Tameside Metropolitan Borough Council Preliminary Flood Risk Assessment

May 2011

Tameside Metropolitan Borough
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Revision History

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Contract

This report describes work commissioned by Tameside BC. Tameside BC's representative for the contract was Andrew Leah. Chris Isherwood of JBA Consulting carried out this work.

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Purpose

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JBA Consulting has no liability regarding the use of this report except to Tameside BC.

Acknowledgments

JBA would like to thank all those who provided information and data for this report. Special thanks go out to Andrew Leah from Tameside BC, Brian Morrow from United Utilities and John Lymer from the Environment Agency.

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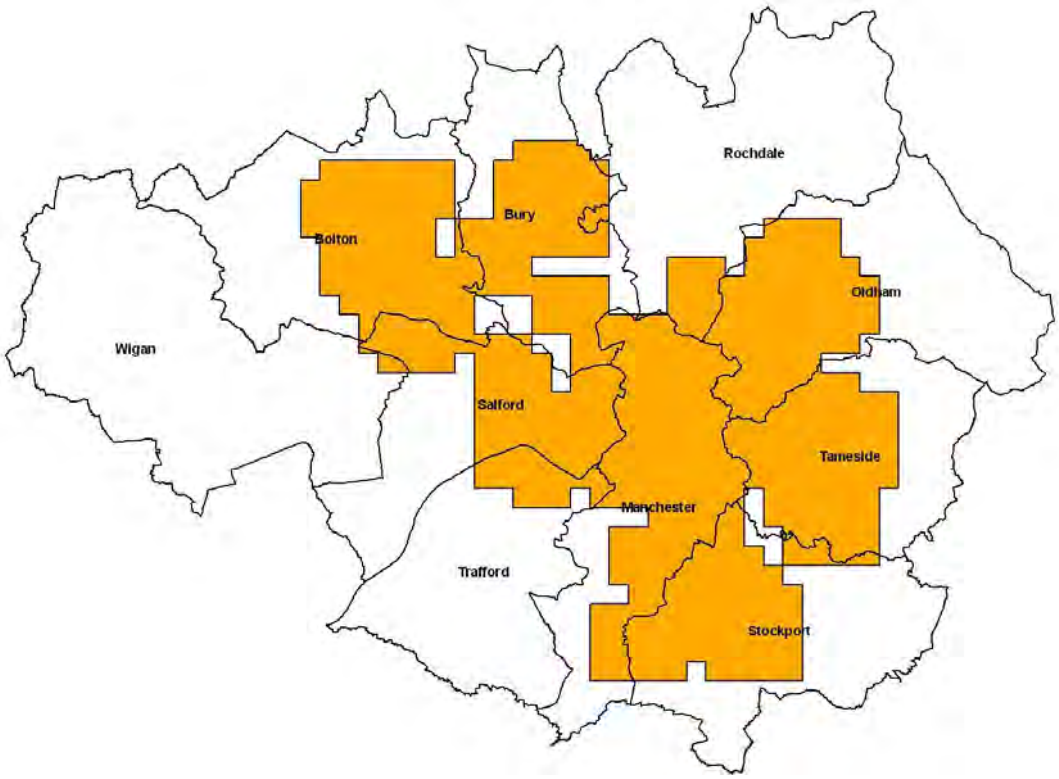
Executive Summary

This report has been prepared to assist Tameside BC meet its duties, as a Lead Local Flood Authority, to manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009). It is part of the Preliminary Flood Risk Assessment (PFRA) process.

The Regulations require LLFAs, through the PFRA process, to carry out a high level screening to determine whether there is a local flood risk within their LLFA boundary based on past (historic) and future (potential) flood risk data. Local flood risk is defined as flooding from surface water, groundwater, ordinary watercourses and canals. This information is assembled in this report known as the Preliminary Assessment Report (PAR) and the supporting spreadsheet and is used to identify Flood Risk Areas.

As a LLFA, Tameside BC must submit their PFRA to the Environment Agency for review by 22nd June 2011. The methodology for producing this PFRA is based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting Flood Risk Areas, both published in December 2010.

In order to ensure a consistent national approach, Defra and WAG identified flood risk criteria and thresholds to be used for defining flood risk areas. The Environment Agency then used these criteria with the national Flood Map for Surface Water (FMfSW) and the National Receptor Dataset (NRD) to identify areas above the flood risk thresholds. Where clusters of these areas above the flood risk thresholds reached over 30,000 people they were identified as indicative Flood Risk Areas. Ten national indicative Flood Risk Areas were identified in England; one of which partially covers, to some degree, all 10 LLFAs in Greater Manchester; Bolton Council, Bury Council, Manchester City Council, Oldham Council, Rochdale Borough Council, Salford City Council, Stockport Metropolitan Borough Council, Tameside Borough Council, Trafford Council and Wigan Council. The Greater Manchester indicative Flood Risk Area is illustrated below.



In order to develop a clear overall understanding of the flood risk across Tameside BC, this report collates and reviews all available local flood risk information of past and future flood

risk. The council's Strategic Flood Risk Assessments and the Greater Manchester Surface Water Management Plan, which is currently being carried out, provided the majority of this data.

Based on the evidence that was collected, no past flood events were considered to have had „significant harmful consequences'. Therefore, no records were included on past flooding in Annex 1 of the Preliminary Assessment Spreadsheet.

Future flood risk is assessed using a number of national and local datasets including the

- Environment Agency's national Areas Susceptible to Surface Water Flood Map
- Environment Agency's national Flood Map for Surface Water
- Environment Agency's national Areas Susceptible to Groundwater Flood Map
- Environment Agency's national Flood Map for rivers and the sea
- Bury Rochdale Oldham Strategic Flood Risk Assessment (SFRA) surface water flood maps
- Joint Manchester Salford Trafford Level 2 Strategic Flood Risk Assessment (SFRA) surface water maps
- Joint Manchester Salford Trafford Level 2 Strategic Flood Risk Assessment (SFRA) Groundwater map
- United Utilities sewer model surcharge volumes

Whilst some local surface water mapping is available, this does not cover all 10 local authorities and therefore does not allow a consistent approach to be adopted between LLFAs to identify future risk areas across Greater Manchester. In order to maintain consistency and prevent the production of conflicting results with those already supplied nationally by the Environment Agency, it was agreed during Greater Manchester SWMP Steering Group meetings with the Environment Agency and United Utilities that the FMfSW should be the „locally agreed surface water information' in Tameside and across Greater Manchester. It must be noted, that the FMfSW is being used for this PFRA only as a stopgap until the Greater Manchester SWMP is complete (expected to be available in summer 2011). Once complete the SWMP surface water modelling outputs are likely to become the new „locally agreed surface water information' across Greater Manchester.

Based on the Environment Agency's FMfSW approximately 24,200 properties are estimated to be at risk from potential flooding to a depth of 0.3m and a further 7,200 at a depth above 0.3m during a rainfall event with a 1 in 200 annual chance of occurring in Tameside. Using this flood risk data and the Environment Agency's flood risk thresholds, 50 1km grid squares illustrating future risk were identified in Tameside. By carrying out a grouping approach to the 1km grid squares across England, the Greater Manchester cluster was identified with 86,500 people at risk, of which 11,600 fall within Tameside. As the Greater Manchester cluster exceeds the threshold of 30,000 people, the Environment Agency as identified the area as an indicative Flood Risk Area.

Through this PFRA process it was concluded that the Environment Agency's Greater Manchester indicative Flood Risk Area is representative of significant risk in Tameside and Tameside BC identifies this as their Flood Risk Area without any alteration.

By having a Flood Risk Area covering Tameside, the next stage of the PFRA process is triggered. This means the council will have to produce flood hazard maps, flood risk maps by June 2013 and flood risk management plans for that area by June 2015.

