"It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by an SFRA where one has been prepared. If the DPD has reached the 'submission' stage – the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal"*;
- Part b) – *"The development should be on developable previously-developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously-developed land"*; and
- Part c) – *"A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible will reduce the flood risk overall"*.

2.4.5 For successful application it is important that the arguments presented for justification through the Exception Test are in line with policies set out in Local Plans and the LDF, supported by reference to other national planning and sustainability policies, such as development of Greenfield sites.

2.4.6 This Level 2 SFRA aims to provide information to enable satisfaction of Part c) of the Exception Test. Tameside MBC will need to provide evidence that Part a) and Part b) of the Exception Test can be satisfied.

3 Planning Context

3.1.1 Tameside MBC is currently in the process of preparing the Borough's Local Development Framework (LDF), which will comprise a series of Development Plan Documents and Supplementary Planning Documents (SPD). The SFRA will inform this process and in particular, preparation of the Core Strategy and the Site Allocations DPD.

3.1.2 The North West of England Plan (September 2008) also known as the Regional Spatial Strategy (RSS) set local authority targets for housing provision between 2003 and 2021. Tameside is required to provide a total of 13,500 homes during this period, an annual average rate of provision of 750. The future of The North West of England Plan is uncertain, along with other regional spatial strategies, due to their proposed revocation under the Localism Bill. At the time of writing this report the RSS for the North West is regarded as a material consideration.

3.1.3 The estimated total number of dwellings in the supply of approved sites in Tameside on 31st December 2008 was 6,665 (Tameside MBC housing land supply report). Of these, 3,933 (59.1%) were deliverable.

3.1.4 The RSS also set out the provision of employment land required in the region between 2005 and 2021. The identified need in Greater Manchester was 1,904 Ha, which represented a 536 Ha shortfall in the supply of land that was available in 2005 (1368). However, this figure was not disaggregated down to individual district figures and it is for each Borough to determine its employment land requirements over the plan period.

3.1.5 The Tameside MBC Employment Land Review will address the employment land requirements for the plan period of the LDF Core Strategy. Through the monitoring process, a total of 70.41 Hectares (Ha) of employment land has been identified as available within the borough as at 31st March 2010. This represents a slight decrease compared to the 2009 figure of 71.22 Ha.

3.1.6 The Tameside UDP (adopted November 2004) sets out some of the key growth areas proposed in the borough. One major strategic employment site is identified at Ashton Moss of which the major part is now complete. A series of Potential Development Areas are also proposed across the Borough. Mixed use schemes are particularly encouraged in these areas. Figure 3-1 and Figure 3-2 in Appendix 1 show an overview of the National Land Use Database of Previously Developed Land and Buildings (NLUD-PDL), housing and employment sites and Strategic Housing Land Availability Assessment (SHLAA) sites, respectively, within Tameside MBC.

3.1.7 Development expected within the four key Potential Development Areas in Tameside identified in Section 1.2.2 are discussed in more detail in Section 6.

4 SFRA Approach

4.1 General Approach

4.1.1 The SFRA builds on the AGMA Sub-Regional SFRA and Level 1 SFRA for Tameside taking into consideration the FRA Hierarchy recommended in PPS 25. The starting point for the Level 1 update is the Sub-Regional SFRA which was completed by Scott Wilson in 2008.

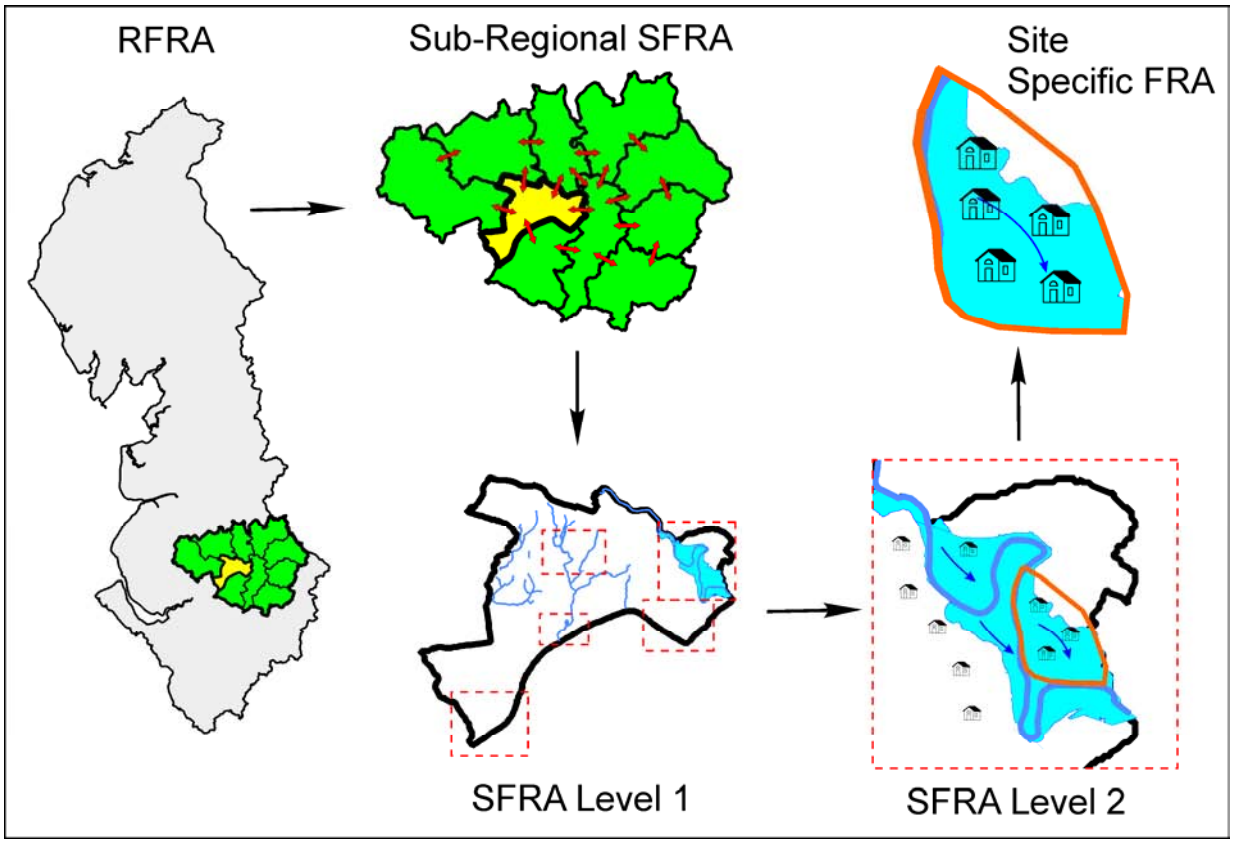


Figure 4-1: Hierarchical Approach to Flood Risk

4.2 Level 1 Update

4.2.1 The first part of the SFRA involves an assessment of flood risk from other non-fluvial sources of flooding within the district boundary, in accordance with PPS 25 and identified in the Sub-Regional SFRA as critical data gaps. The other sources of flooding considered in the SFRA that are relevant to Tameside are:

- Flooding from the land - pluvial (overland flow) flood risk;
- Flooding from sewers;
- Flooding from groundwater;
- Flooding from reservoirs and canals.

4.2.2 The general methodology for identifying Level 2 sites would normally involve overlaying district-wide flood risk data with development data across the district, based on development aspirations published in the Core Strategy. Areas where a significant amount of development is planned to be directed to will then require a Level 2 SFRA to inform the Sequential Test and Exception Test, if flood risk issues have been identified in those areas.

4.2.3 The Sub-Regional SFRA did not identify any areas where a Level 2 SFRA is required partly because the core strategy was still being developed. In this SFRA commission the need for a Level 2 SFRA requirement was identified in the brief for the four key Potential Development Areas that are located adjacent to the River Tame and Wilson Brook/Godley Brook in order to provide more detailed flood risk data to inform the Sequential and Exception Tests, as required. Flood zones and flood depth hazard maps were derived for all 4 areas using a hydraulic model of the River Tame. Details of the hydraulic modelling and mapping work are given in Section 6 of the report.

4.2.4 In order to complete the Level 1 SFRA update and Level 2 SFRA, flood risk data were requested from various sources, including Tameside MBC, Environment Agency, United Utilities (UU) and British Waterways (BW). The flood risk data were used to fill in data gaps on a district-wide scale and for the Level 2 SFRA in the four key Potential Development Areas.

4.2.5 Data availability was a key issue for the SFRA which has limited the assessment of flood risk from other sources in particular. The extent of the Level 1 update was therefore tailored to suit the data availability for each source of flooding.

4.3 Level 2 SFRA Requirements

4.3.1 In general each Level 2 SFRA will differ slightly from others as it seeks to address the particular flood risk issues that are specific to the area in question. The general requirements for a Level 2 SFRA have been set out in the AGMA Sub-Regional SFRA to enable AGMA councils to determine a consistent scope for a Level 2 assessment in line with the principles of the Hybrid Approach.

4.3.2 As part of the AGMA Sub-Regional SFRA flow charts have been produced (Chart 4-1, Chart 4-2 and Chart 4-3) which highlight the issues which the Level 2 SFRA should address and the level of detail and items of work required.

4.3.3 These charts are not designed to be an exhaustive and detailed brief of services, not least because every Level 2 SFRA and more detailed study will have different requirements depending on the flood risk issues (or combination of issues), location and the potential development options of the site or area of interest as well as data availability. As a result,

some flexibility in the specification and provision of services for Level 2 SFRAs and more detailed studies is required in each Level 2 SFRA study.

4.3.4 The charts are based on the four main flood sources within the study area (as defined by the Level 1 SFRA). These include fluvial, sewer and drainage, pluvial and surface water, and artificial sources (including reservoirs and canals).

Chart 4-1: Specifying where a Level 2 SFRA or more detailed studies are required.

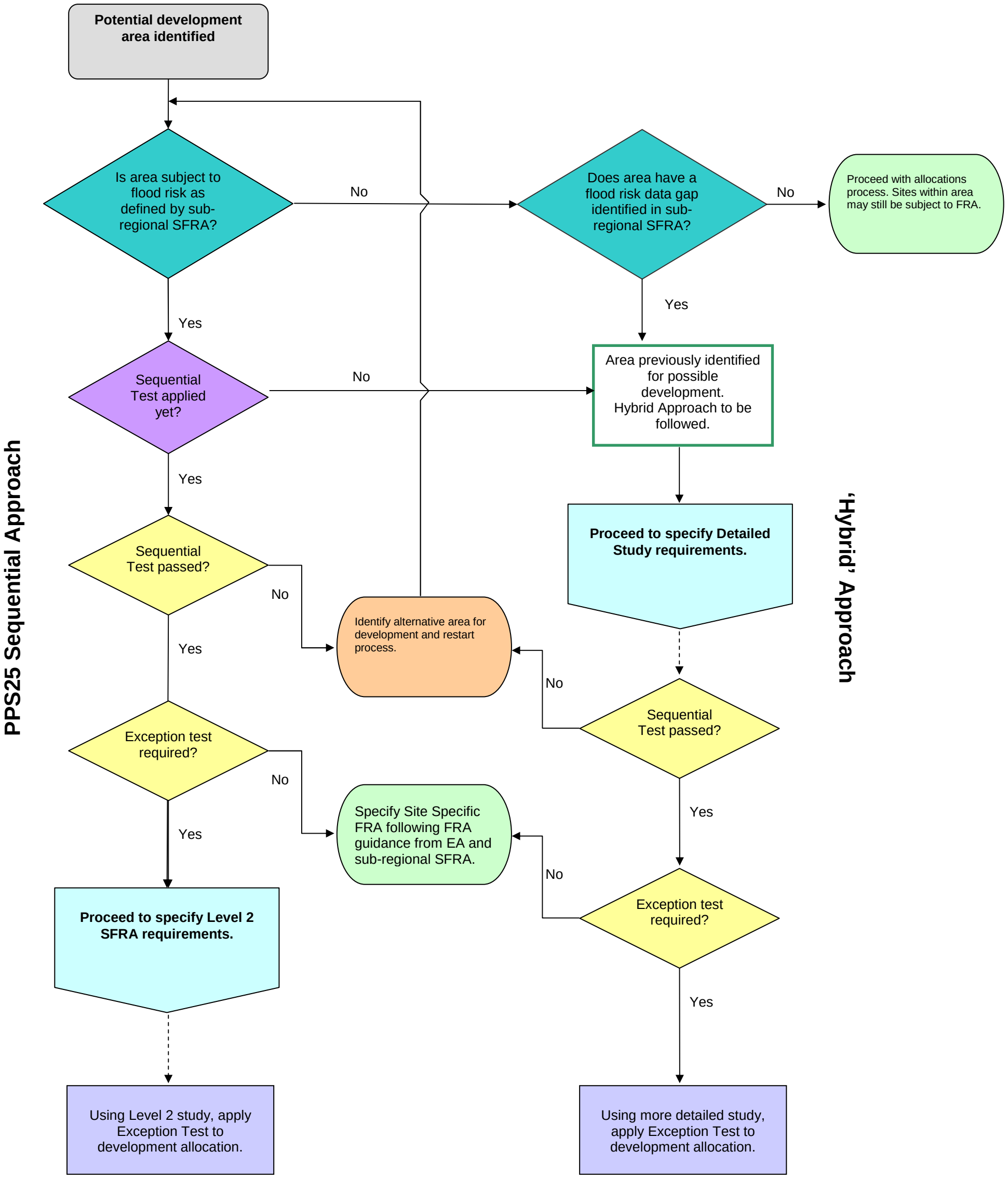


Chart 4-2: Specifying the requirements of a Level 2 SFRA or more detailed study for fluvial and pluvial sources of flooding.

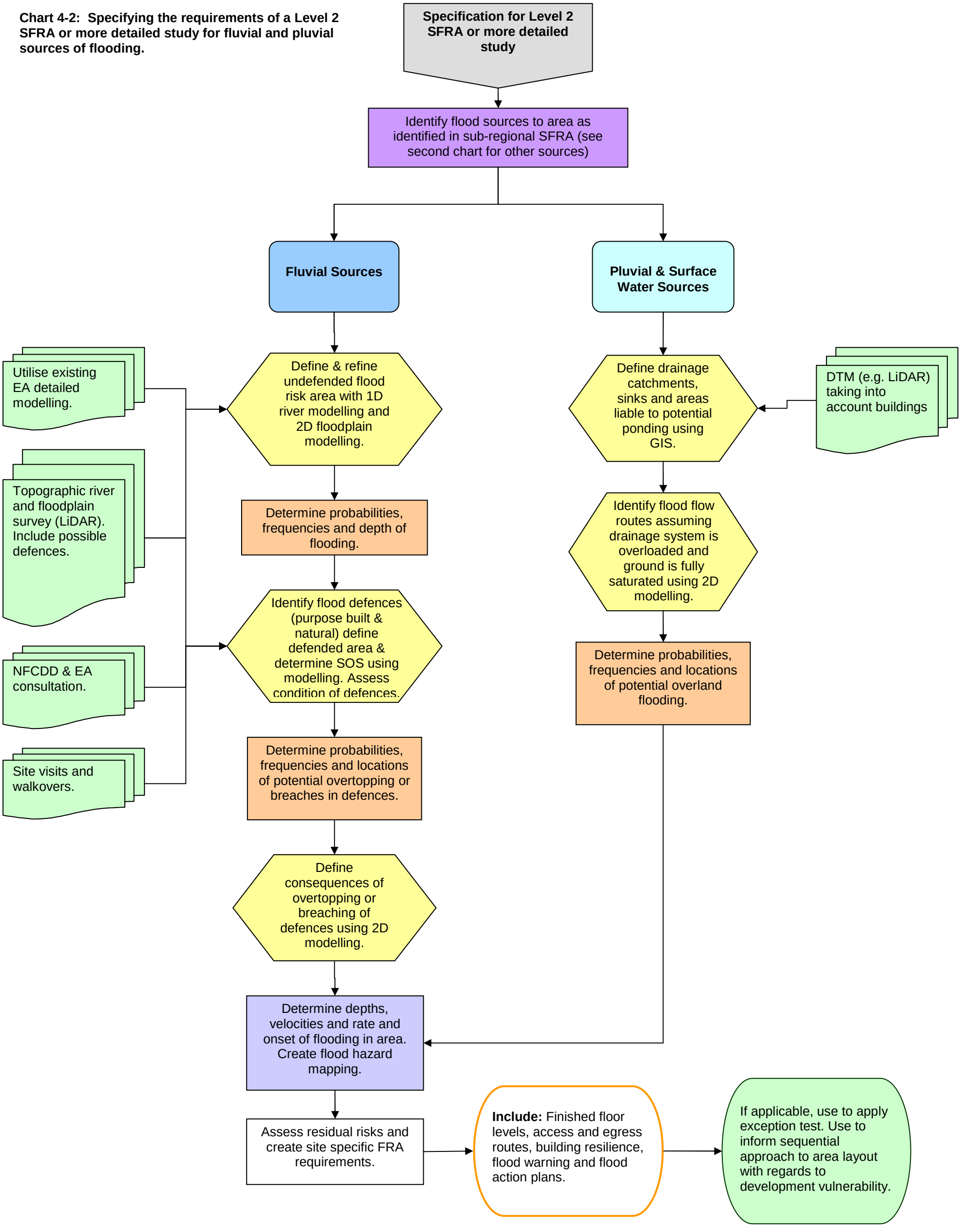
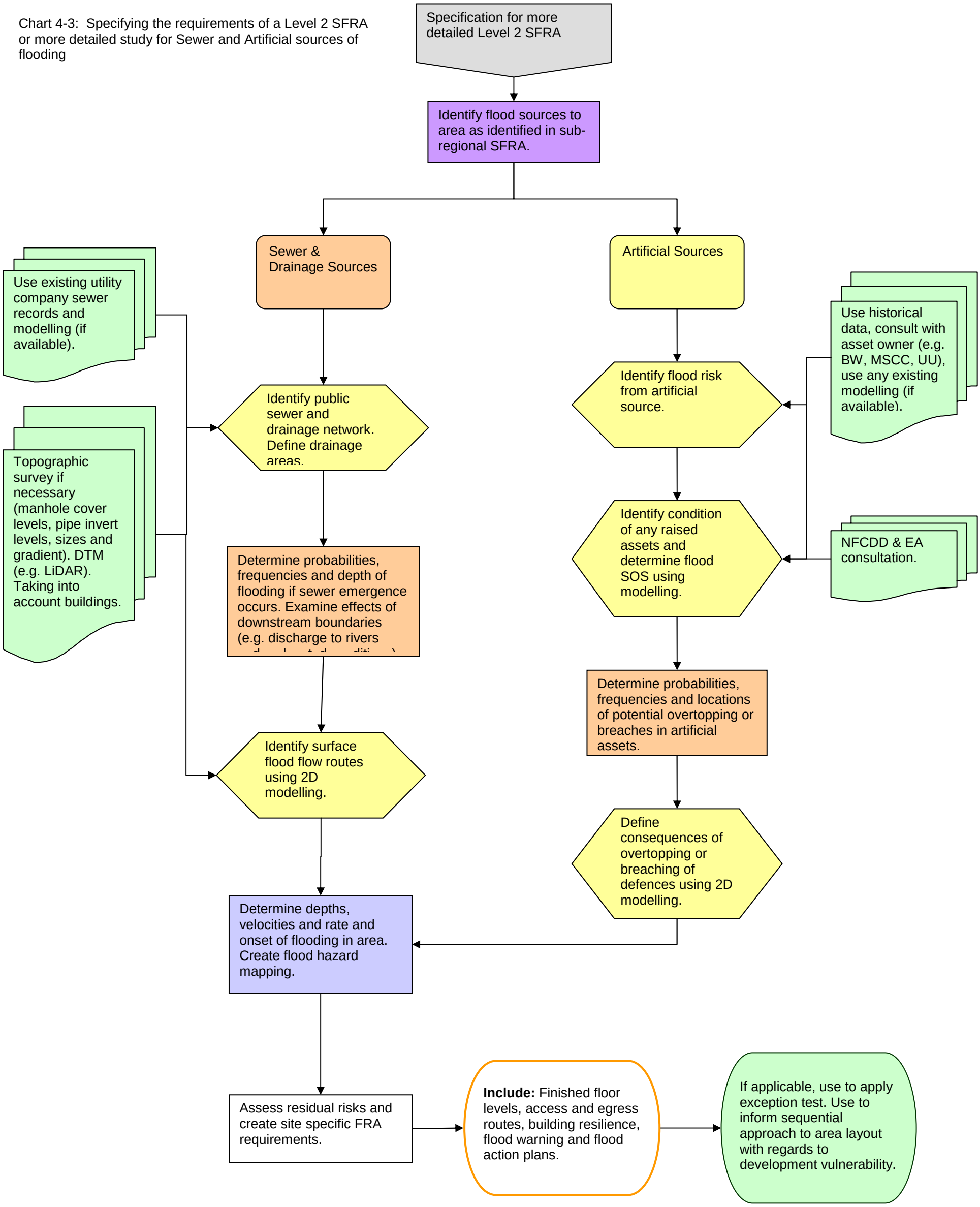


Chart 4-3: Specifying the requirements of a Level 2 SFRA or more detailed study for Sewer and Artificial sources of flooding



4.4 Level 2 SFRA Output

4.4.1 In accordance with the PPS25 Practice Guide and Chart 4-1 the scope of a Level 2 fluvial SFRA should consider the detailed nature of the flood hazard within each Flood Zone and specifically determine:

- The probability of flooding;
- Depth of flooding;
- Frequency and locations of potential overtopping or breach of defences
- Velocities and onset of flooding
- Flood hazard mapping.

4.4.2 Following discussions with the Environment Agency and Tameside MBC and given the characteristics of the River Tame (steepness, mechanism of flooding etc.) in the four key Potential Development Areas, it was not considered necessary to undertake two-dimensional modelling for the Level 2 SFRA in these areas. The logic of this decision will become clearer in Section 6. Therefore the outputs required for the Level 2 SFRAs are:

- The probability of flooding (flood extent);
- Depth of flooding and;
- Flood hazard mapping.

4.4.3 The depth hazard categories have been mapped using guidance set out in the DEFRA/EA Flood Risk Assessment Guidance for New Development Technical Report[3], which suggests categorising depth hazard as shown in Table 4-1.

Table 4-1: Key to Depth Hazard

Depth of Flooding*	At Risk
0.30m - 0.50m	Some
0.50m - 1.50m	Most
>1.50m	All
*Taken from Table 13.1, FD2320/TR2 Report	

4.4.4 The information on flood probability and depth hazard maps within the four key Potential Development Areas will provide the additional information required for the Exception Test and formulation of appropriate development policies in these areas.

[3] Flood Risk Assessment Guidance for New Development, Defra/EA Flood and Coastal Defence R&D Programme Technical Report FD2320/TR2, October 2005

4.4.5 Following discussions with Tameside MBC and the Environment Agency it was agreed that a Level 2 SFRA for pluvial sources of flooding was not required for the Tameside SFRA. Instead, it was agreed that the Level 1 data will be screened to identify areas where further investigation of flood risk from pluvial sources is required as part of a Surface Water Management Plan (SWMP).

5 Level 1 SFRA Update

5.1 Flooding History

5.1.1 There have been a number of reported incidents of flooding from different sources within the district of Tameside. Figure 5-3 in Appendix 1 shows locations of reported incidents of historical flooding in the district. In 1998 a major incident of flooding from the River Tame was reported in Mossley and Uppermill in Oldham and from the River Etherow in Hollingworth (Source: Upper Mersey CFMP). Information received from BW shows that overtopping and breach of the Huddersfield Narrow Canal occurred in 1972 near the Stamford (Stalybridge) Golf Course west of Buckton Vale (Figure 5-3 in Appendix 1) as a result of vandalism. Micklehurst Brook caused flooding along Micklehurst Road on 24 August 2004. Data received from Tameside MBC shows recorded evidence of flooding in Mossley, Ashton-under Lyne, Stalybridge and Hyde (see Figure 5-3, Appendix 1). A number of incidents of historical flooding have been reported within the district resulting from surface water runoff, and hydraulic overloading of highway drains and public sewers.

5.2 Level 1 Update of Fluvial Flooding across Tameside

Fluvial Sources of Flooding within Tameside

5.2.1 The River Tame is the main watercourse within the administrative boundary of Tameside. Other main rivers within the district are the River Medlock and River Etherow and their tributaries. The River Tame and Etherow are both part of the Upper Mersey catchment. Both rivers rise in the Pennines with steep to moderate channel gradients and are amongst the steepest of the main watercourses within the Upper Mersey catchment. Figure 5-1 shows an overview of the main watercourses within Tameside.

5.2.2 The River Tame drains the north-eastern area of the Mersey catchment on the western flank of the Pennines with a total area of 147km^2. The source of the river originates as an outflow from Readycon Dean Reservoir (Readycon Dean Brook) in the moors above Denshaw. The channel passes into Crook Gate, Dowry and New Years Bridge Reservoirs before proceeding past Denshaw and through Delph where it is joined by a number of tributaries including Thurston Clough, Wall Hill and Hull Brooks. At Dobcross east of Oldham, the River Tame is then joined by Diggle Brook and Pickhill Brook.

5.2.3 From here, the Tame flows in a general south westerly direction through Tameside. Tributaries of the River Tame through Tameside include Chew Brook in Oldham; Micklehurst Brook, Swineshaw Brook and Carr/Staly Brook in Mossley; Fern Bank Brook in Stalybridge; Johnson Brook on the Hyde/Dukinfield boundary; Denton Brook in Denton and Wilson Brook and Godley Brook in Hyde.

5.2.4 The River Medlock rises from the north east of Oldham and then flows south west beyond Oldham towards central Manchester. Short reaches of the river flow along or just within Tameside's northern boundary. The river then flows through east Manchester taking a westerly course to its confluence with the River Irwell in central Manchester. Tributaries of the Medlock within Tameside include Holden Clough, Taunton Brook and Lumb Clough draining the north western part of the district before discharging into the Medlock.

5.2.5 Other watercourses passing through Tameside include Jeremy Brook and Dodgeleach Brook in Audenshaw.

5.2.6 The River Etherow is a tributary of the River Goyt. It flows along the south eastern boundary of the borough into Stockport where it joins the Goyt below Compstall. Longdondale/Hurstclough Brook originates near Mottram within Tameside and is a tributary of the River Etherow, joining at Broadbottom.

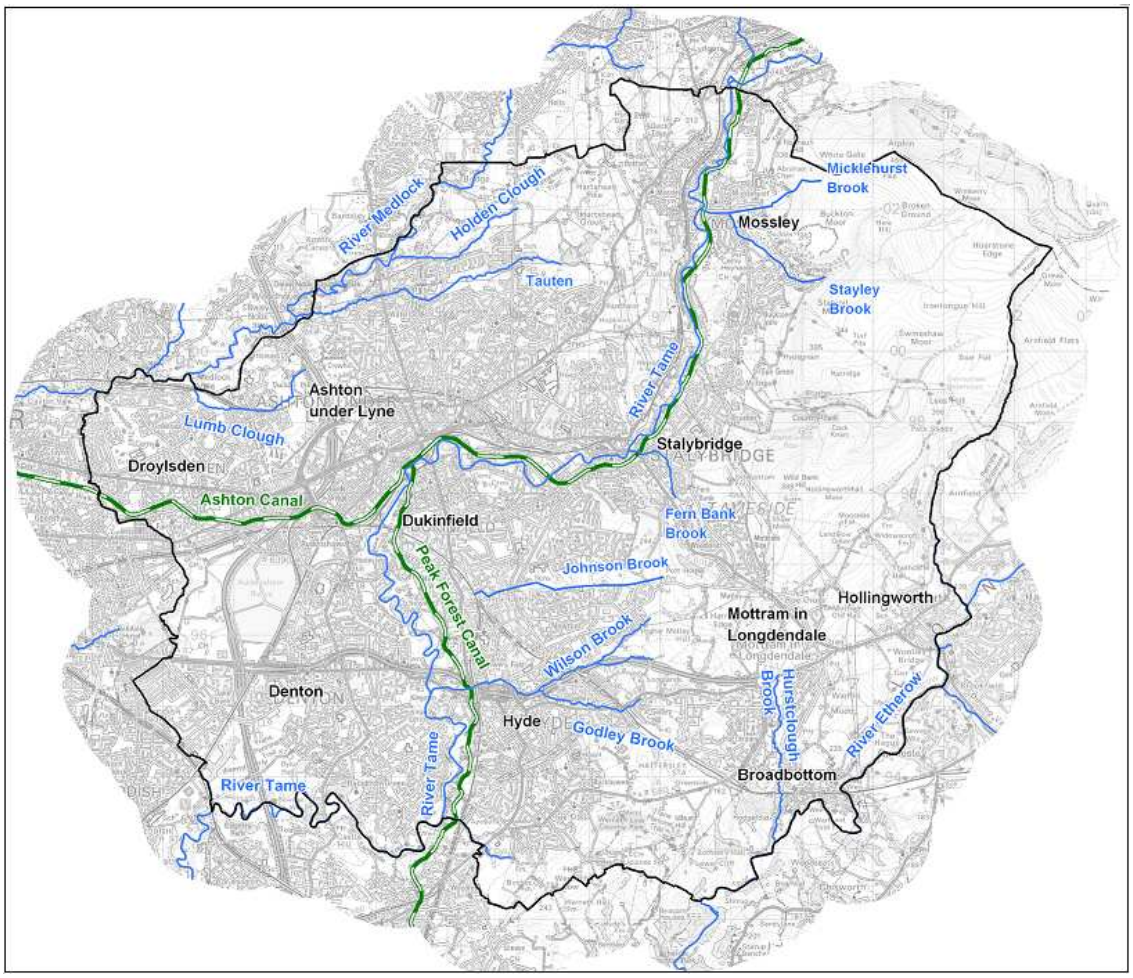


Figure 5-1: Overview of watercourses in the borough.

5.2.7 The Tame proceeds southwards out of Tameside into Stockport where it merges with the River Goyt to form the River Mersey.

Method of Assessment

5.2.8 Assessment of fluvial flood risk at district level was based on Flood Zone maps received from the EA which, as part of the Level 2 SFRA scope, were updated with new flood outlines for the River Tame derived using detailed river modelling techniques. This was achieved by combining four separate models of different reaches of the River Tame extending from the northern Tameside borough boundary to approximately 1.2km downstream of the confluence of the River Tame with Wilson Brook at Hyde. This is discussed in more detail in Section 6.2.

5.2.9 The level of confidence in the Flood Zones from the Level 1 update varies depending on whether they have been derived from detailed hydraulic modelling (higher confidence) or using generalised broad-scale flood mapping methods (medium to low confidence). Figure 5-2, Appendix 1 shows reaches of watercourses within the district for which the Environment Agency holds hydraulic models. Flood Zones that are not based on detailed hydraulic modelling data are likely to be less accurate compared to the modelled reaches. It is therefore important to take this into consideration when undertaking FRAs in future (see Section 8.1.4 for more information).

Flood Risk Maps

5.2.10 A map showing the updated Flood Zones within Tameside MBC is shown in Figure 5-1, Appendix 1. The maps show that the risk of fluvial flooding within the borough is generally low. Flood Zone 3b is generally contained within the river banks. Flood Zone 3a and Flood Zone 2 extend out of bank at some locations, however, the spread of the Flood Zones beyond the river banks is generally limited by the incised nature of the valleys.

5.2.11 The areas at relatively greater risk of fluvial flooding are listed below. Those that also fall within the four key Potential Development Areas are discussed in more detail in Section 6.

- Waterloo area in Ashton, along Taunton Brook near the A627 road crossing. Flooding in this area is from Taunton Brook and a minor tributary from the south;
- The industrial area near the confluence of the River Tame and Carr/Staly Brook in Mossley. Flooding in this area is from the River Tame combined with Carr/Staly Brook;
- The area bound by Bayley Street, Dale Street, Bridge Street and the River Tame in Stalybridge and the area bound by Park Road and the River Tame;;
- The Shepley South and Shepley North Industrial Estates. Flooding in this area is from the River Tame;
- The area near the sewage works, south of the Shepley South Industrial area. Flooding in this area is from the River Tame;

- The areas adjacent to the River Tame, near the Wilson Brook confluence. Flooding in this area is from the River Tame.

5.2.12 All these areas are located partly or wholly within the flood outlines for the 1% AEP (1 in 100 year) event. The flood outlines for the River Tame were derived from detailed models. Therefore, the confidence associated with them is relatively high.

5.2.13 Elsewhere within the district where the extent of Flood Zone 3a and Flood Zone 2 is significant the flood plain lies within the Green Belt where planned development is very limited (Figure 3-3 and Figure 5-1 in Appendix 1). The risk to properties in these areas is therefore low.

5.2.14 It should be noted that the Flood Zone map shown in Figure 5-1, Appendix 1 only includes outlines for Main Rivers under the responsibility of the EA within the district that have a catchment area greater than 3km^2. The potential flood risk posed by relatively smaller ordinary watercourses (under the responsibility of the LPA/IDB/private land owners) should be taken into consideration in future FRAs for sites located close to such watercourses.

5.3 Pluvial Flood Risk (flooding from overland flow)

Source of Flooding

5.3.1 Overland flow is caused by water flowing over ground surfaces that has not entered a natural drainage channel or artificial drainage system[4]. Overland flow often occurs typically when the soil is saturated and natural drainage channels or artificial drainage systems do not have the capacity to absorb the additional flow. Overland flow can cause localised flooding in natural valley bottoms as normally dry areas become covered in flowing water and in natural low spots where the water may pond. Flooding from this source can occur anywhere within a catchment, but is most likely to occur in relatively low-lying areas, or where the main runoff pathways are restricted by terrain or man-made obstructions.

Method of Assessment

5.3.2 There have been reported incidents of localised highway flooding and other non-specific reported incidents of flooding in Tameside (see Figure 5-3 in Appendix 1). Apart from these reported incidents of flooding, the only district wide information on pluvial flood risk is the Environment Agency's map showing Areas Susceptible to Surface Water Flooding (ASTSWF). The ASTSWF maps were produced for the whole of the UK. The latest versions of the Environment Agency maps for Tameside MBC were requested and provided for the study as a GIS layer, which could be overlaid with maps and other spatial data types. The ASTSWF maps provide three bandings including 'less', 'intermediate' and 'more' susceptible to surface water flooding. The 'more' band will normally be useful to

[4] CIRIA Report C624. Development and flood risk – guidance for the construction industry. London 2004.

help identify areas which have a natural vulnerability to flood first, flood deepest, and/or flood during relatively frequent, less extreme events (when compared to the other bands).

5.3.3 The map was produced following a simple method that uses rainfall data for a 6.5 hour storm with a 0.5% average probability of being exceeded each year (1 in 200 AEP).

5.3.4 The ASTSWF maps were used to highlight pluvial flood areas within the district. An assessment of the topography based on a LiDAR (light detection and ranging) digital terrain model (DTM) was also undertaken to investigate the general natural drainage pattern within the district and to identify low-lying areas where ponding of surface water is likely to occur.

Results

5.3.5 The ASTSWF maps should be interpreted with caution as they are based on broad scale modelling. The Environment Agency recommends that LPAs should use local data to assess the bands and then decide which bands are most appropriate for their purposes, noting that surface water flooding can occur outside of the bands[5]. Because of the way the ASTSWF maps have been produced and the fact that they are indicative, the maps are not appropriate to act as the sole source of evidence for any specific planning decision at any scale without further supporting studies or evidence. Their use in planning will normally be to highlight areas where more detailed study of surface water flooding may be appropriate as part of a SFRA in England. In this study we have used all bands combined for the screening of wider areas that are susceptible to surface water flooding. **It is emphasised that this is a broad screening approach which should be refined in future SWMPs**.

5.3.6 The ASTSWF map for Tameside (Figure 5-4 in Appendix 1) provides a general overview of pluvial flood risk areas within the district and the distribution of flood prone areas is supported by topographical data based on LiDAR. It shows a wide distribution of ASTSWF within the district. Areas susceptible to pluvial flooding include Droylsden, Ashton-under-Lyne, Denton, Hyde and Audenshaw. Mossley, Stalybridge and Dukinfield are shown to be less susceptible to surface water flooding. These areas lie on a relatively higher elevation compared to the rest of the district.

5.3.7 Generally, the low lying areas along the river valleys and along the course of culverted watercourses as well as natural low spots appear to be most susceptible. The LiDAR map (Figure 5-5, Appendix 1) shows the western part of the district to be relatively low compared to the rest of the district. These areas appear to be the most susceptible to surface water ponding. Nonetheless, there is a risk of surface water flooding in the higher-lying areas as well and flash flooding is more likely to occur in these areas due to the steep nature of their topography.

[5] Areas Susceptible to Surface Water Flooding - Guidance for Local Planning Authorities in ENGLAND for land use planning and other purposes (not emergency planning). Version 1. Environment Agency. July 2009.

5.4 Sewer and Drainage Flood Risk

Source of Flooding

5.4.1 Much of the sewer network within Tameside and other parts of Greater Manchester dates back to Victorian times, and some of which is of unknown capacity and condition. More recent sewers within the district are likely to have been designed to the guidelines in *Sewers for Adoption* (WRC, 2006). These sewers tend to have a design standard of up to the 3.3% AEP (1 in 30 year rainfall event,), although in many cases, it is thought that the design standard is lower, especially in privately owned systems.

5.4.2 During heavy rainfall, flooding from artificial drainage systems may occur if:

- the rainfall intensity and/or duration results in the capacity of the drainage system becomes exceeded;
- the system becomes blocked by debris or sediment;
- The system surcharges due to high water levels in rivers.

5.4.3 Sewer flooding has the potential to occur anywhere within the borough, especially in areas with a high urban density.

Method of Assessment

5.4.4 UU provide potable water distribution and wastewater services for Tameside. UU have provided an updated register of flood events that have affected properties (internal) and outside areas such as roads (external) to a five-digit postcode area (Figure 5-6 A, Appendix 1) for the SFRA. The register, known as the DG5 register, contains commercially sensitive information that is also covered by the Data Protection Act (1998).

5.4.5 UU has also provided data showing drainage catchment areas within the district (Figure 5-6 B, Appendix 1) and the drainage network for Tameside. Although this information does not show which areas are at risk of flooding from the sewer network, it gives an overview of which areas are connected and drain to the respective Waste Water Treatment Works (WwTW) within the district. Due to the sensitivity of the sewer network data, UU were unable to provide model results data from their sewer network. The DG5 data is therefore the only data available on flooding from the public sewer network.

5.4.6 Tameside MBC also provided information on recorded flooding incidents from highway drains within the district as a GIS layer, which illustrates the locations where flooding has occurred in the past from this source.

Results

5.4.7 Due to lack of model data showing which parts of the sewer network have insufficient capacity and areas at risk of flooding from sewers; a detailed analysis of the scale and consequences of sewer flooding has not been possible at this stage of the SFRA. The DG5 data and historical records of flooding are the only data sources that were available for the SFRA. These historical data are purely a record of instances of flooding and do not provide an indication as to the current or future flood risk posed by the sewer and drainage network. It is even possible that the causes of the flooding incidents recorded during these events have already been addressed by UU through having undertaken improvement works to resolve problems thus alleviating the sewer flooding issue. For completeness however, a map showing the DG5 data is presented in Figure 5-6 (A), Appendix 1. Recorded incidents of flooding from the drainage system provided by Tameside MBC are shown in Figure 5-3, Appendix 1.

5.4.8 The historical data suggest that the risk of flooding from sewers and the drainage system is low. Audenshaw stands out as the area with the highest risk of sewer flooding based on the DG5 data. Up to 11 incidents of external flooding of properties have been recorded in the area. However, it should be noted that the events recorded are for a high AEP and therefore the risk of flooding from more significant events (with a low AEP) is unknown at this stage. The latter can only be quantified by a more detailed hydraulic assessment of the sewer network and topographic data.

5.5 Critical Drainage Areas

5.5.1 One of the requirements of the SFRA was to have been the identification of Critical Drainage Areas (CDAs) and the need for Surface Water Management Plans (SWMP) to inform development policies. This requirement is also highlighted in paragraph 3.57 of the PPS25 Practice Guide as a required output from a Level 2 SFRA.

5.5.2 The question of CDAs has been raised and discussed on several occasions with LPAs, the Environment Agency, UU and representatives from other AGMA councils at different stages of the SFRA. It became clear during these discussions that although CDAs have been mentioned in the SWMP Technical Guidance[6] (Defra 2009), and in PPS25, there is no clear definition of what actually constitutes a CDA.

5.5.3 For the purpose of this SFRA a CDA is considered to be an area contributing surface water runoff, either as direct overland flow or from the existing sewer network, which causes significant flooding at locations within that area. The risk of flooding is thereby confirmed, either by historical evidence, or through numerical modelling or other detailed form of analysis. A CDA therefore has areas within it where surface water flood risk exists (flood-prone areas within a CDA) and areas where properties, although not directly at risk, contribute to that flood risk (upstream areas in a CDA directly affecting flood-prone areas).