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Glossary

Term or Abbreviation	Definition
Act	A Bill approved by both the House of Commons and the House of Lords and formally agreed to by the reigning monarch (known as Royal Assent)
AGMA	Association of Greater Manchester Authorities
Assets	Structures, or a system of structures used to manage flood risk
AStGWF	Areas Susceptible to Groundwater Flooding
AStSWF	Areas Susceptible to Surface Water Flooding
BAP	Biodiversity Action Plan
Catchments	An area that serves a river with rainwater. Every part of land where the rainfall drains to a single watercourse is in the same catchment.
CFMP	Catchment Flood Management Plan
CSOs	Combined Sewer Overflows
Cultural heritage	Buildings, structures and landscape features that have an historic value. These are also known as heritage assets
Defences	A structure that is used to reduce the probability of floodwater or coastal erosion affecting a particular area (for example a raised embankment or sea wall)
Defra	Department for Environment, Food and Rural Affairs
DTM	Digital Terrain Model
FCERM	Flood and coastal erosion risk management
Flood	The temporary covering by water of land not normally covered with water
FMfSW	Flood Map for Surface Water
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG
FROG	Flood Risk Officers Group
FWMA	Flood and Water Management Act
GHG	Greenhouse Gas
Groundwater	Water which is below the surface of the ground and in direct contact with the ground or subsoil
HSWGW	Historic Surface Water and Groundwater
Indicative Flood Risk Areas	Areas determined by the Environment Agency as indicatively having a significant flood risk, based on guidance published by Defra and WAG and the use of certain national datasets. These indicative areas are intended to provide a starting point for the determination of Flood Risk Areas by LLFAs
LLFA	Local Lead Flood Authority
Local flood risk	Flood risk from sources other than main rivers, the sea and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses
LoSA	Level of Service Agreement
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
Manning's 'n'	An empirically derived coefficient, which is dependent on many factors, including surface roughness and **sinuosity**
MoU	Memorandum of Understanding
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency
Ordinary watercourses	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, IDBs
Preliminary assessment report	A high level summary of significant flood risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding

Term or Abbreviation	Definition
Preliminary assessment spreadsheet	Reporting spreadsheet which LLFAs need to complete. The spreadsheet will form the basis of the Environment Agency's reporting to the European Commission
PFRA	Preliminary Flood Risk Assessment
PPS25	Planning Policy Statement 25
Receptor	Something that may be harmed by flooding
Regulations	The Flood Risk Regulations
Resilience	The ability of the community, services, area or infrastructure to withstand the consequences of an incident
RFRA	Regional Flood Risk Appraisal
Risk	Measures the significance of a potential event in terms of likelihood and impact
River basin district	There are 11 river basin districts in England and Wales, each comprising a number of contiguous river basins or catchments. The Environment Agency is responsible for collating LLFA reports at a river basin district level
SAB	SuDs Approval Board
SACs	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment
SIRS	Sewerage Incident Register System
Source	The origin of a hazard (e.g. heavy rainfall, strong winds, surge etc)
SPAs	Special Protection areas
SSSIs	Sites of Special Scientific Interest
SuDS	Sustainable urban Drainage systems
Surface runoff	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer
SWMP	Surface Water Management Plan
UKIP09	UK Climate Change Projections 2009
UU	United Utilities
WIRS	Wastewater Incident Register System

1. Introduction

1.1 Preliminary Flood Risk Assessment

This document reports the findings of research undertaken by JBA Consulting on behalf of Tameside BC towards the preparation of a Preliminary Flood Risk Assessment (PFRA) for their administrative area.

The chief drivers behind this research and preparation of the PFRA report are two sets of new legislation: the Flood Risk Regulations (the Regulations), which came into force on the 10th December 2009, and the Flood & Water Management Act (FWMA) which gained Royal Assent on the 8th April 2010. Under these pieces of legislation, all Unitary Authorities (such as Tameside BC) and in two-tier systems (all County Councils) are designated as Lead Local Flood Authorities and consequently have a number of new key statutory responsibilities with respect to local flood risk management. Chapter 2 provides a full description of these responsibilities.

The purpose of the Regulations was to transpose the European Floods Directive (Directive 2007/60/EC on the assessment and management of flood risk) into domestic law in England and Wales. The aim of the Directive is to reduce the likelihood and consequence of flooding by establishing a common framework for understanding and managing flood risk across Europe. It establishes four stages of activity within a six-year flood risk management cycle.

In particular, the Regulations places duties on the Environment Agency and LLFAs to prepare a number of key documents including

- Preliminary Flood Risk Assessments (PFRA)
- Flood hazard and flood risk maps
- Flood Risk Management Plans

Table 1-1 shows the elements of work required from Tameside BC under the Regulations, along with the timescales of their respective delivery.

Table 1-1: Work Required under the Flood Risk Regulations 2009

Timescale	Assessment or Plan	Description
22nd June 2011	Prepare a **preliminary assessment report**	The PFRA should focus on local flood risk from **surface water, groundwater, ordinary watercourses and canals**.
22nd June 2011	Determination and identification of **flood risk areas**	Flood Risk Areas are areas of **significant risk** identified on the basis of the findings of the PFRA, national criteria set by the UK Government Secretary of State and guidance provided by the Environment Agency.
22nd June 2013	Prepare **flood hazard maps and flood risk maps** in relation to each relevant flood risk area	The hazard and risk maps will show the likely **extent, depth, direction, speed of flow and probability** of possible floods and their **consequences.**
22nd June 2015	Prepare a **flood risk management plan** in relation to each relevant flood risk area	The flood risk management plans will set out what the **risk management objectives** are, the measures proposed to achieve those objectives and how the measures are to be implemented.

This Preliminary Assessment Report (PAR) will complete the first two stages in the process. The identification of Flood Risk Areas will establish where the final two stages of preparing hazard and risk maps and flood risk management plans are required.

The PFRA (and any subsequent maps and plans) will form part of the local flood risk management strategies that LLFAs are required to prepare under the FWMA. Local

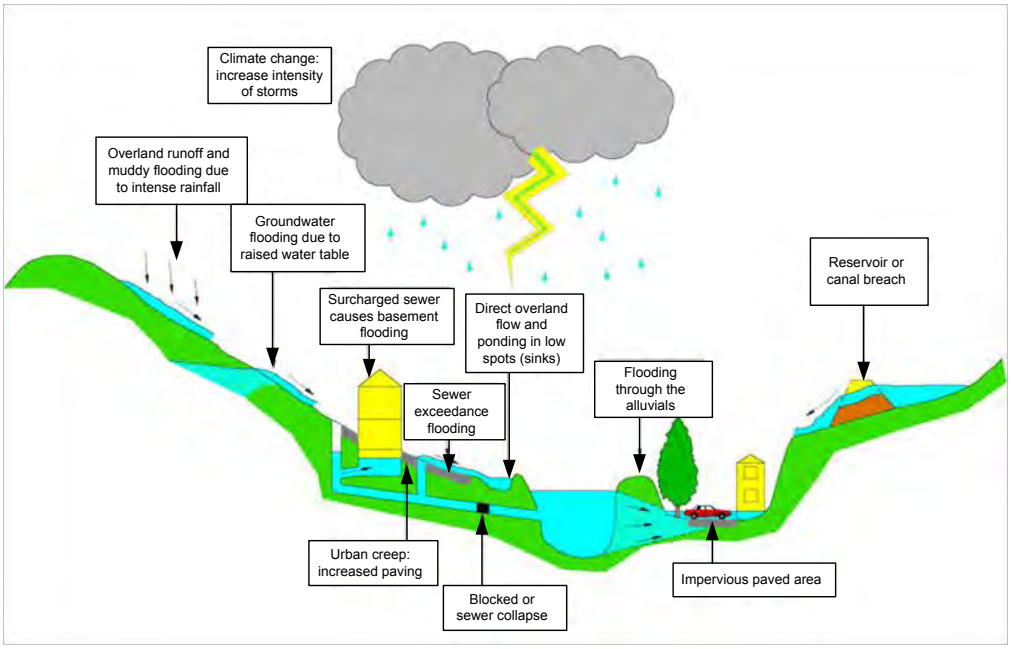
strategies will set out how LLFAs will manage local flood risk in their area and will cover areas not identified as being at significant flood risk under the Regulations.