[6] Defra. Surface Water Management Plan Technical Guidance - Living draft version 1. February 2009

5.5.4 It was agreed with the Steering Group that a screening approach to identify CDAs rather than a detailed assessment would suffice for the SFRA. A simplified methodology to identify CDAs was proposed based on the following considerations:

- historical data on surface water flooding, where available;
- Environment Agency maps showing ASTSWF;
- topographical data (LiDAR and FEH catchment boundaries);
- UU drainage area maps.

5.5.5 The methodology was applied in Tameside. However, due to the uncertainty of the ASTSWF data and lack of sufficient/significant historical flooding data and availability of sewer model output data, it was concluded that a more precautionary approach should be taken to avoid misinterpretation of current and future surface water flood risk. It was agreed that it would be better to focus on identifying policies for CDAs rather than defining CDAs on a map based on insufficient information.

5.5.6 Management policies based on the precautionary principle have been discussed and agreed with Tameside MBC and the Environment Agency based on the above definition of a CDA. The policies and their application should be reviewed as more data on surface water flood risk becomes available to enable CDAs to be defined based on more accurate data. UU are currently considering sharing their sewer model data in future SWMPs and it is anticipated that such data will greatly improve the definition of CDAs across the district.

5.5.7 The CDA work has highlighted cross boundary issues that need to be taken into consideration in future SWMPs. A review of the LiDAR and catchment boundary data shows that part of the south west area of the district drains into Manchester and part of the southern area of Tameside drains into Stockport (Figure 5-5, Appendix 1). Figure 5-6B, Appendix 1 also shows that part of Hadfield and Glossop in Derbyshire drain into Tameside via UU's drainage system.

5.5.8 The CDA screening pointed to Audenshaw and its surrounding in the south western part of the borough (Droylsden, Ashton-under-Lyne and Denton) as areas requiring further attention in future SWMPs. These areas lie on the lower parts of the local river valleys and are shown to be prone to pluvial flooding based on ASTWF maps. Audenshaw also has the highest number of properties registered in the DG5 register.

5.5.9 The historical evidence of flooding suggests that the steep parts of the Tame catchment to the east of the River Tame (Figure 5-3, Appendix 1) are more vulnerable to flooding. This may be due to rapid runoff being generated towards the River Tame or simply a reflection of gaps in the historical records. The effect of additional flows from neighbouring settlements upstream of Tameside in Derbyshire to the east into UU's drainage network (as shown in Figure 5-6 A, Appendix 1) would also require further investigation in future surface water flood risk studies (SWMP).

5.6 Flood Risk from Man-Made/Artificial Sources – Canals

Source of Flooding

5.6.1 The risk of flooding from canals is generally low because of their regulated nature. The main source of flooding from canals results from a breach of raised canal embankments or collapse of a canal reach above culverted sections of a watercourse.

5.6.2 Sections of the Ashton Canal, Peak Forest Canal and Huddersfield Narrow Canal run through Tameside. The Huddersfield Narrow Canal originates in the Pennine moorland with many reservoirs and proceeds through Tameside from the north, very close to the River Tame, up to the canal junction in Ashton-under-Lyne near Dukinfield Junction, where it links with the Peak Forest Canals and the Ashton Canal. The Ashton Canal continues westwards towards Manchester and the Peak Forest Canal continues south towards Stockport following very closely the course of the River Tame. The Huddersfield Narrow Canal runs through the two key Potential Development Areas in Mossley and the Ashton-Stalybridge corridor. The Peak Forest Canal runs close to the third key Potential Development Area; Shepley North Industrial Estate and the site off Gate Street in Dukinfield, and crosses the fourth key Potential Development Area to the south in Hyde.

5.6.3 From the information provided to inform this study there is evidence of a residual risk of flooding from canals in Tameside. Generally the canals have a freeboard of approximately 300mm between the normal water level and canal bank, and water levels are controlled by overflow structures/sluices. However, as historic records have shown, the Huddersfield Narrow Canal was overtopped and breached as a result of vandalism in 1972.

Method of Assessment

5.6.4 The flood risk posed by a potential breach in the canal may be direct or indirect. Direct flooding occurs when properties and assets are flooded by a flood wave travelling overland from the breach location, whereas, an indirect flood risk occurs when flood waters from a breach flow into a nearby watercourse leading to an increase in flow and over-spilling onto adjacent properties and assets.

5.6.5 Following consultations with the Steering Group, a detailed assessment of flood risk from canals through breach modelling was considered to be beyond the scope of the SFRA. A qualitative assessment based on a review of the LiDAR DTM, Ordnance Survey (OS) maps and data provided by BW was undertaken to provide an indication of likely breach flow route and potential risk areas. Sections of canal raised on embankments elevated above the surrounding land (either man-made or cut into a natural hillside) were identified where they run alongside a watercourse, and/or form viaducts with watercourse crossings culverted beneath. The results are summarised in (Table 5-1) and Figure 5-7 in Appendix 1.

Results

5.6.6 Figure 5-7 in Appendix 1 identifies a number of locations within the borough, where canals are more vulnerable to a potential breach because of an existing raised embankment or culvert passing beneath them.

5.6.7 Table 5-1 provides further details of these locations provided, together with the potential breach type.

Table 5-1: Locations where a potential canal breach could affect watercourse flows.

Figure 5 7 Inset No.	Potential Canal Breach Location (Approximate NGR)	Potential Breach Type	Direct/Indirect Flood Risk	Potentially Affected Watercourse
1	Huddersfield Narrow Canal – west of Mossley (SD979027)	Raised embankment	Indirect	River Tame
2	Huddersfield Narrow Canal – west of Buckton Vale (SD975012)	Culverts beneath canal / raised embankment	Indirect	River Tame
3	Peak Forest Canal – west of Dukinfield (SJ934980)	Culverts beneath canal	Direct/Indirect	River Tame
4	Peak Forest Canal – Broomstair Bridge (SJ943952)	Culverts beneath canal	Indirect	River Tame
5	Peak Forest Canal – west of Dukinfield Hall (SJ933971)	Raised embankment	Indirect	River Tame
6	Peak Forest Canal – east of Gower Hey Wood (SJ943941)	Raised embankment	Indirect	River Tame
7	Peak Forest Canal – east of Haughton Green (SJ941933)	Culverts beneath canal	Indirect	River Tame

5.6.8 Figure 5–7, Appendix 1 and Table 5-1 indicate that in most cases, the flood risk posed by a breach in the canal is an indirect flood risk, whereby a sudden influx of additional flows discharged from the canal into a nearby watercourse would increase water levels and thus flooding downstream. The scale of the risk would inevitably be proportional to the volume of water contained within the canal between two adjacent locks, in conjunction with the water levels within the watercourse immediately prior to a breach.

5.6.9 The only location where a raised embankment exists in close proximity to a key Potential Development Area is a reach adjacent to Dukinfield Junction. Flood water from a breach along this section is likely to drain into the River Tame.

5.6.10 PPS25 paragraph E9 states that a site specific FRA for development should investigate, in addition to any fluvial flood risks, the risk posed by other sources of flooding. Therefore, any development in the vicinity of a potential canal embankment breach vulnerability area, such as those identified in Figure 5-7, would require further detailed assessment as part of a site specific FRA to quantify the risk.

5.6.11 A hydrological link between the River Tame and the two canals (Huddersfield Narrow Canal and the Peak Forest Canal) is very likely to exist during high flow events. This has been considered to be beyond the scope of the SFRA and has therefore not been investigated. It is understood that the Environment Agency is aware of this however, and may consider whether to commission future studies to investigate these linkages.

5.7 Flood Risk from Man-Made/Artificial Sources – Reservoirs

Source of Flooding

5.7.1 The risk of flooding from reservoirs is mainly related to the possibility of dam/reservoir wall failure and emergency releases into the catchment. Some of the reservoirs or storage areas within Tameside are subject to the Reservoirs Act 1975 because their storage volumes are greater than 25,000 m^3. The Audenshaw Reservoirs are the largest in the district.

5.7.2 There are also many reservoirs located outside of the study area boundary which may pose a potential residual flood risk to Tameside as indicated on Figure 5-8, in Appendix 1. These reservoirs are located within the headwaters of many of the watercourses which flow through Tameside. The residual risk from these reservoirs is due to additional flows discharging to the rivers and increasing the risk of flooding downstream.

Method of Assessment

5.7.3 The Environment Agency is currently producing Reservoir Inundation Maps (RIM) to quantify the risk of flooding from reservoirs throughout the UK. When completed, RIM will provide detailed flood extent and hazard data. However, it is understood that RIM outputs will not be available to inform the planning process due to security reasons. Therefore for the purpose of the SFRA a qualitative assessment has been undertaken to identify the potential flood risk from reservoirs within the district following a breach.

5.7.4 In the event of a breach or overtopping of the reservoir control structure or embankment the predominant flow route has been identified based on an assessment of local topography and the DTM (based on LiDAR data). It is important to note that no detailed modelling of the flood route or flood depths has been undertaken as part of this study. Flooding from a reservoir breach is a complex process and modelling of reservoir breaches is considered to be beyond the scope of this SFRA, as agreed by the Steering Group. **It is important to note that the assessment method applied in the SFRA is a simplification with the sole purpose of signposting obvious residual risk areas and does not provide a definitive indication of flow routes or risk**.

Results

5.7.5 Figure 5-8 (Appendix 1) identifies thirteen reservoirs where a breach in the control structure or embankments could pose a flood risk to development within Tameside MBC administrative area. The general flow route anticipated in the event of a breach is also identified on Figure 5-8 (Appendix 1), which can be used to indicatively show potential breach vulnerability areas. In general the predominant flow route is anticipated to follow the river valley in which the reservoir is located. Further details of these reservoirs and an indication of the predominant flow route are provided in Table 5.2.

Table 5-2: Reservoir and predominant direction of flow potential inside study area boundary

Figure 5 8 Inset No.	Reservoir Name	Category	Capacity m^3	Predominant Flow Direction
1	Hartshead	Service	35,000	Greenhurst Clough leading to River Medlock valley
2	Buckton Vale	Impounding	90,000	Carr Brook valley
3	Higher Swineshaw	Impounding	768,000	Swineshaw Brook valley leading to River Tame
3	Lower Swineshaw	Impounding	252,000	Swineshaw Brook valley leading to River Tame
4	Arnfield Reservoir	Impounding	977,000	Hollingworth Brook leading to River Etherow
5	Brushes	Impounding	237,000	Swineshaw Brook valley leading to River Tame
5	Walkerwood	Impounding	919,000	Swineshaw Brook valley leading to River Tame
6	Godley Covered	Service	67,000	Southwest towards Hyde
6	Godley Open	Impounding	257,000	Southwest towards Hyde
7	Audenshaw No.1	Non-impounding	2,590,000	Gore Brook leading to Chorlton Brook
7	Audenshaw No.2	Non-impounding	1,745,000	Gore Brook leading to Chorlton Brook
7	Audenshaw No.3	Non-impounding	2,680,000	Gore Brook leading to Chorlton Brook
8	Stamford Park Lake	Impounding	26,572	South towards Stamford Park

5.7.6 The information provided in Figure 5-8 (Appendix 1) and Table 5-2 indicates which reservoirs, in the event of a breach, may pose a potential flood risk to Tameside and/or neighbouring districts.

5.7.7 The most notable are the four cascading reservoirs (Higher and Lower Swineshaw, Brushes and Walkerwood) located within the Swineshaw Brook Valley, a tributary of the River Tame (see Figure 5-8). In the unlikely event of a breach in these reservoir control structures or embankments, additional flows could discharge to the River Tame, which may pose a residual flood risk to the Ashton to Stalybridge Corridor and Shepley Industrial Estates Potential Development Areas (Figure 5-8, Appendix 1).

5.7.8 In the event of a breach in the control structure or embankment of the Audenshaw Reservoirs, depending on the location of the breach around their perimeter, a significant flood risk would be posed to Audenshaw and the neighbouring Authority, Manchester.

5.7.9 In addition to the flood risk posed by reservoirs located within Tameside there are a number of reservoirs located in the headwaters of the River Tame and River Etherow. These reservoirs could pose a flood risk to the study area in the event of a breach.

5.7.10 Figure 5-8 (Appendix 1) also identifies the watercourses within the Tameside MBC administrative area that reservoirs discharge into. The approximate number of reservoirs and the general flow route anticipated in the event of a breach is also identified on Figure 5-8 (Appendix 1). Details of the watercourses and the reservoirs located upstream are provided in Table 5-3.

Table 5-3: Watercourses where reservoirs are located upstream outside of the study area

Watercourse Name	Approximate Number of Reservoirs Located upstream	Approximate Capacity (m^3) of Reservoirs located Upstream
River Tame	9	10,000,000
River Etherow	5	17,500,000
Glossop Brook (Leading to River Etherow)	1	170,000

5.7.11 Figure 5-8, Appendix 1 provides an overview of reservoirs and an indication of flow paths, thus highlighting the flood risk posed by reservoirs within and outside the study area.

5.7.12 There are also a number of smaller sized service reservoirs/ponds within the study area under the responsibility of Tameside MBC, which are not identified in Figure 5-8 or Table 5-3. PPS25 paragraph E9 states that a site specific FRA for development should investigate, in addition to any fluvial flood risks, the risk posed by other sources of flooding. Therefore, development proposed in close proximity to these and other reservoirs would require a site specific FRA to quantify the risk.

5.8 Groundwater Flood Risk

Source of Flooding

5.8.1 Groundwater flooding tends to occur after much longer periods (seasons) of sustained high rainfall, and the areas at most risk are often low-lying where the water table is likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

5.8.2 The main causes of groundwater flooding are:

- Natural groundwater rising due to exceptionally wet periods leading to rapid recharge.
- Groundwater rebound due to cessation of abstraction and mine dewatering
- Existence of confined aquifers and springs.

Method of Assessment

5.8.3 The Environment Agency was contacted to determine availability of groundwater flooding data since the Sub-Regional SFRA has been completed. The data requested include Groundwater Emergence Zone maps, historical evidence of groundwater flooding, groundwater vulnerability maps and groundwater levels data. The Environment Agency provided a broad scale map showing groundwater level contours within the far western part of Tameside district. The Upper Mersey CFMP and the British Geological Survey (BGS) Technical Report WD/97/34 were also reviewed to obtain information on the hydrogeology of the area and references made to groundwater flooding. The assessment was therefore based on review of these three data sources.

Results

5.8.4 There are no documented records of groundwater flooding within Tameside MBC district. Information on groundwater flood risk could not be obtained from either the Environment Agency or Tameside MBC. The Environment Agency has confirmed that Tameside is above a major lower coal measures aquifer and a secondary middle grit aquifer. Table 5-4 details the hydro geological units within Tameside MBC.

Table 5-4: Key Hydro geological Units in the Tameside MBC Borough

System and Lithostratigraphical Division		Aquifer Unit
Quaternary	Alluvium	Variable, but probably an aquitard
	River terrace deposits	Variable, but probably an aquifer
	Fluvio-glacial gravels	Variable, but probably an aquifer
	Glacial sand and gravel	Variable, but probably an aquifer
	Till	Variable, but probably an aquitard
Triassic	Ormskirk/Helsby Sandstone Formation	Aquifer
	Wilmslow Sandstone Formation	Aquifer
	Chester Pebble Beds	Aquifer
	Kinnerton Sandstone Formation	Aquifer
Permian	Manchester Marl Formation/ *Bold Formation*	Mainly aquitard/*aquifer*
	Collyhurst Sandstone Formation	Aquifer
Carboniferous	Coal Measures	Multilayered with aquitard and aquifer units
	Milstone Grit	Multilayered with aquitard and aquifer units

5.8.5 The Wilmslow Sandstone Formation, Chester Pebble Beds Formation and Collyhurst Sandstone Formation are all classed as major aquifers (aquifers allow groundwater movement). In addition, sandstone horizons within the Coal Measures and Millstone Grit may also act as minor aquifers (See Table 5-4). Where these are present at outcrop, there

is some potential for groundwater flooding. However, much of the study area is covered by a blanket of Till, which is expected to behave as an aquitard (aquitards prevent groundwater movement).

5.8.6 Other areas where there is potential for groundwater flooding are those underlain by glacial sand and gravel, fluvio-glacial gravels or river terrace Drift deposits. These are expected to behave as aquifers, although the nature of the deposits is likely to vary on a local scale. It is possible that these Drift deposits will contain perched groundwater tables, and may be in hydraulic continuity with surface water courses.

5.8.7 The Environment Agency's groundwater contour map illustrates groundwater levels between 60 to 50 mAOD in the far west corner of the district. The LiDAR DTM has shown that the ground level is approximately 75mAOD in this area and therefore groundwater is present approximately 10m below the surface. As part of a detailed FRA for any new development, localised groundwater levels should be investigated from Geological Investigation (GI) results.

5.8.8 The body of evidence on groundwater shows that generally, the risk of groundwater flooding within the district is low.

6 Tameside Level 2 SFRA

6.1 Development Proposals in the Key Potential Development Areas

6.1.1 Four key Potential Development Area have been identified in Tameside:

- Mossley (Egmont Street to Manchester Road / Tame Street junction);
- Ashton – Stalybridge Corridor (Portland Canal Basin, Ashton to North End Road, Stalybridge);
- Shepley Industrial Estates and adjoining / nearby land;
- Sites at Watson Street, Denton; Manchester Road / Mill Lane, Hyde and alongside Godley Brook and Wilson Brook, Hyde.

6.1.2 These four areas fall partially within Flood Zone 2 (>=0.1% AEP) and Flood Zone 3 (>=1% AEP) and therefore require a Level 2 SFRA.

6.1.3 A description of the specific development proposals in each area and their vulnerability classification to flooding according to PPS25 are set out in Appendix 2 (Tameside Level 2 SFRA – Planning Policy Summary Table).

6.2 Level 2 Fluvial Flood Risk Assessment in Key Potential Development Areas

6.2.1 A Level 2 SFRA has been undertaken to provide sufficient detail on fluvial flood risk to inform the Sequential Test and the Exception Test for the development of appropriate planning policies within the four Potential Development Areas. Detailed hydraulic modelling was undertaken as part of the Level 2 SFRA to determine Flood Zones within the four Potential Development Areas and produce flood envelopes and flood depth hazard maps for the Exception Test. Flood defences within the four Potential Development Areas were inspected to determine their conditions and standard of protection (SoP), where applicable. An assessment of the impact of development in the four Potential Development Areas was also undertaken.

Sources of Fluvial Flooding to the Four Key Potential Development Areas

6.2.2 The main source of flooding to the four Potential Development Areas is the River Tame and its tributaries. Most of the tributaries flowing through the Potential Development Areas are small steep and partly culverted watercourses with relatively smaller discharges compared to the River Tame. Tributaries of the Tame flowing through the areas include Wilson Brook and its smaller tributary from the south Godley Brook (Hyde), Carr/Staly

Brook (Mossley), Micklehurst Brook (Mossley), Fern Bank Brook (Stalybridge). These watercourses generally flow in an east-westerly direction before discharging into the River Tame (Figure 5-1). There are no significant tributaries discharging along the western bank of the River Tame through Tameside.

Hydraulic Model availability

6.2.3 The River Tame flows through the four Potential Development Areas that require a Level 2 SFRA. The Environment Agency holds a number of hydraulic models for different reaches of the River Tame as shown in Figure 6-1. The models were constructed on behalf of the Environment Agency at different times for different flood studies. In a recent study some of the models were reviewed under the Strategic Flood Risk Management Framework (SFRM) to address some of the inconsistencies found in some of the separate model results.