1.2 Sources of flooding

As described in the Regulations, flood risk management associated with the sea, main rivers and reservoirs is the responsibility of the Environment Agency. Whilst the Environment Agency Flood Map is included in the PFRA to illustrate possible interactions and future risk associated with ordinary watercourses, this PFRA does not explicitly deal with those sources not under LLFA responsibility.

LLFAs are responsible for assessing risk from sources of flooding other than main rivers, the sea and reservoirs. In particular, this includes surface runoff, groundwater and ordinary watercourses and any interaction these have with drainage systems, and other sources of flooding including sewers. LLFAs will however have to take into account the interaction of flooding from main rivers, the sea and reservoirs with local sources. Sections 1.2.1 to 1.2.6 provide a description of each relevant source related to Tameside.

Figure 1-1: Flooding from all Sources



1.2.1 Surface water flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may last less than an hour or only a few hours. The resulting water follows natural valley lines, creating flow paths along roads, through and around developments and ponding in low spots, which often coincide with fluvial floodplains in low-lying areas. Surface water runoff can also exceed the capacity of the local drainage network and affect areas not obviously susceptible to flooding from the local topography.

1.2.2 Groundwater flooding

Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from abnormal springs. This tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth.

There are several mechanisms, which produce groundwater flooding including prolonged rainfall raising groundwater levels, high in bank river levels, artificial obstructions and groundwater rebound.

1.2.3 Sewer flooding

Foul/combined sewers and surface water drainage systems are spread extensively across urban areas with various interconnected systems discharging to treatment works and into local watercourses. The main dendritic network of trunk sewers within older urban areas will be combined and it is only more recently in the 20th Century that a separate system of sewers has evolved at the periphery of urban areas.

Combined systems necessarily discharge to sewage treatment works; combined Sewer Overflows (CSOs) provide an overflow release from the drainage system into local watercourses or surface water systems when the system cannot cope during times of high flows. Surface water systems collect surface water drainage separately and discharge directly into local watercourses.

Sewer flooding occurs due to large rainfall events causing sewers to surcharge leading to highway and external curtilage flooding and sometimes internal sewer flooding to properties. Basement flooding is a significant issue, which causes much of the DG5 reportable flooding.

1.2.4 Ordinary watercourse flooding

There are a number of ordinary watercourses in Tameside. Ordinary watercourses are not classified as Main Rivers and as such come under the control of the council. These watercourses are often rural in nature and include drains and tributaries to main rivers. The majority of these (named and un-named) have been identified in the council SFRA. It is worth noting that some parts of the River Irwell and River Mersey are ordinary watercourses.

Flooding of watercourses is associated with the exceedance of channel capacity either from high flows or local factors such as online structures.

1.2.5 Canal flooding

Sections of the Huddersfield Narrow Canal and the Ashton Canal run through Tameside. The Tameside SFRA provides an assessment of the risk associated with this canal.

The risk of flooding along each canal is dependent on a number of factors. As they are closed systems and heavily controlled, they will not respond in the same way as a natural watercourse during a storm event. Flooding is more likely to be associated with residual risks, similar to those associated with river defences, such as overtopping of canal banks, breaching of embanked reaches or asset (gate or culvert) failure. Canals are often interlinked with other sources, such as the rivers that feed them and the watercourses or drains that cross underneath and consideration should be given to this interaction in any assessment of flood risk.

1.2.6 Interaction with main rivers

Many of the sources listed above connect to the main rivers in Greater Manchester. For instance ordinary watercourses flow into main rivers and vice versa, main rivers flow into or under broad canals and the Manchester Ship Canal, and urban drainage systems outfall into main rivers.

Flooding mechanisms associated with these interactions are often the result of flow backing up because another source (such as a river) has prevented it from discharging normally. Information about past flooding will often be about an unknown source (i.e. it is not clear where the water came from), or flooding because of interactions between sources (in which case two or more sources may be recorded). This interaction will be difficult to identify without detailed flood risk studies.

1.3 Study area

The study area for this PFRA is the administrative area of Tameside. Tameside BC is located in North West of England and the Council is one of ten councils that comprise the conurbation of Greater Manchester. Under the FWMA, each council in Greater Manchester is a LLFA. Figure 1-2 illustrates the geographical extent of the study area.

The study area falls within the North West River Basin District, which is served by the Environment Agency North West region and one water company, United Utilities.

1.4 Aims and objectives

The aim of this PFRA is to provide a high level screening assessment of local flood risk across the study area, including information on past (historic) and future (potential) floods and their potential consequences. The PFRA assembles this information to identify Flood Risk Areas, which warrant further examination through the production of maps and management plans.

The key objectives can be summarised as follows:

- Identify relevant partner organisations involved in future assessment of flood risk; and summarise means of future and ongoing stakeholder engagement.
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information.
- Provide a summary of the systems used for data sharing and storing, and provision for quality assurance, security and data licensing arrangements.
- Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures.
- Assess historic flood events within the study area from local sources of flooding (including flooding from surface water, groundwater, canals and ordinary watercourses), and the consequences and impacts of these events.
- Establish an evidence base of historic flood risk information, which will be built upon in the future and used to support and inform the preparation of the Council's local flood risk management strategy.
- Assess the potential harmful consequences of future flood events within the study area.
- Review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas.

Figure 1-2: Tameside MBC PFRA Study Area

2. Lead Local Flood Authority Responsibilities

2.1 Introduction

The Flood Risk Regulations 2009 transpose the European Floods Directive (Directive 2007/60/EC on the assessment and management of flood risk) into domestic law in England and Wales. The production of a PFRA is a requirement under the Regulations. The Flood & Water Management Act 2010 defines further responsibilities for flood risk management based on the recommendations of the Pitt Review.

This section provides a brief overview of these other responsibilities, which Tameside BC is obliged to fulfil, under its new role as a Lead Local Flood Authority.

2.2 Governance and partnership arrangements

Sir Michael Pitt's review of the flooding in 2007 stated, *"The role of local authorities should be enhanced so that they take on responsibility for leading the co-ordination of flood risk management in their areas"*. The Floods and Water Management Act provides for this through the new role of the Lead Local Flood Authority, of which Tameside BC has been designated, and is therefore responsible for leading local flood risk management across their administrative area.

Sir Michael Pitt's Review recommended that the LLFA should bring together all relevant bodies to help manage local flood risk. The Act recognises the important role district councils, highways authorities and water companies play, and these bodies, together with the Environment Agency, are classed as risk management authorities.

The Act enables effective partnerships to be formed between the LLFA and the other relevant authorities who retain their existing powers (with some enhancement). It requires the relevant authorities to co-operate with each other in exercising functions under the Act and they can delegate to each other. It also empowers a LLFA to require information from others needed for their flood risk management functions.

Ideally, these working arrangements should be formalised to ensure clear lines of communication, mutual co-operation and management through the provision of Level of Service Agreements (LoSA) or Memorandums of Understanding (MoU).

Partnership working is essential in the management of local flood risk. Tameside BC should ensure that appropriate partnerships are in place, which will help the collection and sharing of data, and the effective management of the PFRA process. Regulation 35 of the Regulations and Section 13 of the Act reflects the importance of relevant authorities working and cooperating with one another.

2.3 Flood Risk Management Structure

2.3.1 Association of Greater Manchester Authorities (AGMA)

In preparation for meeting the new duties, the local authorities in Greater Manchester, through AGMA, jointly commissioned an independent study into the Flood & Water Management Act and Flood Risk Regulations. This examined the implications for all the Councils in Greater Manchester of this legislation, and considered options for how the ten local authorities could respond in the most efficient and effective manner. AGMA officers from various professions which have a bearing on flood risk management including Civil Contingencies, Drainage Engineers, and Planning are about to commence work on developing governance arrangements, appropriate structures and consequent capacity levels to fulfil these new requirements, building on a strong history of collaborative working.

There will be synergies between the LLFAs' new duties and the Greater Manchester Surface Water Management Plan (SWMP), and having a robust communication strategy is recognised as a priority given the challenging and complicated nature of this agenda. Cross-profession

working groups across Greater Manchester have also been established to share best practice and co-ordinate actions across AGMA.

2.3.2 Lead Local Flood Authority (LLFA)

Tameside Council is currently undertaking various stages and levels of service review and as such will confirm its management group structure when it becomes clear in due course.

2.4 Stakeholder engagement

This PFRA is primarily based on communication and information obtained through the North West Regional Flood Risk Appraisal, the Greater Manchester Sub-Regional SFRA, the Council's own SFRA and the emerging Greater Manchester SWMP.

During these regional, sub-regional and local strategic flood risk studies the Council has sought to engage stakeholders representing the following organisations and authorities. Not all stakeholders were involved in all aspects of the various pieces of work listed above.

- Association of Greater Manchester Authorities
- Bolton Council
- Bury Council
- Manchester City Council
- Oldham Council
- Rochdale Borough Council
- Salford City Council
- Stockport Metropolitan Borough Council
- Tameside Borough Council
- Trafford Council
- Wigan Council
- Environment Agency
- United Utilities
- British Waterways
- Manchester Ship Canal Company
- Highways Agency
- Greater Manchester Fire and Rescue Service

It is important to note that various sector/department leads within the individual councils were consulted, including Emergency Planning, Strategic Planning, Highways, Drainage and Parks Departments.

Tameside BC is closely involved with the preparation of the Greater Manchester SWMP, which is currently in its early stages; a Communication and Engagement Plan has been drafted as part of the SWMP. Consultation so far has focused on key partners (all 10 local authorities, the Environment Agency and United Utilities). The engagement plan will be a useful reference document for future consultation.

2.5 Further responsibilities

Aside from forging partnerships, coordinating and leading on local flood management, there are a number of other key LLFA responsibilities that have arisen from the FWMA. These responsibilities are included in Table 2-1 below. A recent letter from Defra to LLFAs date 8th March 2011 identified a number of responsibility commencement dates.

Table 2-1: Further Key LLFA Responsibilities under the FWMA

LLFA Responsibility	Description	Legislation Commencement
Local Strategy for Flood Risk Management	A LLFA is required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	October 2010
Investigating Flood Incidents	A LLFA has a duty to investigate and record details of significant flood events within their area. This duty includes identifying risk management authorities and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	April 2011
SuDS Approving Body	The Act establishes each LLFA as a SuDS Approving Body (the "SAB"). The SAB would have responsibility for the approval of proposed drainage systems in new developments and redevelopments, subject to exemptions and thresholds. Approval must be given before the developer can commence construction. The SAB would also be responsible for adopting and maintaining SuDS, which serve more than one property, where they have been approved. Highways authorities will be responsible for maintain SuDS in public roads, to National Standards.	Expected April 2012
Works Powers	The Act provides a LLFA with powers to do works to manage flood risk from surface runoff, groundwater and on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Implementation is planned to follow the national strategy coming into force later in the year
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Implementation is planned to follow the national strategy coming into force later in the year
Asset Register	A LLFA has a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	April 2011

3. Methodology and Data Review

3.1 Introduction

The PFRA is a high level screening exercise used to identify areas of local risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding. The PFRA involves

- collecting information on past (historic) and future (potential) floods
- assembling the information into a preliminary assessment report
- identifying Flood Risk Areas

Under the Regulations, Flood Risk Areas will require further examination and management through the production of flood risk and flood hazard maps and flood risk management plans.

This Preliminary Assessment Report (PAR) provides the evidence for identifying Flood Risk Areas. It also includes the information and decisions made by Tameside BC in identifying Flood Risk Areas allowing one reference document to be produced. Although not a requirement of the Regulations, a PAR will also provide a useful reference point for all local flood risk management and so inform local strategies.

The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010.

3.2 Methodology

To prepare this PFRA, readily available information on past and future floods has been gathered. The council's SFRA provided the majority of this data. In order to make sure the most up-to-date flood risk data was available for the PFRA, the early stages of the Greater Manchester SWMP revisited the data collection process collecting new or updated datasets from their original source.

Some of this information will be limited to specific locations, local data availability will depend on the councils own data collection systems and other information will be part of large national datasets obtained from the Environment Agency. Section 3.3 discusses data availability in more detail.

3.2.1 Assessing historic flood risk

The council's SFRA provided the majority of historical flood risk data. The Environment Agency (anecdotal and photographs) and United Utilities provided further historical records during the early stages of the Greater Manchester SWMP.

Historical flood risk data came in a number of formats including spreadsheet, word documents and GIS datasets. Geo-referenced historical incidents and national receptor datasets provide the opportunity to display the historic flood events spatially and identify the potential consequence of the historical event, which was not available in the original dataset.

The preliminary assessment report spreadsheet only records those events with significant harmful consequences. A historical event was only attributed as having a significant harmful consequence where consequences data (number or properties, people or critical services flooded) was available.

However, as the PFRA process provides an opportunity to summarise all information available on past floods, not just those with significant consequences, all historical records have been included in the summary map(s), table and description of past flooding. Although not required by the Regulations, this will be useful for the council's future local strategy.

3.2.2 Assessing future flood risk

If a location does not have a recorded history of past floods, it does not mean that there is no risk of flooding. To ensure flood risk is assessed objectively, the PFRA should consider where flooding might occur in the future, rather than only reacting to floods in the past.

Future floods, or future flood risk, are otherwise known as potential flooding, or potential flood risk. Computer models usually produce information about future floods. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's national surface water and groundwater flood maps, the Environment Agency's national Flood Map and any local surface water modelling carried within the Council's SFRA; the SWMP will provide a good source of information once completed. Section 3.3 provides further detail on readily available information.

The following list highlights a number of factors considered when assessing future flood risk across the study area

- topography
- location of ordinary watercourses
- location of flood plains that retain water
- characteristics of watercourses (lengths, modifications)
- under-capacity of the sewer network
- effectiveness of any works constructed for the purpose of flood risk management
- location of populated areas
- areas in which economic activity is concentrated
- presence of critical infrastructure
- current and predicted impact of climate change
- predicted impact of any long-term developments that might affect the occurrence or significance of flooding, such as proposals for future development

3.2.3 Identifying Flood Risk Areas

The Regulations require LLFAs to determine whether there is a significant risk in their area based on local flooding and to identify the area affected by the risk i.e. the Flood Risk Area. In order to achieve this, the LLFA are required to identify areas with known flood histories, areas at risk of future flooding and where identified, the consequence of that flooding.

The Regulations identify a number of flood risk indicators to consider when assessing the consequences of flooding on human health, economic activity, and the environment (including cultural heritage). Table 3-1 provides a summary of these indicators.

Table 3-1: Flood Risk Indicators

Impacts of Flooding on	Flood Risk Indicators
Human Health	• Number of people (based on residential properties) • Number of critical services (schools, hospitals, nursing homes, police/fire/ ambulance stations etc)
Economic Activity	• Number of non-residential properties (e.g. shops, offices and churches) • Length of road or rail • Area of agricultural land
Environment	• Designated sites (SSSIs, SACs, SPAs, etc) and BAP habitat
Cultural Heritage	• World Heritage Sites

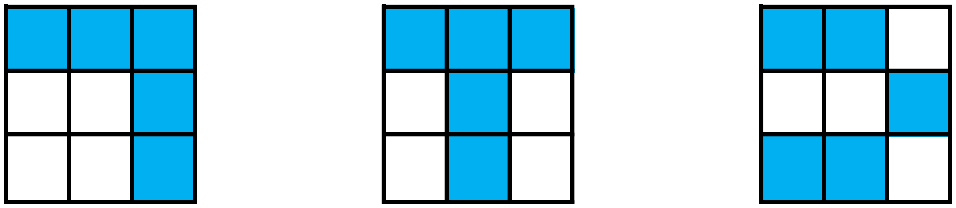
To ensure a consistent and proportionate approach, using the above indicators, Defra and WAG have identified flood risk thresholds[1] for defining Flood Risk Areas based on human health and economic activity. Environment and cultural heritage indicators have not been used. These pre-determined thresholds for human health and economic activity are:

- 200 people,
- 20 businesses, or
- 1 critical service at risk

The Environment Agency has then applied these criteria to their national surface water maps to identify areas (blue squares), using a 1km-grid square approach, which exceeds the pre-determined thresholds. Figure 5-5, discussed later on, illustrates the areas above the flood risk thresholds identified within the study area.