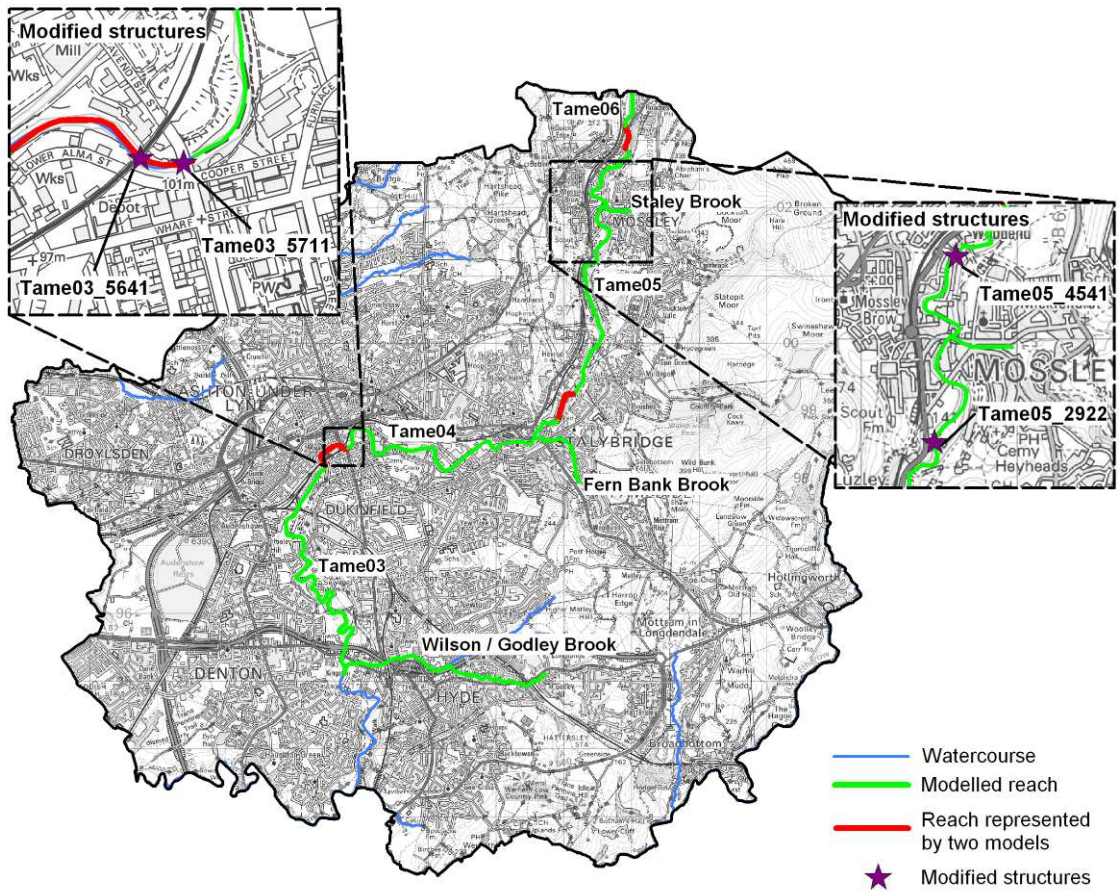


Figure 6-1: Model coverage and hydraulic structures modified in the combined model

Mossley

6.2.4 Three Environment Agency hydraulic models cover the Mossley Potential Development Areas. The models in this reach are the Tame06, Tame05 and Carr/Staly Brook models. The Tame06 and Tame05 models overlap at Roaches Bridge north of the development area. Carr/Staly Brook flows into the River Tame at its confluence to the north of the Bottoms area in Mossley. The upstream extent of the Carr/Staly Brook model is located at the junction of Micklehurst Road and The Rowans. The modelled section of Carr/Staly Brook covers the reach of the watercourse within the development area defined in the brief, but does not cover the full length of Carr/Staly Brook. A section of Micklehurst Brook has also been modelled to support the planning application for a development.

Ashton to Stalybridge Corridor

6.2.5 In the Ashton to Stalybridge Corridor Potential Development Areas, the Tame04 model covers the majority of the reach of the Tame within the development area. The Tame05 model covers part of the upstream reach of the River Tame and overlaps with the Tame04 model at Souracre. The Tame03 model overlaps with the Tame04 model at the downstream extent of the development area.

6.2.6 The confluence of Fern Bank Brook is located within the development area at Stalybridge. A significant proportion (approximately 1km) of Fern Bank Brook is culverted. The Environment Agency model of Fern Bank Brook covers the open channel section from Fern Bank Close to the culvert entrance and includes the culverted reach up to its confluence with the River Tame.

Dukinfield - Shepley Industrial Estates

6.2.7 The Tame03 model covers the reach of the River Tame within the Shepley Industrial Estates Potential Development Area. There are no model overlaps and no tributaries of the Tame within the development area.

Hyde

6.2.8 The Tame03 model covers the reach of the River Tame to the confluence with Wilson Brook running through the Hyde Potential Development Area. The Environment Agency does not currently hold a hydraulic model of the River Tame downstream of the Wilson Brook confluence; however, they provided a hydraulic model of Godley Brook and Wilson Brook, which covers the reach of these watercourse within the study area.

Hydraulic Modelling Approach and Methodology

6.2.9 The hydraulic modelling approach to determine flood extents and flood hazard mapping along the River Tame was developed making maximum use of existing model data whilst ensuring that the model results are robust to inform the SFRA. The incompleteness of the model data has led to some complications that merit an explanation prior to discussing the methodology applied in the SFRA.

6.2.10 As discussed above, a number of flood modelling studies have been conducted on the River Tame and its tributaries. The most recent flood modelling reports and the models

obtained from the Environment Agency were reviewed as part of the SFRA in order to determine the most appropriate modelling approach for the study. The reports reviewed include:

1. Environment Agency, Upper Mersey S105 Flood Mapping Hydraulic Modelling Final Report, June 2001
2. River Tame and Tributaries Flood Risk Mapping Final Report, 2006
3. Upper Mersey Flood Mapping, Hydrology Report (Draft), 2007
4. Environment Agency, Upper Mersey and Micker Brook Flood Risk Mapping, April 2008
5. Upper Mersey Flood Mapping Assessment Report, 2009

6.2.11 A review of these reports showed that none of the studies preceding the *Upper Mersey Flood Mapping Assessment* (2009) provided flow data for all four reaches of the River Tame within the Tameside borough boundary. Due to the history of flood studies in the area, each study focussed on certain reaches of the River Tame and therefore provided flow data for those reaches only. Table 6-1 below shows the reaches investigated in each study.

Table 6-1: Model reaches considered in previous studies

Model Reach	2006 Study	2007 Study	2008 Study	2009 Study
Tame 3		✓		✓
Tame 4	✓			✓
Tame 5		✓		✓
Tame 6	✓			✓
Tame at Mersey confluence		✓ (at Portwood)	✓	
Goyt at Mersey confluence		✓ (at Marple Bridge)	✓	
Upper Mersey		✓ (at Ashton Weir)	✓	

6.2.12 The 2009 study provided flows and flood outlines for the 5% AEP (functional flood plain) and the 0.1% AEP for the Tame 3, Tame 4, Tame 5 and Tame 6 models. The flows were all included in the models received from the Environment Agency. However, these models did not have outputs for the 1% AEP, which is required to define Flood Zone 3 and Flood Zone 2 (in conjunction with the 0.1% AEP outline). It was therefore necessary to derive flows for the 1% AEP event for the purpose of determining water levels and flood outlines for this event as required by PPS25.

6.2.13 The second issue that the model review highlighted was that the flows reported in different studies were inconsistent as shown in Table 6-2.

Table 6-2: Comparison of 1% AEP Model Flows from previous studies

Model Reach	2006 Study (Flow m^3s^{-1})*	2007 Study (Flow m^3s^{-1})*	2009 Study (Flow m^3s^{-1})*
Tame 3		138.0	118.0
Tame 4	94.0		94.0
Tame 5	80.9 (as u/s Tame 4)	75.0	108.7
Tame 6	71.3		71.3
Tame at Mersey confluence		125.0 (at Portwood)	
Goyt at Mersey confluence		121.0 (at Marple Bridge)	
Upper Mersey		500.0 (at Ashton Weir)	

**Determined at model downstream boundary*.

6.2.14 This was brought to the attention of the Environment Agency, who is aware of these inconsistencies to the extent that they commissioned a study to revise the flood outlines for the 1 % AEP event for Tame 3 and Tame 5 under the SFRM Framework. However, the Environment Agency study did not include a revision of the flow inputs and it has not been possible to establish the source and methodology used to derive the hydrological inputs for the revised modelling work.

6.2.15 A pragmatic approach was therefore taken to derive hydrographs for the 1% AEP event for the SFRA Level 2 modelling work. Having carefully considered the choice of method applied, the Growth Curve and Median Flow (QMED) values from the *River Tame and Tributaries Flood Risk Mapping Final Report, 2006*, were used to update the hydrological inputs in the Environment Agency models.

6.2.16 Finally, the Environment Agency models were combined into one composite model for the Level 2 SFRA. This removed the risk of discontinuities in the model results and flood outlines in overlapping model reaches and made it possible to assess the likely impacts of upstream developments in a consistent manner.

6.2.17 In combining the four models the most recent survey data has largely been retained where two adjoining models overlap, unless professional judgement dictated otherwise. The individual upstream boundaries for Tame 5, Tame 4 and Tame 3 have been removed from the combined model as these are implicitly now represented by the flows from the adjoining upstream reach. Tributary flows and distributed lateral flows were retained in the model. To ensure that mass balance is not compromised lateral flows were redistributed according to number of inflow points left after merging two adjoining model reaches.

6.2.18 It was noted during the model review that some of the hydraulic structures were not correctly represented in the existing models and two new bridges have been built after the models have been constructed. Changes have therefore been made to the model to represent the hydraulic structures shown in Figure 6-1 following a site visit to confirm the geometry of the structures.

6.2.19 The composite model of the River Tame was used to determine flood outlines and water levels for the 5% AEP, 1% AEP, 1% AE plus climate change and 0.1% AEP. Depth Hazard maps were also produced to determine flood hazard in the four Potential Development Areas:

6.2.20 For Wilson Brook (and its tributary inflow Godley Brook) in Hyde and Fern Bank Brook in Stalybridge, the two dimensional TUFLOW model obtained from the Environment Agency was used to derive flood outlines and depths.

6.2.21 After visiting the four Potential Development Areas and reviewing the LiDAR data and hydraulic model of the Tame it was concluded that a two dimensional model was not necessary for the Level 2 SFRA. This conclusion was reached on the basis that the River Tame is a steep incised channel with a relatively narrow valley. Furthermore, the spread of the flood outlines is narrow on both sides of the channel with minimal continuous raised flood defences or infrastructure that provide a standard to 1% AEP (1 in 100 years) in these areas.

Flood Defences and Standard of Protection (SoP)

6.2.22 An inspection/survey of flood defences was completed as part of the Level 2 SFRA work to determine the location of existing defences, their condition and type. A walkover survey was undertaken along the entire reach for all Potential Development Areas. Prior to the walkover, the National Fluvial and Coastal Defence Database (NFCDD) was reviewed to highlight areas where the inspection needed to focus.

6.2.23 The walkover survey confirmed the presence of very few flood defences within the four key Potential Development Areas, as highlighted in the NFCDD. Flood defences found in the study area were mainly informal defences comprising stone/brick masonry walls and in most cases they exist only for a short reach of the river (Appendix 1 - Figure 6-1H, Figure 6-2H and Figure 6-4H). A summary of the findings of the flood defence inspection is given below. A detailed report of the defences can be found in the Flood Defence Inspection Report in Appendix 3.

Mossley

6.2.24 The majority of the surveyed channels consisted of heavily vegetated natural channels with occasional stone and brick walling to the base of the channel. Around the existing mill at Waggon Road, there are intermittent stone walls above the existing ground level, but these are more of a safety feature to prevent access to the river rather than a defence structure.

6.2.25 Carr/Staly Brook runs in a stone-sided channel adjacent to Micklehurst Road before entering a culvert under the roadside terraced houses and emerging at the confluence with the River Tame, immediately upstream of Waggon Road.

Tame Valley: Ashton to Stalybridge

6.2.26 Outside of the town centre, the majority of the river is a mixture of natural and maintained channels with varying degrees of vegetation. Due to the predominantly industrial nature of the surrounding land, there are numerous walls and fences that protrude above the natural bank level, however, they are haphazard in nature and cannot be considered as formal defences.

6.2.27 However, there are two areas where there are raised flood defence structures: between Stamford Street and Caroline Street in the town centre and also alongside Park Road between Tame Street and Clarence Bridge.

Shepley Industrial Estates

6.2.28 The length of River Tame investigated at Shepley, immediately upstream and downstream of Shepley Road, consists of a mixture of maintained channels and heavily vegetated natural channels. There are no defence structures along this reach of the river.

Hyde

6.2.29 Three watercourses were inspected, namely Godley Brook, Wilson Brook and the River Tame, with the majority of the channels being either naturally vegetated or classed as a maintained channel.

6.2.30 Along Wilson Brook, raised defences exist alongside Commercial Street where a brick wall tied into higher ground at the east and the access bridge to the west provided a measure of defence to the car park. Further west, between Park Road and Newton Street, the old industrial warehouses immediately adjacent to the right bank provide a raised defence along this section of channel.

Water Levels

6.2.31 Figure 6-2: shows a long section from the model with river bed levels and water levels for the 5% AEP (functional floodplain), 1% AEP, 1% AEP plus climate change and the 0.1% AEP events. The 5% AEP event is largely contained within the banks of the channel throughout Tameside. Figure 6-2 shows that the River Tame has a steep channel gradient of between 0.004 (1:250) to 0.005 (1:200) from Mossley to Shepley. The channel gradient then reduces to approximately 0.001 (1:1000) between Shepley and Hyde.

6.2.32 A number of existing hydraulic structures in the channel cause significant drops in the river bed level at these locations. As a result of the steep channel gradient the conveyance of the river is high and the difference in water levels for different flows (e.g. 1% AEP and 0.1% AEP) is relatively small, increasing towards the downstream end of the model as the channel gradient decreases. The gradients of the tributaries of the River Tame are also relatively steep. Water levels in these tributaries, including Carr/Staly Brook, Fern Bank Brook and Wilson Brook are largely determined by water levels of the River Tame near their confluence with the Tame.

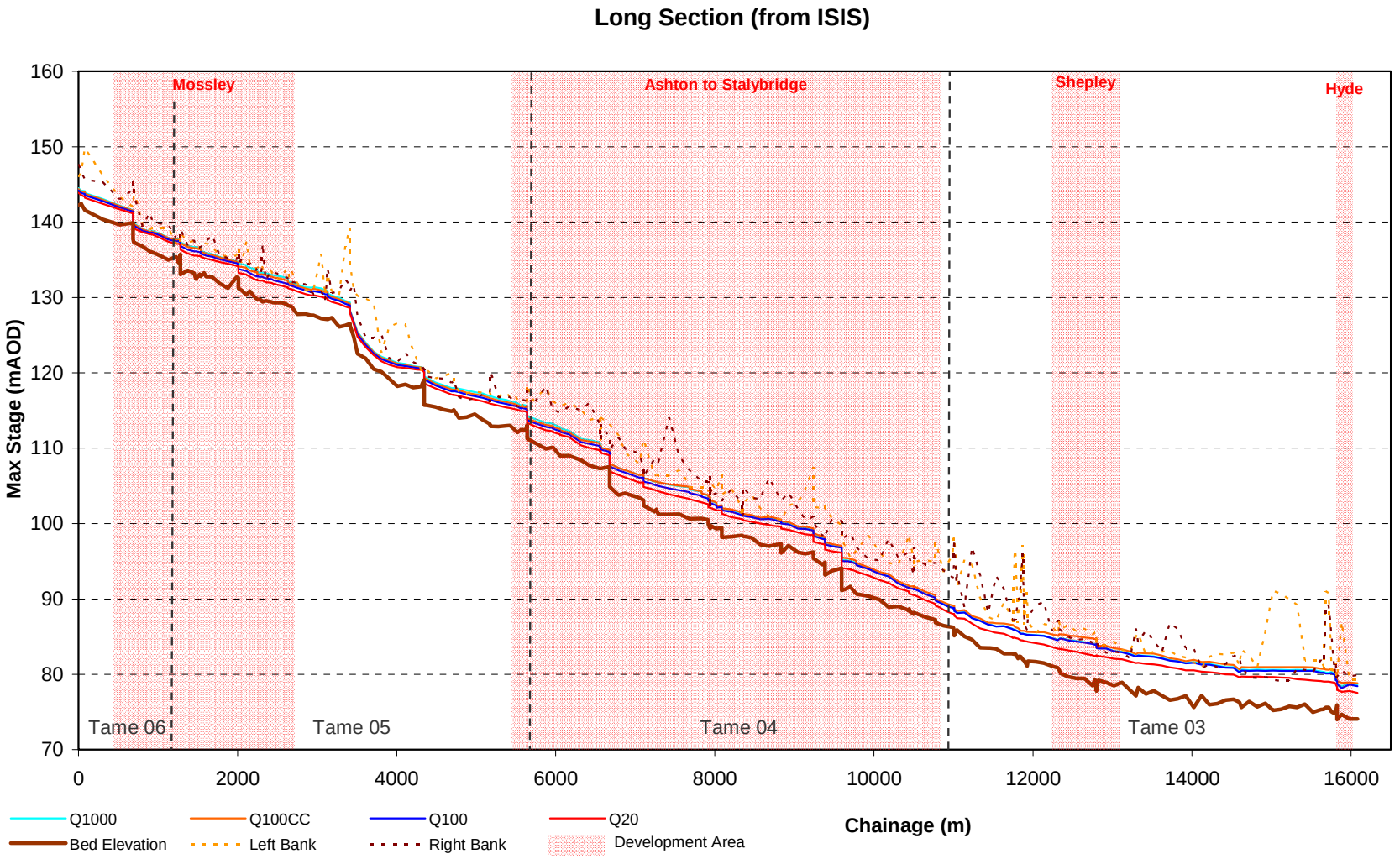


Figure 6-2: Long section showing water levels along the Tame through Tameside

Flood Outlines, Flood Depths and Depth Hazard Mapping

6.2.33 In order to apply the Exception Test for developments within the Potential Development Areas, flood hazard maps are required. The hazard maps provide information on flood depths in addition to how far the flood outlines extend. Flood depth hazard maps have been produced using model results for the 1% AEP, 1% AEP plus climate change and the 0.1% AEP events and LiDAR data. The maps are presented below and in Appendix 1 (Figure 6-1 D-G, Figure 6-2 D-G and Figure 6-3 D-G).

6.2.34 Depth hazard categories were mapped using guidance set out in the DEFRA/EA Flood Risk Assessment Guidance for New Development Technical Report 2[7]. Generally, the depth hazard maps show inundated areas identified as posing 'Danger for All' in and very close to the channel. Areas located further away from the channel are forecasted to be within the range of 'Danger for Most' and 'Danger for Some'. The results for the four Potential Development Areas are discussed below.

Mossley

6.2.35 Figure 6-3 (also presented in Appendix 1 Figure 6-1A) shows the flood outlines for the 1% AEP and 0.1 % AEP events. Depth hazard maps, with and without allowances for climate change for the 1%AEP event are shown in Figure 6-4 and Figure 6-5 (Appendix 1 Figure 6-1 E-F) respectively. Flood risk in the area is from the River Tame and its tributary Carr/Staly Brook which receives additional flows from Micklehurst Brook before discharging into the River Tame. The areas at risk of flooding in the Mossley development area are as follows:

- The area bound by Winterford Road (Dark Lane extending across the Tame) the River Tame up to the dogleg near the industry park area and Manchester Road (signposted as M1): Most of this area is located in Flood Zone 2. Modelled flood depths for the 1% AEP event within the area at risk of flooding are below 0.3m. The listed Woodend Mills, now partially occupied by commercial and industrial units occupy this area.

- The area north of Carr/Staly Brook, bounded by Waggon Road, Audley Street, the River Tame, and the Huddersfield Narrow Canal up to the canal lock adjacent to Border Mill Fold (signposted as M2). Most of the area outside of the Tame channel and canal lie in Flood Zone 2. Modelled flood depths for the 1% AEP event in most of the area are less than 0.3m.

[7] Flood Risk Assessment Guidance for New Development, Defra/EA Flood and Coastal Defence R&D Programme Technical Report FD2320/TR2, October 2005

- The area south of Carr/Staly Brook, bounded by the River Tame, Egmont Street, The Huddersfield Narrow Canal and Waggon Road (signposted as M3): The Glover Centre Industrial Estate off Egmont Street occupies most of this area, with the smaller Centre Court employment area off Waggon Road. Almost all of the area lies in Flood Zone 3a and Flood Zone 2. Modelled flood depths for the 1% AEP event are mostly between 0.3m-0.5m, but within the 0.5-1.5m range in places.