The next step in the national approach was to identify clusters of these areas. In England, the union of all 3 x 3 km squares that contain five or more touching areas (blue squares) makes a cluster. Blue squares are touching if they are adjacent up or down, side by side or diagonally as shown in the examples below.

Figure 3-1: Areas above Flood Risk Threshold Clustering Approach



Clustered areas, which also exceed a collective of 30,000 people at risk of flooding, are Indicative Flood Risk Areas. For further details, please refer to Defra's Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding (December 2010).

As these Indicative Flood Risk Areas have been identified using a national approach and nationally available data, this assessment focuses on reviewing these areas using locally derived information where available to confirm or adjust the national Indicative Flood Risk Area or to identify any new areas which the council deemed to be significant.

Section 6 provides a further explanation into the Indicative Flood Risk Area review process adopted.

3.3 PFRA data

As mentioned previously, a crucial part of a PFRA process is the task of collating available and readily derivable data and information on flooding to provide an assessment of flood risk. Table 3-2 provides a list of relevant information and datasets available from key stakeholders on both historic and future flood risk.

Table 3-2: Relevant Information and Datasets

Holder	Dataset	Description
EA	Areas Susceptible to Surface Water Flooding	The first generation national mapping, outlining areas of risk from surface water flooding across the country with three susceptibility bandings (less, intermediate and more). Please refer to Table 5-2 for further detail on modelling approach taken.

[1] The Environment Agency thresholds are used to identify high risk areas for this PFRA process only and has no links to the SWMP or other local flood risk studies.

Holder	Dataset	Description
	Flood Map for Surface Water	The second generation national surface water flood mapping which was released at the end of 2010. This dataset includes two flood events (with a 1 in 30 and a 1 in 200 chance of occurring) and two depth bandings (greater than 0.1m and greater than 0.3m). Please refer to Table 5-2 for further detail on modelling approach taken.
	Flood Map (Rivers and the Sea)	Shows the extent of flooding from rivers with a catchment of more than 3km² and from the sea
	Areas Susceptible to Groundwater Flooding	Coarse scale national mapping showing areas which are susceptible to groundwater flooding
	National Receptors Dataset	A national dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations
	Indicative Flood Risk Areas	Nationally identified flood risk areas, based on the definition of „significant' flood risk described by Defra and WAG
	Historic Flood Map	Attributed spatial flood extent data for flooding from all sources
	Catchment Flood Management Plans	CFMPs consider all types of inland flooding, from rivers, groundwater, surface water and tidal flooding and are used to plan and agree the most effective way to manage flood risk in the future
LLFA	North West Regional Flood Risk Appraisal	The RFRA provides a regional overview of the 14 river catchment areas in the North West. The main aspects of the appraisal included a survey of all LPA, an evaluation into the potential impact of flooding in relation to the proposed housing, an assessment of any potential flood risk implications related to regionally significant economic development and a review of other sources of flooding.
	Greater Manchester Sub-Regional Flood Risk Assessment	The sub-regional SFRA provides an overview of flood risk from all sources and provides an early engagement and data sharing protocol between key flood risk stakeholders.
	Council Strategic Flood Risk Assessment	The Level 1 SFRA contains useful information on historic flooding, including local sources of flooding from surface water, groundwater, mine water and the drainage system. The Level 2 SFRA provides a detailed assessment of flood risk in high risk locations.
	Greater Manchester Surface Water Management Plan	The Greater Manchester SWMP has just begun. It will provide a detailed risk assessment of surface water flooding and identify potential management options. The SWMP will also carry out further detailed surface water modelling throughout the study area.
UU	DG5 Register	The DG5 Register logs and records all sewer flood incidents in Greater Manchester due to under capacity only. It is NOT a true register of properties/areas at risk of flooding, but a register of properties/areas that have flooded and reported it to United Utilities.
	Hydraulic model results	Results from United Utilities hydraulic model runs for 1, 2, 5, 10, 20 & 30 years return rainfall storms. These results are in a spreadsheet represented by sewer spill volumes per manhole.
	WIRS and SIRS	Extracts from United Utilities' sewerage incident database

3.3.1 Data limitations

A brief assessment of the data collection process is included in this chapter to provide transparency with respect to the methodology. Flagging up the issues identified in the data collection phase could serve as a catalyst to improve the collection of flood risk data going forward.

Whilst the PFRA is fit for purpose and is based on the best available information, local information on historical flood events identify a lack of consistent flood data recording systems resulting in incomplete, or sometimes nonexistent, flood record datasets. The

information collected will still provide a useful dataset, they are often anecdotal and/or incomplete and it can be difficult to determine accurately the frequency and consequences of events. Although it is good practice for the council to record historic flood incidents, this was not a requirement until April 2011, which could be the main reason for incomplete or inconsistent historical records.

The PFRA data register provides a record of all data collected during the PFRA process. Whilst the majority of the datasets could be mapped geographically (GIS) helping to visualise the risk of flooding, other datasets could not be mapped reducing its confidence. Historical flooding information was generally a mix in both quality and quantity. For instance, some local historical records collected from the Environment Agency included photographs of the event, however did not include GIS layers.

3.3.2 Data sharing and storage systems

Tameside BC has developed extensive and secure data storage systems (including secure off-site back ups) and data management processes, in order to deliver services to the communities within the Borough. As part of this, flood risk management data is, and will continue to be, handled using appropriate and secure systems and processes.

Tameside BC is part of the Association of Greater Manchester Authorities (AGMA) and a member of the AGMA ICT Group, which has been established to develop strategies to improve data processing, storage and sharing across Greater Manchester and with external partners. Through this group, there is scope for flood risk data management / sharing arrangements to be further refined and developed.

3.3.3 Quality assurance

During the data collection process, each dataset was reviewed and its quality rated for use in the PFRA. A data quality score was given, which is a qualitative assessment based on the Data Quality System provided in the SWMP Technical Guidance document (March 2010). Table 3-3 explains this system.

The use of this system provides a basis for analysing and monitoring the quality of data that is being collected and used in the preparation of the PFRA. Recording also ensures that uncertainties or gaps in information are identified at an early stage.

Table 3-3: Recording the Quality of Data

Data Quality Score	Description	Explanations	Example
1	Best possible	No better available; not possible to improve in the near future	• High resolution LIDAR • River/sewer flow data • Rain gauge data
2	Data with known deficiencies	Best replaced as soon as new data are available	• Typical sewer or river model that is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	• Location, extent and depth of much surface water flooding • Operation of un-modelled highway drainage • 'future risk' inputs e.g. rainfall, population
4	Heroic assumptions	An educated guess	• Ground roughness for 2D models

3.3.4 Data licensing and restrictions

Table 3-4 illustrates the restrictions on the use of this data.

Table 3-4: Summary of Data Restrictions and Licensing Details

Data Owner	Restrictions on Data Use
Environment Agency	This data falls under the license agreement with Tameside BC and the Environment Agency. The use of some data is restricted to Tameside BC and their consultants for the preparation of its preliminary flood risk assessment. The use of other data is unrestricted.
United Utilities	This data falls under the license agreement with Tameside BC and United Utilities. The use of all data provided is restricted to Tameside BC and their consultants for the preparation of the Greater Manchester SWMP and PFRA.

4. Past Flood Risk

4.1 Overview of historical flooding in Tameside

According to the Tameside SFRA (2011), there have been a number of reported incidents of flooding from different sources within 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. Information received from British Waterways during the SFRA shows that overtopping and breach of the Huddersfield Narrow Canal occurred in 1972 near the Stamford (Stalybridge) Golf Course west of Buckton Vale as a result of vandalism. Micklehurst Brook caused flooding along Micklehurst Road on 24 August 2004.

Data received from Tameside Council during the SFRA also shows recorded evidence of flooding in Mossley, Ashton-under Lyne, Stalybridge and Hyde and a number of incidents of have been reported within the district resulting from surface water runoff, and hydraulic overloading of highway drains and public sewers.

The Environment Agency and United Utilities also provided useful historic flood incident data for use in the PFRA. Table 4-1 provides a list of all datasets provided.

Only historic incidences with associate GIS have been included in Figure 4-1 and Figure 4-2 and as such these figures may not correlate to the full list of historic events referenced in this PFRA.

Table 4-1: Tameside Historical Flood Datasets

Source	Dataset	Media Type	Number of Incidents and/or Areas	Comment
Tameside Council	Tameside SFRA	PDF	-	The SFRA was published in 2011.
Environment Agency	Flood Event Outlines	GIS Polygon	12	Incidents mainly related to main rivers.
United Utilities	DG5 Records	GIS Point	72	The total number of recorded flood incidents that have been internal to and external to properties.
United Utilities	Sewerage Incident Register System	GIS Point	19,400	Incidents related to the sewer network from July 1989 to March 2008. The dataset includes all incidents including those with no consequences.
United Utilities	Wastewater Incident Register System	GIS Point	7,900	Incidents related to the sewer network from April 2008 to Jan 2011. The dataset includes all incidents including those with no consequences.

4.2 Incidents recorded by the Environment Agency

The Environment Agency provided their Flood Event Outline GIS layer, identifying a number of areas through Tameside with record flood events. From the 12 areas identified, two incidents were attributed to flooding associated with the drainage network and surface water. The remaining included flooding from main rivers or incidents with an unknown source attributed.

4.3 Incidents recorded by United Utilities

United Utilities DG5 database (Feb 2011) was provided for use in the preparation of the Greater Manchester SWMP detailing the total number of flood incidents that have been internal to and external to properties. Currently there are 35 and 37 properties on the internal and external DG5 register respectively.

United Utilities also provided two main datasets associated with historical flood incidents in Tameside listed below. These incidents include all sources of flooding, including those that did not have an impact of people, property or the environment. The number of incidents attributed with direct surface water consequences has also been identified including flooding internally to properties and highways.

Table 4-2: United Utilities Historic Incident Databases

Data Source	Total Incidents Recorded	Number Incidents attributed with Direct Surface Water Flooding Consequences
Sewerage Incident Register System (SIRS)	19,400	561
Wastewater Incident Register System (WIRS)	7,900	360

4.4 Significant harmful consequences in Tameside

Only the local historical datasets information provided by United Utilities provides a full account on the consequence of flooding incidents recorded. However, there is insufficient data to draw definitive conclusions at this scale.

Considering all historical data collected, there is insufficient data to confirm the occurrence of an event with significant harmful consequences. Therefore, Annex 1 of the Preliminary Assessment Spreadsheet provides no records of historical events with significant harmful consequences.

The PFRA has still mapped all historical incidents collected as part of the process, as they will provide a useful dataset during the production of flood hazard maps, flood risk maps, flood risk management plans and the local flood risk management strategy.

Figure 4-1: Local Historic Flood Map

Figure 4-2: United Utilities SIRS and WIRS

5. Future Flood Risk

5.1 Introduction

If a location does not have a recorded history of past floods, it does not mean that there is no risk of flooding. To ensure flood risk is assessed objectively this PFRA has also considered where flooding might occur in the future. Modelled information provides the basis for the assessment of future flood risk.

5.2 Overview of future flood risk in Tameside BC

5.2.1 Surface water flooding

As identified in Table 3-2 there are a number of national and local surface water flooding datasets available for Tameside.

The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The Environment Agency released their first-generation national mapping in 2008, Areas Susceptible to Surface Water Flooding (AStSWF). The AStSWF map shows areas susceptible to surface water flow or ponding using three susceptibility bandings for a rainfall event with a 1 in 200 chance of occurring. The Environment Agency adopted a simplified modelling approach, which excluded the underground sewerage, drainage systems, smaller over ground drainage systems and buildings.

The Environment Agency updated their national methodology in 2010 and released their second-generation national mapping, Flood Map for Surface Water (FMfSW). The revised model included a number of improvements to the AStSWF model including two flood events (1 in 30 and 1 in 200 annual chance), the influence of buildings and the influence of the sewer system. The FMfSW also displayed its outputs using two depth bandings (greater than 0.1m and greater than 0.3m).

Table 5-1 identifies the number of properties at risk of surface water flooding using the two national datasets.

Table 5-1: Properties at Risk from Future Surface Water Flooding in Tameside

National Dataset	Banding	Number of Properties	Number of Residential Properties	Number of non-Residential Properties
Areas Susceptible to Surface Water Flooding (1 in 200 yr)	Less	13,800	11,300	2,500
	Intermediate	4,900	3,800	1,100
Flood Map for Surface Water (1 in 200-yr)	>0.1m	24,200	20,800	3,400
	>0.3m	7,200	6,000	1,200

During the Bury Rochdale Oldham SFRA and Manchester Salford Trafford SFRA, local surface water modelling was carried out. This is available in key locations within Bury, Rochdale and Oldham and is available throughout Manchester, Salford and Trafford. This local modelling was carried out in 2009, developing the methodology of the Environment Agency's first-generation mapping to include local characteristics of rainfall and topography.

Tameside BC is currently involved in developing a Greater Manchester wide Surface Water Management Plan (SWMP). During the first phase of the plan, additional local surface water modelling is being carried out covering all ten LLFAs in Greater Manchester. The methodology adopted will develop that of the Environment Agency's second-generation mapping to include local characteristics of rainfall, topography and urban drainage. United Utilities have also been heavily involved in developing the agreed methodology. The

modelling will look at a range of rainfall events with flood outlines, depths and hazards produced. This mapping will be available in summer 2011.

5.2.2 Locally agreed surface water information

Environment Agency guidance on using surface water flood risk information recommends that Tameside BC, as a LLFA, should: review, discuss, agree and record, with the Environment Agency, Water Companies, Internal Drainage Boards and other interested parties, what surface water flood data best represents their local conditions, known as locally agreed surface water information. Whilst this is not a requirement under the Regulations, it does inform the PFRA process as this information should play an important role in identifying Flood Risk Areas.

As discussed above, there are currently three sources of surface water information across Tameside BC; two national Environment Agency maps and a set of local maps produced during the Bury Rochdale Oldham SFRA and the Manchester Salford Trafford SFRA. A fourth local map is due to be developed through the Greater Manchester SWMP. Table 5-2 identifies the different modelling approaches adopted in producing the currently available surface water information.

Table 5-2: Comparative Surface Water Modelling Approaches

Variable	Surface Water Mapping Products		
	Areas Susceptible to Surface Water Flood	Flood Map for Surface Water	SFRA Surface Water Maps
Date	2008	2010	2009
Coverage	Greater Manchester	Greater Manchester	All Manchester All Trafford All Salford All Oldham Heywood Littlebrough Radcliffe Ramsbottom
Annual Probability Rainfall	1 in 200	1 in 30 1 in 200	1 in 200 current 1 in 200 future
Storm Duration	6.5 hrs	1.1 hr	1.1 hr
Rainfall Profile	50% summer	50% summer	50% Summer
Percentage Runoff	0	39% rural 70% urban	38% rural 70% urban
Reduction to rainfall amount to represent sewer flow	0	0mm/hr rural 12mm/hr urban	0
Manning's „n'	0.1	0.1 rural 0.03 urban	0.05 rural & urban
DTM	Infoterra bare earth LIDAR and Geo-Perspectives	EA 2010 Composite (SAR, EA LIDAR and PGA2 LIDAR)	EA LIDAR
Buildings	Not represented	Buildings layer DTM raised by 5m	Buildings layer DTM raised by 0.6m
Roads	Not considered	Not considered	Roads layer DTM lowered by 0.1m
Threshold Bands	Less - 0.1 to 0.3m Intermediate - 0.3 to 1m More - >1m	- >0.1m - >0.3m	Less - 0.1 to 0.3m Intermediate - 0.3 to 1m More - >1m

Within Greater Manchester, the Environment Agency used the second-generation Flood Map for Surface Water (FMfSW) to identify the indicative Flood Risk Area. Whilst some local

mapping is available, it does not cover all 10 local authorities and therefore does not allow a consistent approach to be adopted in identify areas above the flood risk thresholds across Greater Manchester.