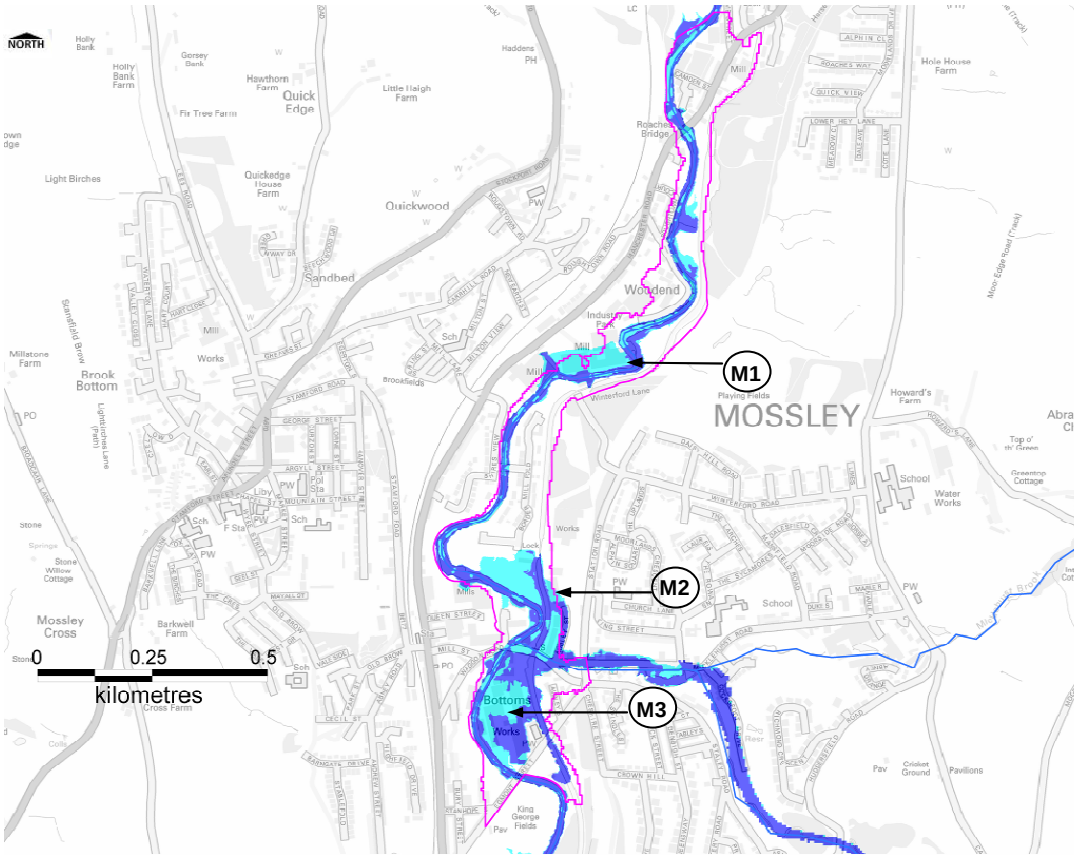
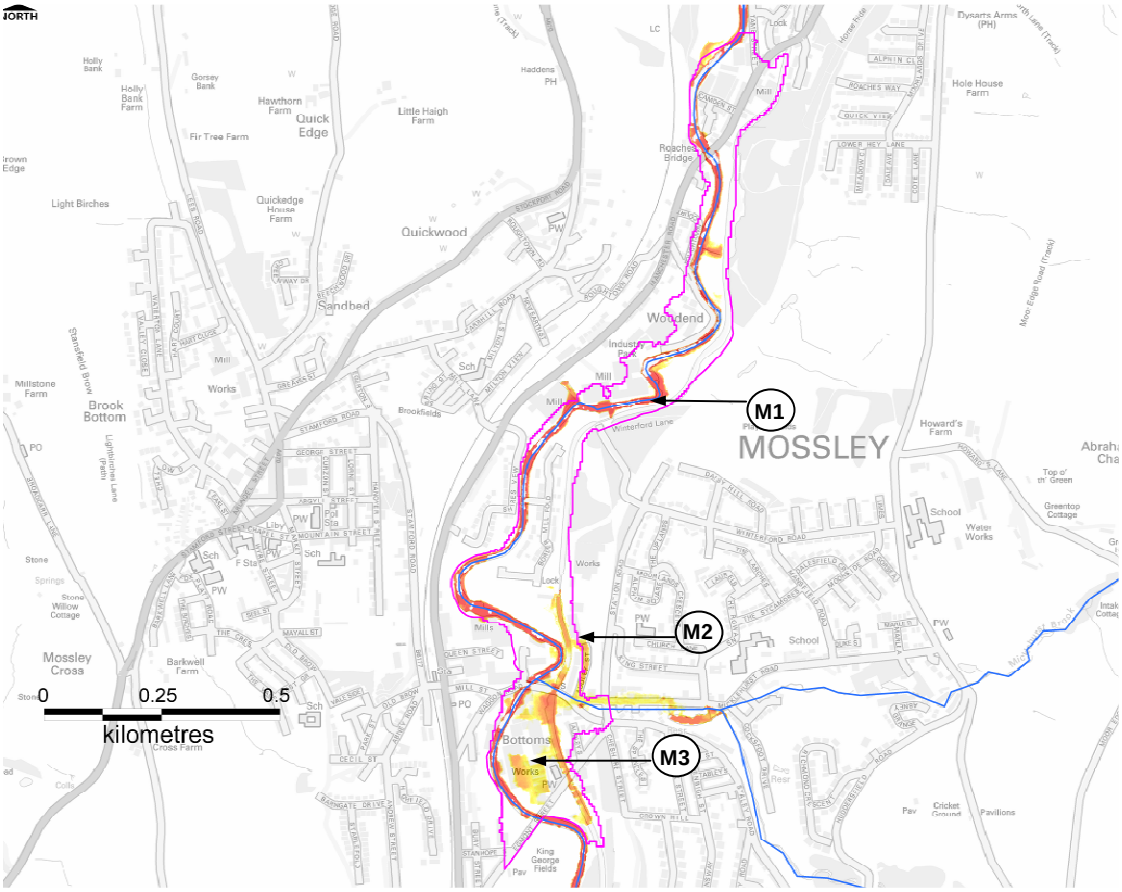


Figure 6-3: Mossley Development Area 1% AEP and 0.1 % AEP Flood Outlines

(See figure 6-1(A) in Appendix 1 for higher resolution).

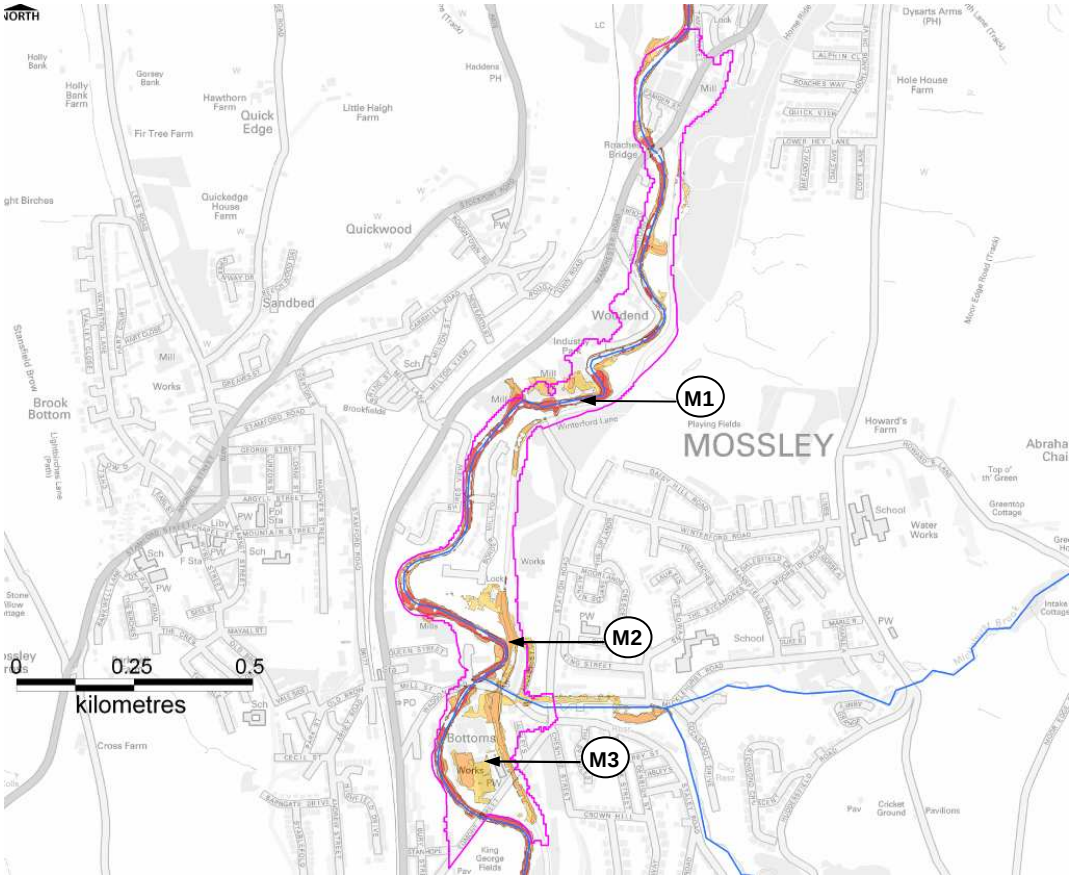


Depth Hazard Key

0.30m - 0.50m	Danger to Some
0.50m - 1.50m	Danger to Most
>1.50m	Danger to All

Figure 6-4: Mossley Development Area Depth Hazard Map for the 1% AEP event

(See figure 6-1(E) in Appendix 1 for higher resolution).



Depth Hazard Key

0.30m - 0.50m	Danger to Some
0.50m - 1.50m	Danger to Most
>1.50m	Danger to All

Figure 6-5: Mossley Development Area Depth Hazard Map for the 1% AEP plus climate change event
(See figure 6-1(F) in Appendix 1 for higher resolution).

Ashton to Stalybridge Corridor

6.2.36 Figure 6-6 (also presented as Figure 6-2A in Appendix 1) shows the flood outlines for the 1% AEP and 0.1 % AEP events. Depth Hazard Maps, without and with Climate Change are shown in Figure 6-7 and Figure 6-8 respectively. Flood risk in the area is from the River Tame and its tributary Fern Bank Brook. The areas at risk of flooding in the Tame Valley: Ashton to Stalybridge development area are as follows:

- The area bounded by Melbourne Street, Castle Street, Caroline Street and the River Tame, in Stalybridge (signposted as AS1): Flooding in this area is from the River Tame and the area at risk lies mainly within Flood Zone 2; a smaller part lies in Flood Zone 3a. Modelled flood depths for the 1% AEP event are mainly below 0.3m.

- The area bounded by Caroline Street, High Street, Peel Street, Dale Street, Bayley Street and the River Tame, in Stalybridge (signposted as AS2): Flooding in this area is from the River Tame. The area at risk lies mainly in Flood Zone 2, but areas adjoining the river in the north east corner are in Flood Zone 3a. Modelled flood depths for the 1% AEP event range from 0.3m to 1.5m.
- A small part of the River Tame valley between the Huddersfield Narrow Canal crossing and Tame Street (signposted as AS3): Flooding in this area is from the River Tame. The area at risk lies in Flood Zone 3a and Flood Zone 2. Modelled flood depths for the 1% AEP event are between 0m and 0.5m in the area at risk of flooding ('Danger for Some') in the area concerned. A small works adjoins the south bank of the River Tame, with a vacant local authority depot beyond.
- Part of the area bounded by Belvedere Drive/Malakoff Street, Sandy Lane/Clarence Street, Tame Street, Park Road Street and Binns Road (signposted as AS4): Flooding in this area is from the River Tame. The area at risk on the left bank lies in Flood Zone 3a and the area on the right bank lies in Flood Zone 2. Modelled flood depths for the 1% AEP event on the left bank are between 0m and 0.5m ('Danger for Some').
- Part of the area bounded by Sandy Lane, Park Road and the River Tame (signposted as AS5): Flooding in this area is from the River Tame. The area at risk lies mostly within Flood Zone 3a and modelled flood depths for the 1% AEP event are mainly between 0m and 1.5m in the area at risk of flooding (danger for some, danger for most).
- Part of the area within the loop of the River Tame bounded by Furnace Street, Cooper Street, King Street and the River Tame (signposted as AS6): Flooding in this area is from the River Tame. The area at risk lies mainly in Flood Zone 3a and modelled flood depths for the 1% AEP event are mainly between 0m and 1.5m in this area ('Danger for Some', 'Danger for Most'). Modelled flood depths of more than 1.5m ('Danger for All') are predicted for a small area between Furnace Street and the River Tame, south of the slaughter house for the 1% AEP event. This area includes an unused Greenfield site to the north and a vacant, derelict site on Gate Street, both adjoining the River Tame that would be suitable for employment development.

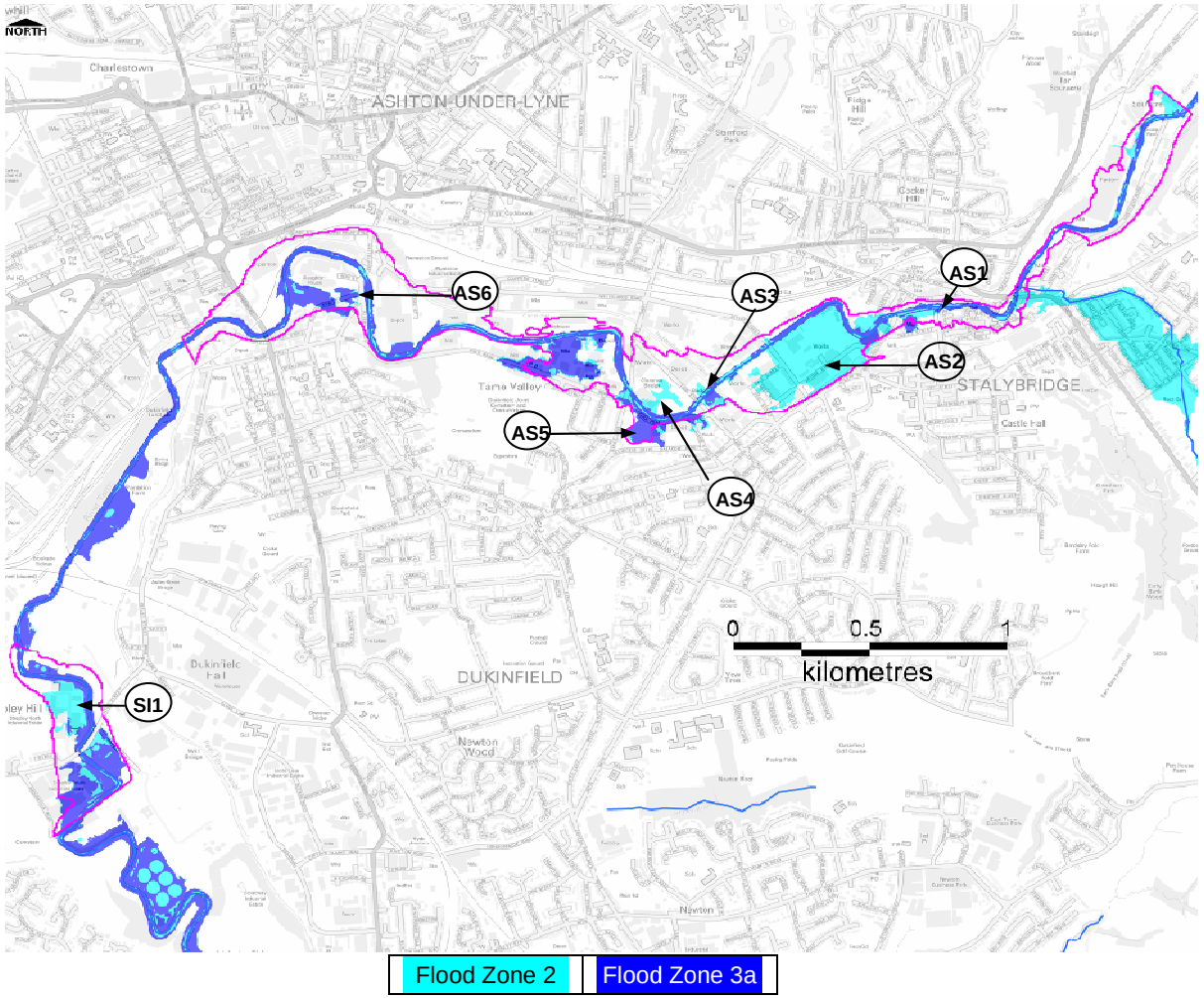
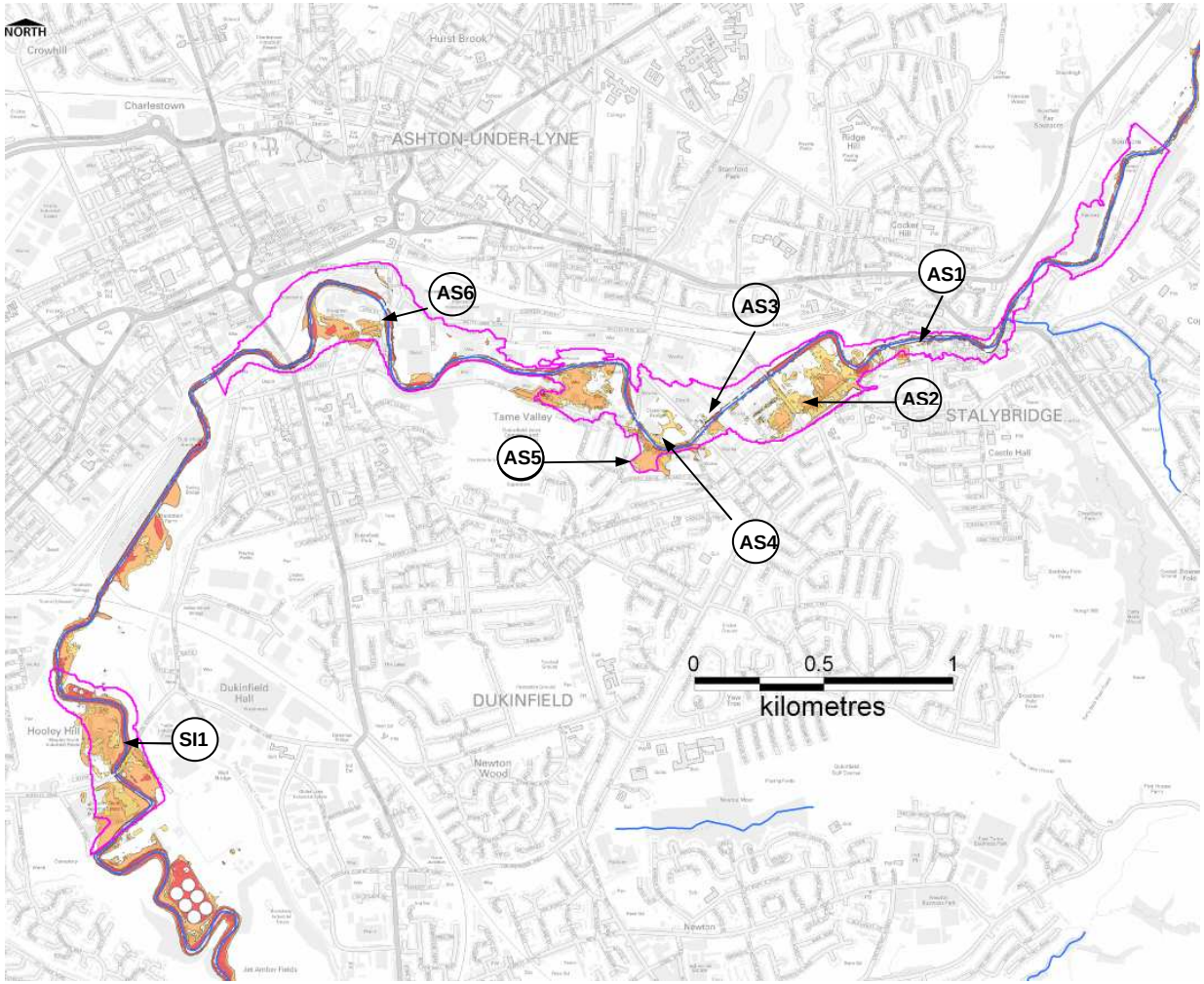


Figure 6-6:Tame Valley: Ashton to Stalybridge and Shepley Development Area 1% AEP and 0.1 % AEP Flood Outlines*

*** See figure 6-2(A) in Appendix 1 for higher resolution.**

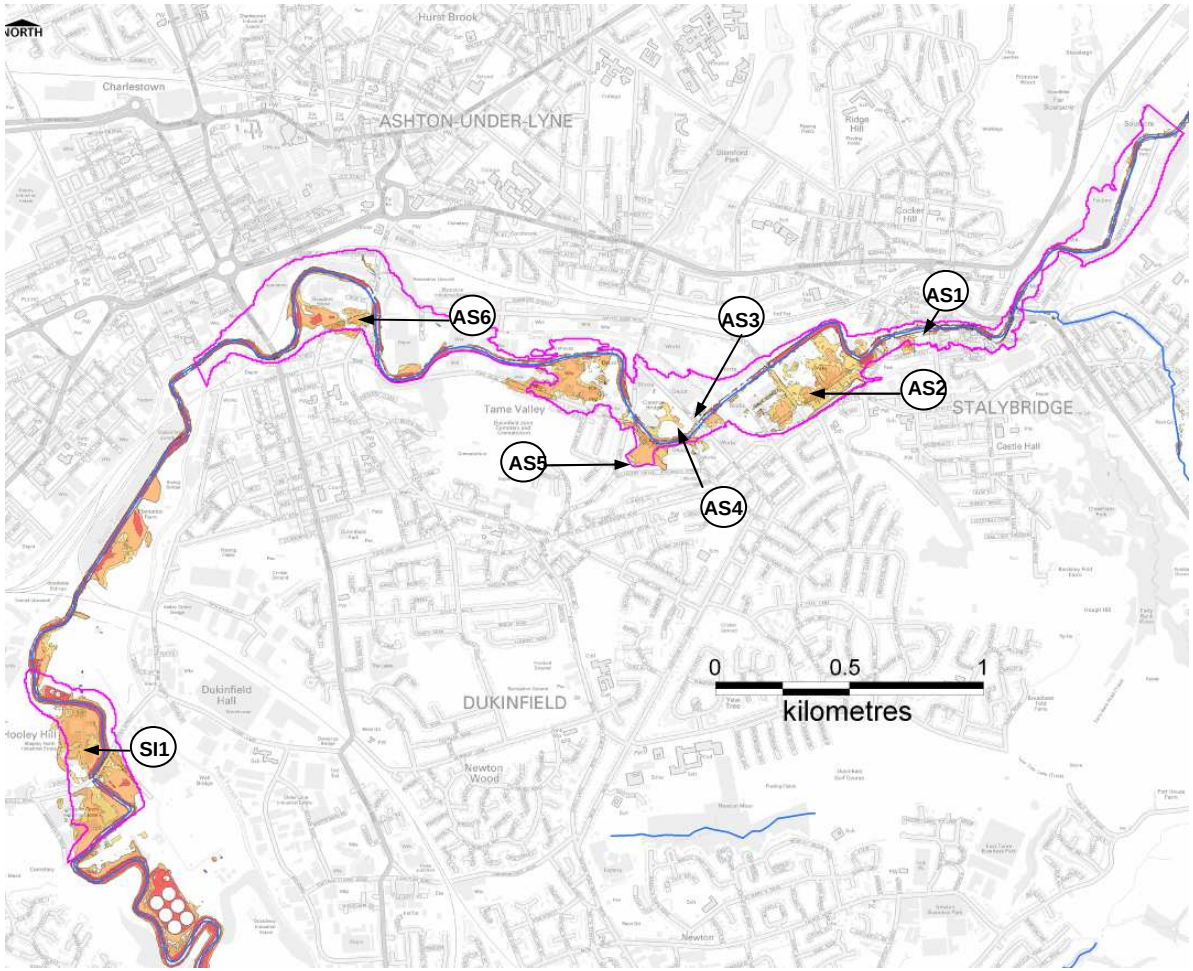


Depth Hazard Key

0.30m - 0.50m	Danger to Some
0.50m - 1.50m	Danger to Most
>1.50m	Danger to All

Figure 6-7: Tame Valley: Ashton to Stalybridge Corridor and Shepley Industrial Estates, Dukinfield Depth Hazard Map for the 1% AEP Event*

* **See figure 6-2(E) in Appendix 1 for higher resolution**.



Depth Hazard Key

0.30m - 0.50m	Danger to Some
0.50m - 1.50m	Danger to Most
>1.50m	Danger to All

Figure 6-8: Tame Valley: Ashton to Stalybridge Corridor and Shepley Industrial Estates, Dukinfield Depth Hazard Map for the 1% AEP plus Climate Change Event*

*** See figure 6-2(F) in Appendix 1 for higher resolution.**

Shepley Industrial Estates

6.2.37 Flood outlines and flood depths for the Shepley Industrial Estate Potential Development Area are shown in Figure 6-6 (also presented in Appendix 1 Figure 6-2A), Figure 6-7 and Figure 6-8, respectively, on the same maps as the Ashton to Stalybridge Corridor Potential Development Area. Flood risk in the Shepley Industrial Area is from the River Tame. Part of the area within the Potential Development Area boundary (signposted as SI1) is at risk of flooding and lies in Flood Zone 3a and Flood Zone 2. Modelled flood depths for the 1% AEP event are between 0.3m and 1.5m (partly 'Danger for Some and partly Danger for Most').

Hyde

6.2.38 Figure 6-9 (also presented in Appendix 1 Figure 6-3A) shows the flood outlines for the 1% AEP and 0.1 % AEP events within the Hyde Potential Development Area. Depth Hazard Maps, without and with Climate Change are shown in Figure 6-10 and Figure 6-11 respectively. Flood risk in the area is from the River Tame and its tributary Wilson Brook which receives additional flows from Godley Brook before discharging into the River Tame. The areas at risk of flooding in the Hyde development area are as follows:

- Part of the area bounded by the River Tame, Watson Street and Manchester Road. Flooding in this area is from the River Tame (signposted as H1): The area at risk of flooding lies within the 1% AEP flood outline (Flood Zone 3a) and is mainly greenfield land. Modelled flood depths for the 1% AEP event in the area are between 0m and 0.5m ('Danger for Some').
- Part of the Wilson Brook valley between Park Road and Newton Street (signposted as H2): A small area immediately adjacent to the brook (mainly on the left bank) lies within the 0.1% AEP flood outline of Wilson Brook (Flood Zone 2). Wilson Brook is the source of flooding in this area. Modelled flood depths for the 1% AEP event in most of the area are less than 0.3m.
- Part of the area bound by Park Road, Clarendon Road, Repton Avenue and Wilson Brook up to its confluence with Godley Brook (signposted as H3). Combined flows from Wilson Brook and Godley Brook cause flooding in this area. Part of this area that is located close to Wilson Brook lies in Flood Zone 3a and Flood Zone 2. Modelled flood depths for the 1% AEP event within the area at risk of flooding lie between 0 and 0.5m ('Danger for Some').
- Part of the Godley Brook valley between Halton Street and the M67 culvert (signposted as H4). Godley Brook is the source of flooding in this area. A small area immediately adjacent to the brook lies within the 0.1% AEP flood outline of Godley Brook (Flood Zone 2). Flood depths for the 1% AEP within the area at risk of flooding lie between 0 and 0.3m.

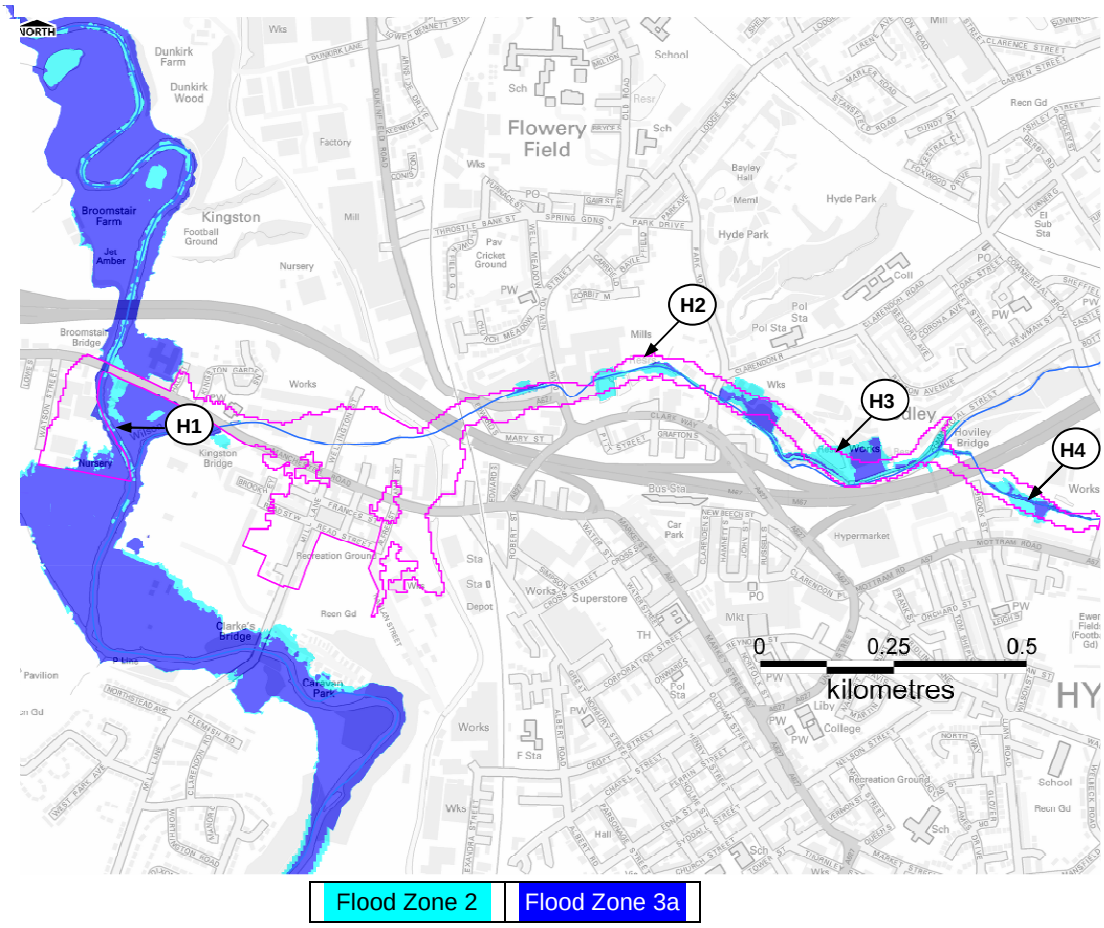
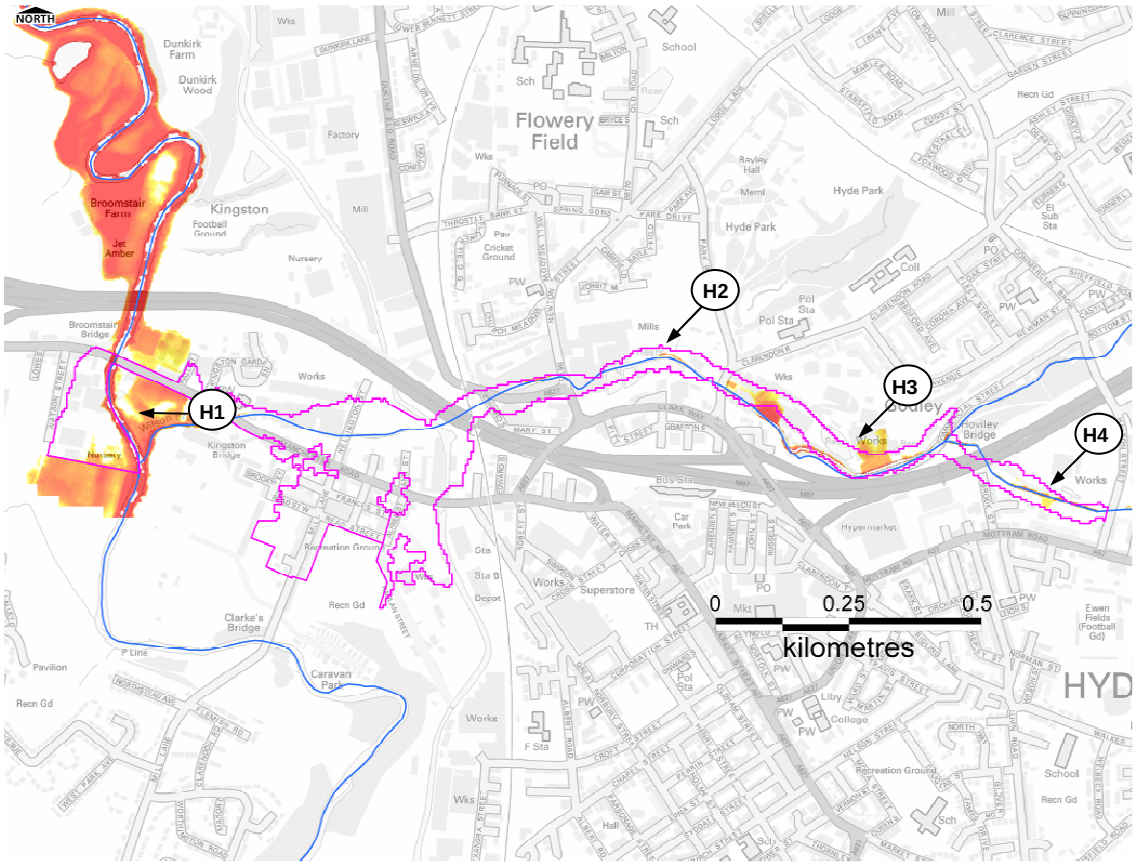


Figure 6-9: Hyde Development Area 1% AEP and 0.1 % AEP Flood Outlines

(See figure 6-3(A) In Appendix 1 for higher resolution)

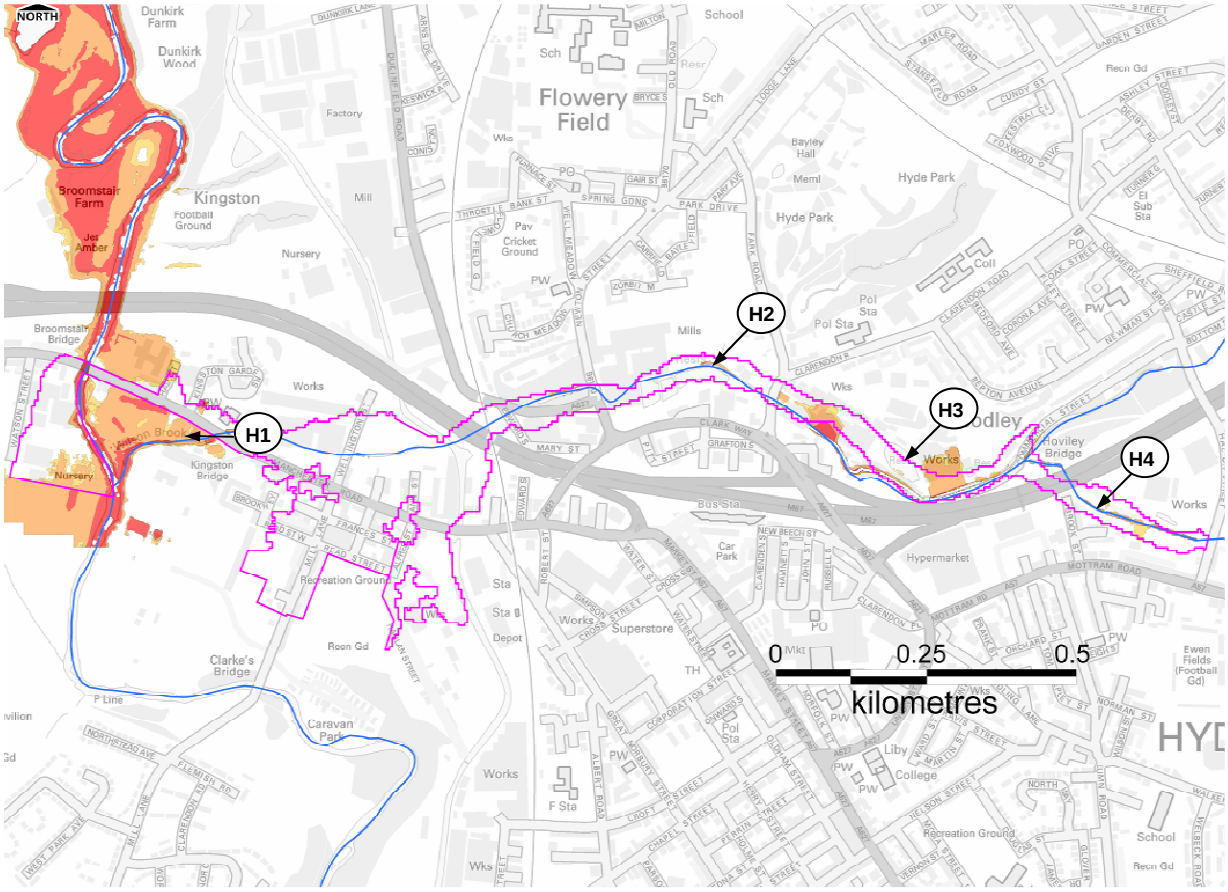


Depth Hazard Key

0.30m - 0.50m	Danger to Some
0.50m - 1.50m	Danger to Most
>1.50m	Danger to All

Figure 6-10: Hyde Development Area Depth Hazard Map for the 1% AEP Event

See figure 6-3(E) In Appendix 1 for higher resolution.



Depth Hazard Key		
	0.30m - 0.50m	Danger to Some
	0.50m - 1.50m	Danger to Most
	>1.50m	Danger to All

Figure 6-11: Hyde Development Area Depth Hazard Map for the 1% AEP plus Climate Change Event (See figure 6-3(F) In Appendix 1 for higher resolution)

6.3 Risk of Flooding from Other Sources

Mossley

6.3.1 Incidents of flooding from the Carr/Staly Brook Culvert and Micklehurst Brook in August 2004 have been reported in the Mossley Potential Development Area, as shown in Appendix 1 Figure 6-1 I. No other incidents of flooding have been reported within the development area.

6.3.2 The ASTSWF map (Appendix 1 Figure 5-4) shows that most of the development area is susceptible to surface water flooding[8].

[8] In accordance with Environment Agency Guidance on the use of the ASTSWF maps, areas susceptible to surface water flooding are not shown on more detailed mapping in Appendix 1 Figures 6-1 I, 6-2 I or 6-3 I.

6.3.3 The risk of flooding from groundwater within the Mossley Potential Development Area is considered to be low based on the available data. There is an unquantified residual risk of flooding from a breach of a canal embankment located within the development area and an unquantified residual risk of flooding from Buckton Vale Reservoir upstream of Carr/Staly Brook and reservoirs upstream of the development area.

Ashton to Stalybridge Corridor

6.3.4 Incidents of flooding have been reported in the Ashton to Stalybridge Corridor Potential Development Area near Tame Street, downstream of the Huddersfield Narrow Canal crossing, as shown in Appendix 1 Figure 6-2 I. No other incidents of flooding have been reported within the Ashton to Stalybridge Corridor development area.

6.3.5 The ASTSWF map (Appendix 1 Figure 5-4,) shows that most of the development area is susceptible to surface water flooding.

6.3.6 The risk of flooding from groundwater within the Ashton to Stalybridge Corridor development area is considered to be low based on the available data. There is an unquantified residual risk of flooding from a breach at the Huddersfield Narrow Canal crossing located within the development area. There is also an unquantified residual risk of flooding from the cascade of reservoirs located in the Swineshaw Brook Valley and other reservoirs upstream of the development area.

Shepley Industrial Estates

6.3.7 No incident of flooding has been reported in the Shepley Industrial Estate Potential Development Area, as shown in Appendix 1 Figure 6-2 I.

6.3.8 The ASTSWF map (Appendix 1 Figure 5-4,) shows that part of the development area is susceptible to surface water flooding.

6.3.9 The risk of flooding from groundwater within the Shepley Industrial Estate development area is considered to be low based on the available data. There is an unquantified residual risk of flooding from a breach of a canal embankment located within the development area, but no immediate residual risk of flooding from reservoirs near the development area. However, there is an unquantified residual risk of flooding from reservoirs in the upstream catchment.

Hyde

6.3.10 Incidents of highway flooding have been reported on Dukinfield Road (A627) near the railway line in the Hyde Potential Development Area, as shown in Figure 6-3 I, Appendix 1. Also, the Halton Street Culvert on Godley Brook has a known history of flooding, but the area affected is outside of the development area.

6.3.11 The ASTSWF map (Appendix 1 Figure 5-4,) shows areas susceptible to surface water flooding within the development area.

6.3.12 The risk of flooding from groundwater within the Hyde development area is considered to be low based on the available data. There is no canal embankment or culvert in the development area that can cause flooding to the development area, according to the data reviewed. There is, however, an unquantified residual risk of flooding from two reservoirs in the upstream part of the development area; Godley Reservoir Covered (a service reservoir) and Godley Reservoir Open (impounding reservoir).

7 SFRA Policies and Flood Risk Management

7.1.1 The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is exceptionally necessary in high risk areas (medium to high probability of flooding - Flood Zones 2 and 3 respectively), development policies should aim to make it safe without increasing flood risk elsewhere and, where possible, reducing flood risk overall.

7.1.2 To achieve this aim Tameside MBC must be able to use the SFRA to **appraise risk** and develop policies to **manage risk** and **reduce risk** through planning and other means.