In order to maintain consistency between LLFAs and prevent the production of conflicting results with those already supplied nationally by the Environment Agency, it was agreed during Greater Manchester SWMP Steering Group meetings with the Environment Agency and United Utilities that the FMfSW should be the „locally agreed surface water information' in Tameside and across Greater Manchester. Figure 5-1 illustrates the FMfSW within Tameside.

It must be noted, that the FMfSW is being used for this PFRA only as a stopgap until the Greater Manchester SWMP (intermediate phase) is complete. Once complete the SWMP surface water modelling outputs are likely to become the new „locally agreed surface water information' across Greater Manchester.

5.2.3 Groundwater flooding

The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding (AStGWF), provides the basis for assessing future flood risk from groundwater.

The map was derived using the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map and thus covers consolidated aquifers (chalk, sandstone etc, termed 'clearwater' in the data attributes) and superficial deposits. It does not take account of the chance of flooding from groundwater rebound. It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. Four area categories illustrate susceptible areas, which show the proportion of each 1km square where groundwater might emerge. Figure 5-2 illustrates this dataset. The Environment Agency's AStGWF dataset is included in Annex 2 'Future Floods' of the Preliminary Assessment Spreadsheet.

5.2.4 Sewer flooding

As part of their ongoing drainage area programme, United Utilities have constructed hydraulic models of some of their main sewer systems through Tameside. A series of design storms representing rainfall events of different return periods (1, 2, 5, 10, 20 & 30-years) were applied to the models. The outputs of the models include a range of surcharging volumes at individual model nodes. These volumes are included in this PFRA to assess future risk of sewer flooding.

Whilst this data allows a high-level analysis of sewer flood risk, there are a number of limitations with the data:

- not all sewer networks are modelled
- model confidence is unknown
- model results (volumes) do not identify those areas at risk once the sewer surcharges and wastewater begins to flow

Figure 5-3 illustrates total volume of water discharging from the modelled sewer system during the 1 in 30-year rainfall event. Whilst the PFRA illustrates this data, it is not included in Annex 2 'Future Floods' of the Preliminary Assessment Spreadsheet. This is because the true consequences of sewer flooding could not be identified with the data in its current format.

5.2.5 Canal flooding

Whilst the PFRA has identified a historic risk of broad canal flooding, there are no modelled flood risk data available. Some SFRAs across Greater Manchester have assessed to potential consequences of broad canal flooding, however no model was developed to assess the actual potential risks associate with the canals.

The Environment Agency has recently completed modelling of the Manchester Ship Canal, the results of which are now included in their national Flood Map (February 2011). Figure 5-4

illustrates the current Environment Agency Flood Map. The Environment Agency Flood Map is included in Annex 2 'Future Floods' of the Preliminary Assessment Spreadsheet.

5.2.6 Ordinary watercourse flooding

Flooding from ordinary watercourses can be identified using the Environment Agency's Flood Map and the council's SFRA. Figure 5-4 illustrates the current Environment Agency Flood Map. The Environment Agency Flood Map is included in Annex 2 'Future Floods' of the Preliminary Assessment Spreadsheet.

Where ordinary watercourses do not have flood zones attributed to them or data is based on broad scale modelling techniques applied by the Environment Agency during the first flood zones, the locally agreed surface water information could be used as a surrogate dataset to illustrate potential flow patterns.

5.3 Future flood risk and their consequences

The Environment Agency has assessed the potential consequences of future surface water flooding using the national FMfSW (1 in 200-year rainfall). The results of this have been used during the identification of indicative Flood Risk Areas. Although included in Annex 2 'Future Floods' of the Preliminary Assessment Spreadsheet, no other flood risk datasets on future flood risk, other than the FMfSW, was used to identify indicative Flood Risk Areas within this PFRA.

By counting the number of people, businesses and critical services at risk, the Environment Agency has identified a number of areas across Tameside, which exceeds the Defra and WAG flood risk thresholds. Significant harmful consequences are:

- 200 or more people,
- 20 or more businesses, or
- 1 or more critical services at risk.

The Environment Agency then aggregated these results nationally using a 1km grid squares approach, identifying those grid squares that exceed these thresholds. Figure 5-5 illustrates the 50 1km grid squares across Tameside which exceeding the future flood risk thresholds. For further information, Appendix A provides a breakdown of each 1km grid square listing the exceeded threshold. As discussed in Section 6, these areas are clustered to identify indicative Flood Risk Areas by the Environment Agency.

5.4 Effects of climate change and long term developments

The below text is a standardised statement supplied by the Environment Agency in the PFRA Guidance on climate change and climate change predictions.

5.4.1 The evidence

There is clear scientific evidence that global climate change is happening now. It cannot be ignored.

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation, however the broad trends are in line with projections from climate models.

Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance, or rarer) could increase locally by 40%.

5.4.2 Key projections for North West River Basin District

If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are

- Winter precipitation increases of around 14% (very likely to be between 4 and 28%)
- Precipitation on the wettest day in winter up by around 11% (very unlikely to be more than 25%)
- Relative sea level at Morecambe very likely to be up between 6 and 36cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 11 and 18%

Increases in rain are projected to be greater near the coast than inland.

5.4.3 Implications for flood risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

Wetter winters and more of this rain falling in wet spells may increase river flooding especially in steep, rapidly responding catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Drainage systems in the district have been modified to manage water levels and could help in adapting locally to some impacts of future climate on flooding, but may also need to be managed differently. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help us adapt to climate change and manage the risk of damaging floods in future.

5.4.4 Adapting to change

Past emissions means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, we have to make local decisions against deeper uncertainty. We should therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within the flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

5.4.5 Long term developments

It is possible that long term developments might affect the occurrence and significance of flooding. However, current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims 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 such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

Adherence to Government policy ensures that new development does not increase local flood risk. However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased contrary to Government policy, usually because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels, which are "significant" (in terms of the Government's criteria).