7.2 District Wide SFRA Policies

7.2.1 To ensure a holistic approach to flood risk management and make sure that flooding is taken into account at all stages of the planning process, the findings of the SFRA should be incorporated into the emerging LDF for Tameside MBC. In accordance with PPS25, a specific policy on flood risk should be included in the final Core Strategy to ensure that:

- Development is located in the lowest flood risk areas;
- New development is flood-proofed to a satisfactory degree and does not increase flood risk elsewhere;
- Surface water is managed effectively on site; and
- Any development in Flood Zone 2 or Flood Zone 3 is safe.

7.2.2 At the district level the Level 1 update data should be used by Tameside MBC to appraise risk to and from developments. With the help of the Flood Zones appropriate policies can be formulated for each Flood Zone taking into consideration the vulnerability classification for each development.

7.2.3 In Flood Zone 1 the policy objective should be to reduce surface water runoff from the site through appropriate application of sustainable drainage techniques (i.e. SuDS) and to reduce the overall risk from other sources.

7.2.4 In Flood Zone 2 and 3 the policy objectives should be:

a. To reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques (i.e. SuDS);
b. To create space for flooding to occur by restoring functional floodplain and flood flow paths and by identifying, allocating and safeguarding open space for flood storage.
c. To reduce the overall risk of flooding from other sources.

7.2.5 Application of the Sequential Test should ensure that more vulnerable land uses are not permitted in areas at high risk of flooding. Where there are valid over-riding reasons for a vulnerable land-use in a higher flood risk area, Tameside MBC and/or developer needs to demonstrate that all three elements of the Exception Test are passed.

7.2.6 In order to ensure that developments satisfy the Exception Test the following should be considered:

- Sequentially allocate development to consider relocating existing development plans to land in zones with a lower probability of flooding;
- If development is to be constructed with less vulnerable uses on ground level, agreements need to be in place to prevent future alteration of these areas to more vulnerable uses without further assessment of flood risk;
- Multi-storey residential development should be considered in high flood risk areas where development is absolutely necessary as it offers an opportunity to retreat to higher levels; and
- For 'More Vulnerable' and 'Highly Vulnerable' developments proposed within Flood Zone 2 and Flood Zone 3 opportunities should be sought to:
  - reduce flooding by considering the layout and the form of the development and the appropriate application of sustainable drainage techniques;
  - create space for flooding to occur by restoring functional floodplains and flood flow pathways and by identifying, allocating and safeguarding open space for storage; and
  - ensure developers incorporate flood resilience measures into the design of developments, including such measures as:
    - Replacing timber floors with concrete floors covered with tiles,
    - Replacing chipboard/MDF kitchen / bathroom units with plastic equivalents,
    - Replacing gypsum plaster with more water-resistant material, such as lime plaster or cement render,
    - Moving service meters, boilers and electrical points above flood levels,
    - Install one-way valves into drainage pipes to prevent sewage backing up into the house.

Surface Water Management Strategy

7.2.7 A site-specific FRA is required by PPS25 for all development proposals greater than 1 ha, or 0.5ha in CDAs (the CDA criteria was recommended by AGMA and the Environment Agency), to determine the impacts the development would have upon surface water runoff, regardless of the Flood Zone the development is located within. The use of Sustainable Drainage Systems (SuDS) should be encouraged for all developments as part of any surface water management strategy. SuDS options should be investigated as part of a surface water management plan (SWMP).

7.2.8 PPS25 states that a Level 2 SFRA should identify where there is a need (or not) for a SWMP. It is considered that it would be prudent to undertake such a study for Tameside MBC given the widespread distribution of areas susceptible to surface water flooding. AGMA has recently received funding to undertake a SWMP study for the Greater Manchester area which includes Tameside.

7.2.9 A SWMP is a framework through which key local partners with responsibility for surface water and drainage in their area work together to understand the causes of surface water flooding and agree the most cost effective way of managing surface water flood risk[9]. SWMPs do not form part of the statutory spatial planning system, but have important links with it.

7.2.10 As discussed in Section 5.5 surface water management policies across AGMA have been discussed and agreed with AGMA and the Environment Agency based on consideration of CDAs throughout the district. Although CDAs have not been presented in the SFRA it is recommended that surface water management policies are developed taking into account the concept of CDA. When future work on SWMPs enables better definition of CDAs then the policies can be applied more consistently in agreement with UU and the Environment Agency. A district-wide policy to reduce runoff should be encouraged.

7.2.11 The policy for flood prone areas in a CDA should include reducing the risk of surface water flooding as well as reduction of runoff taking climate change into consideration. In non-flood prone areas within CDAs the policy should be to reduce runoff taking climate change into consideration. In areas outside CDAs new developments should aim to reduce runoff and achieve sustainable rates.

7.2.12 The target in terms of percentage runoff reduction is not fixed. Whilst PPS 25 does not suggest a specific amount or percentage reduction the Code for Sustainable Homes[10] on the other hand encourages up to 100% reduction of additional runoff in areas where the risk of flooding is high. Tameside MBC should therefore agree target rates with the Environment Agency.

7.2.13 The Environment Agency suggests reducing runoff from Brownfield sites across the district by 30% and 50% in CDAs. In the interim, before achieving a better definition of CDA boundaries a target rate of 50% on all Brownfield sites is recommended. To reduce the risk of surface water flooding in CDAs it is suggested to set floor levels to 300mm above road level as agreed at the CDA meeting of 22nd September 2009.

[9] Surface Water Management Plan Technical Guidance - Living draft version 1, February 2009
[10] DCLG (2006) Code for Sustainable Homes

7.3 Specific SFRA Policies for the Potential Development Areas

7.3.1 Policies for the district will apply to the four Potential Development Areas. The detailed modelling for the four Potential Development Areas makes it possible to use the outlines and flood depth hazard mapping to achieve a better understanding of fluvial flood risk.

7.3.2 The highest risk hazard occurs close to the River Tame and its tributaries. Developments, including residential, employment and mixed use proposals (Appendix 2) are planned close to some of these areas. Appropriate policies should be implemented to make these developments safe and flood proof. Future development plans should also take into consideration the need to provide a corridor between the river bank and new development to provide access for river maintenance work as normally required by the EA.

7.3.3 A site-specific FRA will be required for developments in Flood Zones 2 and 3a and any development within Flood Zone 1, which exceeds 1 Ha.

7.3.4 Should development be proposed in Flood Zones 2 and 3a, then a site-specific FRA should be undertaken to delineate the boundary of Flood Zone 3a considering an allowance for climate change in order to optimise the layout and use of different parts of the site to reduce the risk of flooding to people and properties. The site-specific FRA should also address issues relating to the management of surface water runoff and flood risk from non-fluvial sources.

7.3.5 Surface water runoff from development sites should be reduced to 50% of Brownfield runoff rate considering climate change for all developments and finished floor levels should be set to 300mm (this was recommended pending further consultation with AGMA councils) above road level where the risk of surface water flooding is possible.

7.3.6 The development plans for the four Potential Development Areas are summarised by site in Appendix 2. For each site a description of the type of development is presented in a table and the vulnerability of the various types of developments are also shown in the table for ease of application of the Sequential Test. The sites (both SHLAA and employment) were screened according to the Flood Zone they fall into. Potential Development Areas that fall within Flood Zones 2 and 3a are discussed below.

Mossley

7.3.7 Development opportunities have been identified in the area bounded by Winterford Road (Dark Lane extending across the Tame) the River Tame up to the dogleg near the industry park area and Manchester Road (area signposted as M1 in Figure 6-3). Most of the area lies in Flood Zone 2 with flood depths mostly below 0.3m for the 1% AEP. The site is occupied by the listed multi-storey Woodend Mills and adjoining land and buildings. The Mossley Mill development Brief (SPG) envisages eventual conversion for mix use with up to 50% residential. This could represent up to 150 dwellings. Mixed use developments are

a combination of “More Vulnerable” and “Less Vulnerable development and are suitable in Flood Zones 1, 2. The Exception Test will be required for residential developments in zone 3a.

7.3.8 The area north of Carr/Staly Brook, bounded by Waggon Road, Audley Street, the River Tame, and the Huddesrfield Narrow Canal up to the Canal Lock adjacent to Border Mill Fold (area signposted as M2 in Figure 6-3). Most of the area lies in Flood Zone 2 with flood depths less than 0.3m in most of the area for the 1% AEP. This is a former employment area that has partly been redeveloped for housing. There is an outstanding permission for 22 new houses and an expired permission for 20 houses on the derelict site of Victoria Mill between the River Tame and the canal. Residential developments belong to the category of “More Vulnerable” development and are suitable in Flood Zones 1, 2. The Exception Test will be required for residential developments in zone 3a.

7.3.9 Development opportunities have been identified in the area south of Carr/Staly Brook, bounded by the River Tame, Egmont Street, The Huddesrfield Narrow Canal and Waggon Street (area signposted as M3 in Figure 6-3). Part of the site lies in Flood Zone 3a and Flood Zone 2 with flood depths for the 1% AEP between 0 and 0.5m and 0.5 to 1.5m in some places. The area is mainly employment land where steady change is expected, for example as industrial units are extended or redeveloped. Industrial units belong to the category of “Less Vulnerable” developments and are suitable in Flood Zones 1, 2 and 3 provided that adequate mitigation measures are implemented.

Ashton to Stalybridge Corridor

7.3.10 Development opportunities have been identified in part of the area bounded by Melbourne Street, Castle Street, Caroline Street and the River Tame, in Stalybridge (area signposted as AS1 in Figure 6-6). Most of the site lies in Flood Zone 2 with flood depths for the 1% AEP between 0 and 0.3m. Outline permission has expired for the easternmost part of the Longlands Mill site and other derelict land south of Castle Street where a mixed use development of up to 275 dwellings was approved. Various proposals for redevelopment of commercial properties at Melbourne Street are expected. Commercial properties belong to the category of “Less Vulnerable” developments and are suitable in Flood Zones 1, 2 and 3 provided that adequate mitigation measures are implemented.

7.3.11 Development opportunities have been identified in the area bounded by Caroline Street, High Street, Peel Street, Bayley Street and the River Tame, in Stalybridge (area signposted as AS2 in Figure 6-6). Most of the site lies in Flood Zone 2 but areas adjoining the river in the north east corner are in Flood Zone 3a. Flood depths for the 0.1% AEP are between 0.3m and 1.5m. Appropriate mitigation measures should be implemented to make future developments safe and flood proof.

7.3.12 Development opportunities have been identified in part of the River Tame valley between the Huddersfield Narrow Canal Crossing and Tame Street (area signposted as AS3 in Figure 6-6). Part of the site lies in Flood Zone 3a and Flood Zone 2 with flood depths for the 1% AEP between 0 and 0.5m. The area could be affected by residual risk due to failure of the Huddersfield Narrow Canal culvert immediately downstream. The only significant proposal in this area is for the redevelopment of the former council salt store depot off Tame Street as a waste transfer station. Planning permission was granted in September 2008 but appear unlikely to be implemented now. Waste transfer station belongs to the category of "Less Vulnerable" or "More Vulnerable" depending on whether hazardous waste is processed at the station or not. Exception Test may be required for development in Flood Zone 3a.

7.3.13 Development opportunities have been identified in part of the area bounded by Belvedere Drive/Malakoff Street, Sandy Lane/Clarance Street, Tame Street and Park Road and Binns Road (area signposted as AS4 in Figure 6-6). Part of the site lies in Flood Zone 3a and Flood Zone 2 with flood depths for the 1% AEP between 0 and 0.5m. Part of the area south of Park Road benefits from flood defences and could be affected by residual risk due to failure of the Huddersfield Narrow Canal culvert upstream. The area contains significant employment sites, including a large council depot. Two substantial sites with potential for development are on the edge of Flood Zone 2 and 3. Employment land uses are appropriate in Flood Zones 1, 2 and 3.

7.3.14 Development opportunities have been identified in part of the area within the loop of the River Tame bounded by Furnace Street, Cooper Street, King Street and the River Tame (area signposted as AS6 in Figure 6-6). Part of the area lies in Flood Zone 3a with flood depths for the 1% AEP between 0 and 1.5m. There is a pending application for 12 industrial units at the vacant Vale Industrial Estate at Furnace Street, partly within the southern boundary of this site. Proposal for conversion of the listed Crescent Road Mills to 91 flats have now been withdrawn. Extension of the slaughter house and meat processing plant is likely to occur in future. Appropriate mitigation measures should be implemented to make future developments safe and flood proof.

Shepley Industrial Estates

7.3.15 Development opportunities have been identified in Shepley Industrial Estate Development Area (area signposted as SI1 in Figure 6-6). Part of the area lies in Flood Zones 2 and 3a with flood depths for the 1% AEP between 0.3 and 1.5m. Further proposals for alteration and extension of existing employment premises can be expected in this area. Shepley North Industrial Estate and vacant land to the northwest has been proposed as a potential waste management facility. Vacant land at Gate Street has been specifically identified for the construction of a waste management facility. Waste transfer station belongs to the category of "Less Vulnerable" or "More Vulnerable" depending on whether hazardous waste is processed at the station or not. Exception Test may be required for development in Flood Zone 3a.

Hyde

7.3.16 Development opportunities have been identified in part of the area bounded by the River Tame, Watson Street and Manchester Road (area signposted as H1 in Figure 6-9). The site lies mainly within Flood Zone 1 but its boundary lies close to Flood Zone 3a. There has been limited development in this area in recent years. Nevertheless, limited infilling can be expected under the UDP Policy OL3 (Major Development in the Green Belt). Appropriate mitigation measures should be implemented to make future developments safe and flood proof.

7.3.17 Development opportunities have been identified in part of the Wilson Brook valley between Park Road and Newton Road (area signposted as H2 in Figure 6-9). Part of the area lies in Flood Zone 2. Flood depths for the 1% AEP event are less than 0.3m. There are currently no proposals for this section of the valley. The scope for redevelopment in this area may be limited given the steepness of the valley. Appropriate mitigation measures should be implemented to make future developments safe and flood proof.

7.3.18 Development opportunities have been identified in part of the area bounded by Park Road, Clarendon Road, Repton Avenue and Wilson Brook up to its confluence with Godley Brook (area signposted as H3 in Figure 6-9). Part of the area lies in Flood Zone 3a and Flood Zone 2, with flood depths for the 1% AEP between 0 and 0.5m. There is a possibility for mix used applications in this area. Mixed use developments are a combination of “More Vulnerable” and “Less Vulnerable development and are suitable in Flood Zones 1, 2. The Exception Test will be required for residential developments in zone 3a.

7.3.19 Development opportunities have been identified in part of the Godley Brook valley between Halton Street and the M 67 culvert. Most of the area lies in Flood Zone 2, but a small part of the area lies in Flood Zone 3a. Permission has been granted for apartments on former industrial land south of Godley Brook and outline permission exists for a mixed use development north of the Brook. Mixed use developments are a combination of “More Vulnerable” and “Less Vulnerable development and are suitable in Flood Zones 1, 2. The Exception Test will be required for residential developments in zone 3a.

7.4 Flood Risk Management Options

7.4.1 Figure 6-2 shows that the River Tame is a very steep watercourse with few raised defences in the study area. Flood risk management options are limited to options for holding the line of existing defences by the steepness of the Tame Valley from Mossley to Hyde. Beyond Hyde the Tame Valley becomes increasingly wider and flatter with several meanders forming along the course of the river as it flows towards Stockport where it joins with the River Goyt to form the River Mersey.

7.4.2 The effect of building linear flood defences has not been explicitly investigated in the SFRA due to the length of river involved. However, sensitivity analysis has shown that the effect

of flow increase on water levels is very low as evident from Figure 6-2. This demonstrates that building defences to defend developments in the key areas is not likely to have an adverse effect on flooding. It should, however, be noted that linear flood defences may introduce a residual risk when they fail and should therefore be carefully considered within the specific context of the area under consideration.

7.4.3 A combination of raised defences and enhancement of the capacity of the floodplain downstream of Hyde to detain floodwaters would be viable options to manage flood risk within Tameside without having a negative impact on Stockport. There are significant Green Belt areas adjacent to the Tame and it is strongly recommended that they are preserved where possible, because they provide an ideal opportunity to reduce flood risk by providing space for flood waters to flow through and additional areas for future flood storage schemes. Flood Storage is an effective means of reducing flood risk as it provides benefits to a wider area, particularly downstream of where the storage area is located. It may be possible to combine flood storage opportunities with other appropriate uses in Green Belt areas.

8 Site Specific Flood Risk Assessment Guidance

8.1.1 In accordance with Paragraph E2 of PPS25: "Any organisation or person proposing a development must consider whether that development will not increase flood risk and where practicable endeavour to reduce flood risk. The future users of the development must not be placed in danger from flood hazards and should remain safe throughout the lifetime of the plan or proposed development and land use".

8.1.2 Regardless of the SFRA for Tameside, site-specific Flood Risk Assessments (FRAs) are required for all development in Flood Zone 2 and Flood Zone 3 and for sites greater than 1 ha in Flood Zone 1, in accordance with Table D1 of PPS25.

8.1.3 Future developments should satisfy SFRA policy objectives recommended in Section 7. At all stages of a planning application, developers should consult Tameside MBC, and where necessary the Environment Agency and United Utilities, to ensure the site-specific FRA provides the necessary information to fulfil the requirements for planning applications.

8.1.4 Where the quality and/or quantity of information for any of the flood sources affecting a site is insufficient to enable a robust assessment of the flood risks, further investigation will be required. For example a two dimensional model will be required where details of flooding mechanisms, flow paths and the onset of flooding are required to understand the risk of flooding and to ensure that the proposed development incorporates appropriate mitigation measures.

8.1.5 Developers should also identify residual risk as part of a site specific detailed FRA. Such assessment should be appropriate to the scale and nature of the proposed development and flood risk. Should the potential impact be unacceptable, mitigation should be provided. The depth hazard mapping undertaken for the four key Potential Development Areas within Tameside as part of this SFRA should be reviewed and where necessary expanded as part of any site-specific FRA within the key Potential Development Areas.

8.2 Application of the Sequential Approach

8.2.1 The sequential approach should be applied within development sites to locate the most vulnerable elements of a development in the lowest risk areas e.g. residential developments should be restricted to areas identified as exhibiting low hazard (<0.3m depth) whilst parking, open space or proposed landscaped areas can be placed in areas with a higher probability of flooding (Flood Zone 3).

8.2.2 Structures such as (bus, bike) shelters, park benches and storage facilities located in areas with a high flood risk (Flood Zone 3) should be flood resilient and be firmly attached to the ground.

8.3 Building Design

Finished Floor Levels

8.3.1 Where development in flood risk areas is unavoidable, the most common method of mitigating flood risk to people, particularly with 'more vulnerable' (residential) land uses, is to ensure floor levels are raised above the water level derived for the 1% AEP (1 in 100 year) event plus climate change within the immediate vicinity of the site. An allowance for freeboard should also be added in consultation with the Environment Agency, to account for uncertainties.

8.3.2 The Environment Agency's Standing Advice on FRA and mitigation requirements (finished floor levels, access and egress requirements and acceptable runoff) should be consulted when undertaking a FRA.

8.3.3 In certain situations (e.g. for proposed extensions to buildings with a lower floor level or conversion of existing historical structures with limited existing ceiling levels), it could prove impractical to raise the internal ground floor levels sufficiently to meet the general requirements. In these cases, the Environment Agency should be approached to discuss acceptable options for setting the minimum internal ground floor levels provided flood resilience (wet proofing) measures are implemented up to the 1 in 100 year + 20% future climate change flood level plus an allowance to be agreed. There are also circumstances where flood resistance (dry proofing) measures should be considered first. Further guidance is provided in paragraphs 6.29 to 6.35 of the PPS25 Practice Guide.

8.4 Surface Water Management

8.4.1 In designing buildings flood risk management policies require that the developments are 'safe', do not increase flood risk elsewhere and where possible reduce flood risk overall.

8.4.2 For all developments on brownfield sites in CDAs runoff rates should, as a minimum, be reduced by 50%, taking climate change into consideration. Where feasible developments should aim to reduce runoff to greenfield runoff rates.

8.4.3 All developments on greenfield land, within and outside of CDAs, should reduce runoff to greenfield runoff rates, taking climate change into consideration.

8.4.4 For developments on brownfield sites outside of CDAs, runoff rates should be reduced by 30%. Pending further clarification on the CDA boundaries (to be delivered through SWMPs) a target rate of 50% on all brownfield sites is recommended for the entire district.

8.4.5 PPS25 Practice Guide and Environment Agency guidance strongly recommend that suitable surface water mitigation measures are incorporated into any development plans in order to reduce and manage surface water flood risk to, and posed by, the proposed development. This should ideally be achieved by incorporating SuDS into the drainage strategy for the site.

8.4.6 SuDS designs should aim to reduce runoff by integrating storm water controls throughout the site in small, discrete units. Through effective control of runoff at source, the need for large flow attenuation and flow control structures should be minimised if possible.

8.4.7 SuDS can be broadly split into two types: Source control and Site control. Source control methods aim to control runoff at or close to the source e.g. green roofs, rainwater harvesting. Site control is the management of runoff from several areas e.g. the use of ponds.

8.4.8 In order to identify the most suitable drainage solution, both source and site control measures should be assessed as part of any site-specific FRA. SuDS measures that may be suitable for use in the district are discussed in more detail below.

8.4.9 Table 7-1 has been reproduced from the SuDS Manual, CIRIA C679 and outlines typical SuDS options details typical SuDS components.

Table 7-1: Typical SuDS Components

Component Description	Example
Filter Strips	These are wide, gently sloping areas of grass or other dense vegetation that treat runoff from adjacent impermeable areas.
Swales	Swales are broad, shallow channels covered by grass or other suitable vegetation. They are designed to convey and/or store runoff, and can infiltrate the water into the ground (if ground conditions allow).
Infiltration Basins	Infiltration basins are depressions in the surface that are designed to store runoff and infiltrate the water to the ground. They may also be landscaped to provide aesthetic and amenity value.
Wet ponds	Wet ponds are basins that have a permanent pool of water for water quality treatment. They provide temporary storage for additional storm runoff above the permanent water level. Wet ponds may provide amenity and wildlife benefits.
Extended Detention Basins	Extended detention basins are normally dry, though they may have small permanent pools at the inlet and outlet. They are designed to detain a certain volume of runoff as well as providing water quality treatment.
Constructed Wetlands	Constructed wetlands are ponds with shallow areas and wetland vegetation to improve pollutant removal and enhance wildlife habitat.
Infiltration Devices	Infiltration devices temporarily store runoff from a development and allow it to percolate into the ground.
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation.
Filter Drains and Perforated Pipes	Filter drains are trenches that are filled with permeable material. Surface water from the edge of paved areas flows into the trenches, is filtered and conveyed to other parts of the site. A slotted or perforated pipe may be built into the base of the trench to collect and convey the water.

8.4.10 Some specific SuDS features, including balancing ponds must be located outside the 1 in 100 year floodplain.

Green Roofs

8.4.11 Green roofs are a layer of vegetation, placed over a drainage layer that is designed to intercept and retain rainfall leading to a reduction in the volume of runoff. The use of green roofs can reduce the size of downstream SuDS and drainage infrastructure required.

8.4.12 According to the English Nature research report[11] '*Green Roofs: Their existing status and potential for conserving biodiversity in urban areas*', 71% of rain falling on a 100mm turf layer can be retained within the turf layer, greatly reducing storm water runoff. There are two main types of green roof, extensive and intensive.

8.4.13 An extensive green roof is a covering of the whole roof area with low growing, low maintenance plants. They usually comprise of a 25 – 125mm thick soil layer in which a variety of hardy, drought tolerant, low level plants are grown. Extensive green roofs are designed to be self-sustaining and cost effective and can be used in a wide variety of locations often described as an 'ecological protection layer'.

8.4.14 An intensive green roof is a landscaped area which includes planters or trees and is usually publicly accessible. They may include irrigation and storage for rainwater. They often require more maintenance and impose a greater load on the roof structure than extensive green roofs. Some city parks are in fact intensive green roofs such as the parks within the Canary Wharf Estate, Canada Square and West Ferry Circus and the roof of Cannon Street Station in London.

8.4.15 The Environment Agency's Green Roof Toolkit document providing further information and guidance can be found on their website[12].

Rainwater Harvesting

8.4.16 Rainwater harvesting is also recommended as a potential mitigation method to reduce surface water flood risk. The rainwater harvesting process is essentially the collection of rainwater from roofs into containers, which can be stored either above or below ground. The stored rainwater can then be re-used as and when required for every day non potable uses such as washing machines and toilets. Alternatively, collected rainwater can be released into the sewerage system or other water pathways, in a controlled and timely manner, once the rainfall event has subsided to reduce the risk of flooding and sewerage overflows.

8.4.17 The Environment Agency support the use of rainwater harvesting; however note that *"storage in these types of systems will not usually be able to be counted towards the provision of on-site storage for surface water balancing. This is because the storage*

[11] http://www.wildlifegateway.org.uk/site/pdfs/naturalEngland/498.pdf
[12] http://www.environment-agency.gov.uk/business/sectors/91967.aspx Green roof toolkit, Environment Agency, June 2009

cannot be guaranteed to be available when required given the sporadic nature of the use of the harvested rainwater".

Pervious Pavements

8.4.18 A further SuDS method that would be suitable for Tameside is pervious pavements. Pervious pavements allow rainwater to infiltrate through the surface into underlying construction layers where water is stored prior to infiltration to the ground, reused or released to a surface water drainage system or watercourse at an attenuated rate.

8.4.19 Pervious surfaces can be incorporated into soft landscaping and oil interceptors can be added to improve pollutant retention and removal. In urban areas where there is a high percentage of hard cover the use of pervious surfaces for car parks and hard areas is a valuable technique that should be used wherever possible.

8.4.20 While pervious pavements are a good choice of SuDS for use within the study area, consideration of the proximity of basements and foundations must be made. Where pervious pavements are located within 5m of foundations or basements, an impermeable membrane liner is required to prevent infiltration.

8.4.21 Site geology should also be taken into account when deciding on suitable SuDS measures. Some SuDS systems rely on infiltration which in areas of low permeability may not be technically viable. If SuDS using infiltration are to be used, permeability tests should therefore be carried out to establish infiltration rates. Figure 8-1, Appendix 1 shows the SuDS map for Tameside from the AGMA Sub-Regional SFRAS, which can be used as a starting point for SuDS considerations.

8.4.22 Any surface water management system should be implemented in accordance with relevant policy and guidance such as PPS25, National SuDS Working Group (2004), BRE365, CIRIA C522 for SuDS, CIRIA 523 (SuDS Best Practice Manual) and CIRIA C697 (the SuDS Manual).

8.5 Pluvial Flood Risk

8.5.1 It is recommended that the ASTSWF map is used as a starting point in the assessment of pluvial flood risk to FRA sites. Future developers should investigate the topography of development sites relative to their surroundings in more detail to determine whether they are likely to be affected by surface water flooding based on the Environment Agency maps showing ASTSWF or information derived from SWMPs. If there is any doubt, then the recommended standard for finished floor levels should apply (i.e. a minimum of 300mm above adjacent road levels). The topography of the site should also be investigated to avoid placing development on the path of flow and consequently increasing the risk of pluvial flooding to the site and third parties.

8.6 Flooding from Sewers and Drains

8.6.1 The risk of flooding from sewers and drains could not be properly assessed due to lack of data. Based on the information gathered as part of the Level 1 SFRA update, it is likely that the level of risk from sewer flooding within Tameside is generally low. Future FRAs should investigate the risk of flooding from sewers and drains and confirm runoff rates into sewers with UU, Tameside MBC and the Environment Agency.

8.7 Risk of flooding from Canals and Reservoirs

8.7.1 The risk of flooding from canals and reservoirs in Tameside MBC is generally low. It is recommended that the maps in Appendix 1 Figure 5-7 and Figure 5-8 in are used to assess the need for further investigation of flood risk from reservoirs and canals. If this initial assessment suggests a need for further investigation then an appropriate level of assessment, dependent on the general conditions, the nature of the site and its end use should be undertaken.

8.8 Climate Change

8.8.1 PPS25 and the accompanying Practice Guide recommends an allowance for an increase in the peak rainfall intensity of up to 30%, as well as increase in peak flows in watercourses of up to 20%. This will significantly affect smaller urban catchments, leading to rapid runoff and subsequent increased flows within watercourses, surface water flooding, surcharging of gullies, drains and sewer flooding.

8.8.2 Sewer and surface water flooding are likely to become more frequent and widespread under urbanisation and climate change scenarios if the amount of impermeable surfaces and runoff increases, highlighting the importance of SuDS.

8.8.3 The location of future urban developments and flood defences within a catchment can heavily influence flood risk in the area and has the potential to further increase flood risk at sites downstream of such developments. Impacts of climate change include the lowering of the SoP offered by flood defences and the carrying capacity of culverts, drains, sewers and watercourse channels. These potentially lead to areas being at risk of flooding that were not previously at risk and highlight the increasing conflicts and pressures that are emerging between climate change scenarios and future development aspirations.

8.8.4 The PPS 1 Climate Change Supplement: *Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1*[13] sets out important objectives in

[13] PPS 1 Climate Change Supplement: Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1. http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppsclimatechange.pdf

order to tackle climate change, sea level rise and avoid flood risk. The purpose of design policies should be to ensure that developments are sustainable, durable and adaptable to natural hazards such as flooding. Following this guidance, it should be possible to mitigate against increased flood risk by incorporating flood resistance and flood resilience (flood proofing) measures such as raised finished floor levels into the development design, and/or development of compensatory storage and flood storage basins.

8.8.5 The Adaptation Strategies for Climate Change in the Urban Environment (ASCCUE) project is a study undertaken collaboratively by the University of Manchester, University of Cardiff, University of Southampton and Oxford Brooks University. The project aimed to further the understanding of the impacts and risks of climate change on towns and cities through three 'exposure units' of human comfort, urban green space and the built environment. One of the aspects examined was surface water runoff during extreme rainfall events.

8.8.6 With an increase in development, there comes an increase in the amount of impermeable areas thus leading to increased runoff during storm events. In one of the worst-case modelled scenarios (large urban centre), an increase in rainfall of 56% by 2080, led to an increase in runoff of 82%.

8.9 Residual Risk Mitigation

8.9.1 Residual risks are those risks that remain after flood mitigation measures have been implemented.

8.9.2 As previously discussed (Section 6.2), none of the proposed development sites are located behind defences and therefore are not at risk of flooding through failure or overtopping of flood defences.

Flood Resilience and Resistance Measures

8.9.3 Paragraphs 6.29 to 6.35 of the PPS25 Practice Guide and the Department of Communities and Local Government publication 'Improving the Flood Performance of New Buildings' (May 2007) have both provided guidance on the design of buildings to reduce residual risk of flooding. Further guidance is also provided in the CIRIA Research Project 624 'Development and Flood Risk: Guidance for the Construction Industry' (2004).

8.9.4 Flood proofing is a technique by which buildings are designed to withstand the effects of flooding. There are two main categories of flood proofing; dry proofing and wet proofing. Dry proofing methods are designed to keep water out of the building (flood resistance), and wet proofing methods are designed to improve the ability of the property to withstand the effects of flooding once the water has entered the building (flood resilience).

8.9.5 Table 7-2 summarises recommendations made within Table A3.6 of the C624 report for flood proofing measures which can be incorporated within the design of buildings (subject to compliance with Building Regulations).

Table 7-2: Flood Proofing Options

Feature	Considerations To Improve Flood Proofing
External Walls	Careful consideration of materials: use low permeability materials to limit water penetration if dry proofing required. Avoid using timber frame and cavity walls. Consider applying a water resistant coating. Provide fittings for flood boards or other temporary barriers across openings in the walls (dry proofing).
Internal Walls	Avoid use of gypsum plaster and plasterboard; use more flood resistant linings (e.g. hydraulic lime, ceramic tiles). Avoid use of stud partition walls.
Floors	Avoid use of chipboard floors. Use concrete floors with integrated and continuous damp proof membrane and damp proof course. Solid concrete floors are preferable; if a suspended floor is to be used, provide facility for drainage of sub-floor void. Use solid insulation materials.
Fitting, Fixtures and Services	If possible, locate all fittings, fixtures and services above design flood level. Avoid chipboard and MDF. Consider use of removable plastic fittings. Use solid doors treated with waterproof coatings. Avoid using double-glazed window units that may fill with flood water. Use solid wood staircases. Avoid fitted carpets. Locate electrical, gas and telephone equipment and systems above design flood level. Fit anti-flooding devices to drainage systems.

Emergency Planning

8.9.6 Emergency access and egress is required to enable the evacuation of people from developments and also to provide the emergency services with access to the development during times of flood and enable flood defence authorities to carry out any necessary duties during periods of flood.

8.9.7 An emergency access and egress route is a route that is 'safe' for use by occupiers without the intervention of the emergency services or others. A route can only be completely 'safe' in flood risk terms if it is dry at all times. If a completely safe route is not available then a route with a low hazard should be considered.

8.9.8 For developments located in areas at flood risk the Environment Agency consider 'safe' access and egress to be in accordance with 'FRA Guidance for New Development FD2320' (DEFRA/EA), where the requirements for safe access and egress from new developments are as follows in order of preference:

- Safe, dry route for people and vehicles,
- Safe, dry route for people,

- If a dry route for people is not possible, a route for people where the flood hazard in terms of depth and velocity of flooding) is low and should not cause risk to people,
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles.

8.9.9 For commercial development ('less vulnerable') it is considered that dry access and egress from the site will be desirable during times of extreme floods. For all new residential development ('more vulnerable'), it is considered that dry access and egress from the development will be essential during times of extreme floods from each residential unit to an area outside of the floodplain. New properties within a 'dry island' of the fluvial floodplain will also require dry access due to the disruption to essential services (gas, water, etc.) that would be experienced during a flood event.

8.9.10 It is necessary to ensure that proposed road levels in new developments are such that emergency access and egress routes are maintained or where possible constructed to the 1 in 100 year plus an allowance for climate flood level, as a minimum.

8.9.11 Details of how emergency access and egress will be achieved should be clearly described in site-specific FRAs. This should include:

- A review of any detailed river models (where available);
- A review of flood extents from broad scale modelling; and
- Comparison of flood extents/levels with local ground levels from topographical survey or digital elevation models.

8.9.12 A preliminary assessment undertaken as part of this Level 2 SFRA has identified that access and egress is possible throughout Tameside. However, the assessment of feasible access and egress routes will require investigation of all potential sources of flooding within the site-specific FRAs for each site.

Flood Warning

8.9.13 Where developing in flood risk areas is unavoidable, it is recommended that the owners/occupiers sign up to the 'Floodline Warnings Direct' service operated by the Environment Agency where the area is designated to receive flood warnings (EA website[14]) as a means of mitigating flood risk to people. Where a particular site lies within an area not currently eligible to receive flood warnings, it can be registered with the local EA office as an 'area of interest' in order to receive such warnings. The flood warnings are provided by the service via mobile, telephone, fax or pager. More detailed information on the likely extent and time scale of these warnings can be obtained by request from the Environment Agency, by their 'Quickdial' recorded information service, or via their website.

[14] http://www.environment-agency.gov.uk/subjects/flood/?lang=_e

8.9.14 The Environment Agency has also recently launched a programme to make water levels data accessible to the public via the internet. This provides additional warning to prepare the public to pro-actively manage flood risk.

8.9.15 For any proposed commercial or industrial developments within a designated floodplain (Flood Zone 3b, 3a and 2), or those providing a service to vulnerable groups such as elderly care homes or hospitals, a system for monitoring flood warnings should be developed with designated responsible persons able to monitor and disseminate the warnings. This will provide more time to enable emergency evacuation of staff or residential occupants from the local area which may become flooded during a flood event (including routes for egress) prior to inundation.

8.9.16 Flood warning systems should also enable sufficient time to implement protection measures for any commercial goods or personal belongings on site through sealing of all external doors to prevent flood inflow into such buildings as a precaution.

8.9.17 The exact nature of these emergency plans and procedures should be determined from the results obtained through the detailed FRAs for the individual sites and may be needed in conjunction with other mitigation measures. The need for, and feasibility of flood warning systems for a development should be discussed within the FRA.

8.9.18 Where there are exceptional circumstances in which development is allowed, which is reliant on evacuation, the relevant LPA will need to assess whether the proposals are acceptable to their own emergency planners and the local emergency services. It is not the remit of the Environment Agency to make recommendations on this matter.

9 Conclusions and Recommendations

9.1 Conclusions

Level 1 Update

9.1.1 The Level 1 update was undertaken to fill data gaps in relation to flood risk from non-fluvial sources of flooding. The fluvial flood risk data was also updated with the most recent information received from the Environment Agency. Data availability was a key issue for the SFRA which has limited the assessment of flood risk from other sources in particular. The extent of the Level 1 update was therefore tailored to suit the data availability for each source of flooding and the conclusions are stated below.

9.1.2 The risk of fluvial flooding within the District of Tameside MBC is generally low. Flood Zone 3b is generally within the river banks. Flood Zone 3a and Flood Zone 2 extend out of bank at some locations but the spread of the Flood Zones beyond the river banks is generally limited by the narrow valleys. The areas at relatively greater risk of fluvial flooding are:

- Waterloo area in Ashton, along Taunton Brook near the A627 road crossing;
- The industrial area near the confluence of the River Tame and Carr/Staly Brook in Mossley;
- The area bound by Bayley Street, Dale Street, Bridge Street and the River Tame in Stalybridge and the area bound by Park Road and the River Tame;
- The Shepley South and Shepley North Industrial Estates;
- The area near the sewage works, south of the Shepley South Industrial area;
- The areas adjacent to the River Tame, near the Godley brook confluence.

9.1.3 The ASTSWF map for Tameside shows a wide distribution of areas susceptible to surface water flooding within the District. Generally, the low lying areas along the river valleys and along the course of culverted watercourses as well as natural low spots appear to be most susceptible. Areas susceptible to pluvial flooding include Droylsden, Ashton-under-Lyne, Denton, Hyde and Audenshaw. Mossley, Stalybridge and Dukinfield are shown to be less susceptible to surface water flooding. These areas lie on a relatively higher elevation compared to the rest of the district.

9.1.4 Due to lack of model data a detailed analysis of flood risk from sewer and drains could not be undertaken. Historical data suggest that the risk of flooding from sewers and the drainage system is low. The DG5 data suggest a higher risk of flooding from sewers in the south eastern part of the district. Audenshaw stands out as the area with the highest risk of sewer flooding based on the DG5 data. Up to 11 external flooding of properties have been recorded in the area.

9.1.5 Analysis of reservoirs and canal data within the District suggests that a potential residual risk of flooding from these artificial sources exists. The SFRA has highlighted likely flow routes and potential areas at risk of flooding from artificial sources.

9.1.6 Analysis of data on groundwater and consultations with the Environment Agency suggest that the risk of groundwater flooding within the District is low.

Level 2 SFRA

9.1.7 The detailed hydraulic modelling has shown that although the four Potential Development Areas are all close to the River Tame, significant proportions of the areas lie in Flood Zone 1 and Flood Zone 2 and are appropriate for most of the types of development envisaged in these areas, including “Essential Infrastructure”, “Less Vulnerable”, and “More Vulnerable” developments provided adequate mitigation measures are implemented.

9.1.8 The flood risk hazard in the four Potential Development Areas is generally low; however flood depths of up to 0.5-1.5m have been estimated for the 1% AEP event at a few locations.

Flood Risk Management

9.1.9 A combination of raised defences and enhancement of the capacity of the floodplain downstream of Hyde to detain floodwaters would be viable options to manage flood risk within Tameside without having a negative impact on Stockport.

9.2 Recommendations

9.2.1 To ensure a holistic approach to flood risk management and make sure that flooding is taken into account at all stages of the planning process, the findings of this report should be incorporated into the emerging LDF for Tameside MBC to ensure that:

- New development is flood-proofed to a satisfactory degree and does not increase flood risk elsewhere,
- Surface water is managed effectively on site.
- Development in Flood Zone 2 or Flood Zone 3 is safe.

9.2.2 Recommendations have been presented that apply to the district level and for each of the four Potential Development Areas where proposals for future developments in fluvial flood risk areas are likely to be directed.

9.2.3 The current UDP protects significant Green Belt areas adjacent to the Tame. It is strongly recommended that Green Belt areas are preserved as they provide an ideal opportunity to reduce flood risk by providing space for flood waters to flow through and additional areas for future flood storage schemes.

9.2.4 PPS25 states that a Level 2 SFRA should identify whether there is a need (or not) for a SWMP. The SFRA has highlighted areas where further investigations are required in future SWMP studies for Tameside. One of the key objectives of the SWMP should be to

determine CDA boundaries within the District to enable implementation of policies to reduce surface water flood risk.

9.2.5 It is recommended that Tameside MBC should work with the Environment Agency to investigate flood management options to reduce the risk of flooding from the River Tame and use the AGMA SWMP as an opportunity to produce a comprehensive Flood Risk Management Strategy for Tameside in accordance with the Flood and Water Management Act (2010).

9.2.6 It is recommended that the Level 2 SFRA is updated as and when more flood risk data becomes available. This reflects the 'Living Document' nature of the SFRA and will ensure that the document uses the best available information.

Appendix 1 Maps

Appendix 2 Summary of Planning Data

Appendix 3 Flood Defence Inspection Report