Figure 5-1: Flood Map for Surface Water

Figure 5-2: Areas Susceptible to Groundwater Flooding

Figure 5-3: Sewer Discharge Volumes

Figure 5-4: Flood Map

Figure 5-5: Areas above Flood Risk Thresholds

Figure 5-6: Areas above Flood Risk People Threshold

Figure 5-7: Areas above Flood Risk Non-Residential Threshold

Figure 5-8: Areas above Flood Risk Critical Service Threshold

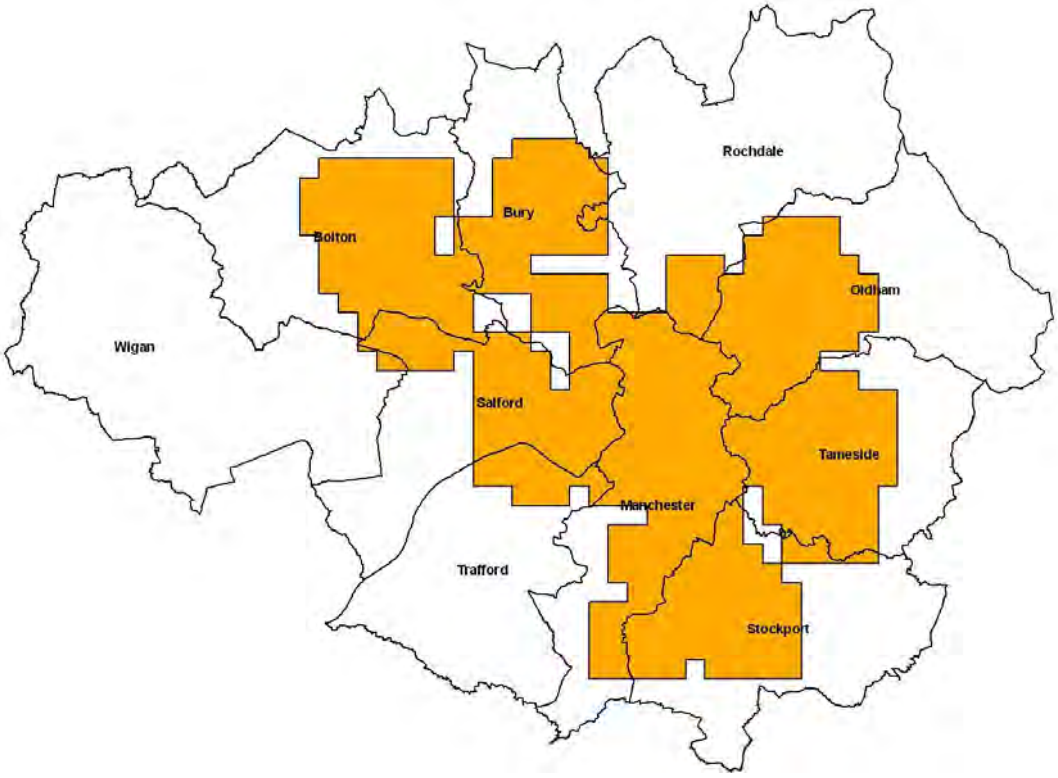
6. Flood Risk Areas

6.1 Introduction

Using the FMfSW and the Environment Agency's flood risk thresholds, 50 1km grid squares illustrating local risk were identified in Tameside (see Section 5.3). By carrying out a grouping approach to the 1km grid squares across England, the Greater Manchester cluster was identified with 86,500 people at risk, of which 11,600 fall within Tameside (Figure 6-3). As the Greater Manchester cluster exceeds the threshold of 30,000 people, the Environment Agency as identified the area as an indicative Flood Risk Area.

Figure 6-1 illustrates the coverage of the Greater Manchester indicative Flood Risk Area. Figure 6-4 illustrates the coverage at a LLFA Level.

Figure 6-1: Greater Manchester indicative Flood Risk Area



6.2 Reviewing the Greater Manchester Indicative Flood Risk Area

It is important to remember that the foundation of the Greater Manchester indicative Flood Risk Area is the national Flood Map for Surface Water (FMfSW), the National Receptor Dataset (NRD) and national flood risk criteria and thresholds. A national approach has also been adopted to convert areas above the flood risk thresholds into clusters and then Flood Risk Areas.

It is therefore important to review the data and approach adopted before reviewing the extent of the Greater Manchester indicative Flood Risk Area at a LLFA level. Table 6-1 lists a number of question and responses used to aid the first step in this review process.

Table 6-1: Reviewing the indicative Flood Risk Area Approach

Question	Response
Is the FMfSW the most appropriate source of information?	Yes, in order to maintain consistency and prevent the production of conflicting results with those already supplied nationally by the Environment Agency, it was agreed during Greater Manchester SWMP Steering Group meetings with the Environment Agency and United Utilities that the FMfSW should be the „locally agreed surface water information' in Tameside and across Greater Manchester. It must be noted, that the FMfSW is being used for this PFRA only as a stopgap until the Greater Manchester SWMP (intermediate phase) is complete. Once complete the SWMP surface water modelling outputs are likely to become the new „locally agreed surface water information' across Greater Manchester.
Are the consequences of flooding from other sources e.g. groundwater, ordinary watercourses likely to lead to significant Flood Risk Areas?	The PFRA has identified a number of sources, which will have a consequence on people, property and the environment if flooding occurs including ordinary watercourses, sewers, canals and their interaction with main rivers. However, information on the actual consequence of flooding from these sources is limited, mainly to those ordinary watercourses, which are included in the Environment Agency Flood Map. Areas at the highest risk from these sources will also be within the current Greater Manchester indicative Flood Risk Area.
Is there information on past floods, which had significant harmful consequences?	Considering all historical data collected, there is insufficient data to confirm the occurrence of an event with significant harmful consequences using the Environment Agency's national significance criteria. Therefore, Annex 1 of the Preliminary Assessment Spreadsheet provides no records of historical events with significant harmful consequences.
Is there any other information on the possible harmful consequences of future floods?	There are a number of modelled outputs available to the PFRA, which have identified sources of local flood risk. The Environment Agency Flood Map does identify a risk associated with ordinary watercourses and main rivers. The FMfSW used to define the iFRA can help identify risks along ordinary watercourse to some degree where they are not shown in the Flood Map. The Flood Map will also help identify possible interactions when compared to the FMfSW. United Utilities modelled outputs, in their current form, do not identify any consequence of sewer flooding. The Greater Manchester SWMP will provide these results once complete.

There are three possible reasons why LLFAs could amend the Greater Manchester indicative Flood Risk Area listed below.

- Geography
- Past flooding
- Future flooding

Table 6-2 provides further detail into potential changes to the Greater Manchester indicative Flood Risk Area.

Table 6-2: Reviewing the Greater Manchester indicative Flood Risk Area

Reason for change		Explanation	Resulting change
Geography	Minor change in boundary	The method for producing indicative Flood Risk Areas is based on clustering 1km grid squares. LLFAs may change the boundary of a Flood Risk Area to create an area, which is more meaningful to map and plan for example, by changing the outline to follow a settlement or community boundary. This reason should only be used if the boundary has been changed for administrative purposes i.e. it is not related to the flood risk.	Yes
	Indicative Flood Risk Area split	Indicative Flood Risk Areas could be split or combined to better reflect local issues e.g. some of the indicative Flood Risk Areas are large and might be better managed by splitting along LLFA boundaries. Alternatively, LLFAs may wish to combine Flood Risk Areas, which are close together to enable them to work collaboratively.	None
	Indicative Flood Risk Areas combined		None
Past / historic flooding	Indicative Flood Risk Area expanded	If the preliminary assessment report includes information on more frequent flooding, or information on flooding from other sources this may lead to an expansion of an indicative Flood Risk Area. As the indicative Flood Risk Areas are based on what is at risk of flooding, an area could be expanded to include the source of the flooding such as the drainage infrastructure, or land which generates the surface runoff.	None
	New indicative Flood Risk Area	This is likely to be based on information on more frequent flooding (high probability) where the thresholds are met. A new indicative Flood Risk Area is unlikely to be identified on the basis of information on other sources of flooding.	None
Future flooding	Indicative Flood Risk Area expanded	If local information identifies additional risks, for example, particularly vulnerable receptors like designated sites. If local information identifies additional sources of flooding or interactions with other sources. This should not include any new or enlarged Flood Risk Areas identified based on information in our surface water maps from the rainfall event with a 1 in 200 chance of occurring in any year as these have already been taken into account in producing the indicative Flood Risk Areas. Flood Risk Areas can be amended based on better local information on surface water which is aligned to the „locally agreed surface water information' or by using other surface water scenarios. If there is local evidence, which demonstrates that the risk is over-estimated by the FMfSW i.e. a local study or SWMP contains better information, or the LLFA knows that the drainage capacity is greater. If the receptors identified are not vulnerable to flooding, for example, they are resilient or resistant.	None
	New indicative Flood Risk Area		None
	Indicative Flood Risk Area reduced in size		None
	Indicative Flood Risk Area deleted		None

6.2.1 Changing the Greater Manchester Indicative Flood Risk Area

To produce a more meaningful area representing administrative boundaries, Table 6-2 proposes a minor change to the boundary of the Greater Manchester indicative Flood Risk Area. This is proposed in the area of Wigan.

Currently the Greater Manchester indicative Flood Risk Area covers the eastern tip of Wigan's administrative area. However, reviewing the land type under which the indicative Flood Risk Area lies shows open rural land with only a small pocket or residential properties. This area did not originally exceed the Environment Agency's flood risk thresholds and was included in the indicative Flood Risk Area due to the national clustering approach.

This area has therefore been removed from the indicative Flood Risk Area, removing Wigan all together from the proposed Greater Manchester Flood Risk Area.

Figure 6-2 illustrates this change. Table 6-3 illustrates the impact that the proposed changes have on the total number of properties and critical services at risk within the Greater Manchester Flood Risk Area.

Annex 3 'Flood Risk Areas' of the Preliminary Assessment Spreadsheet for Wigan does not include the Greater Manchester Flood Risk Area.

Table 6-3: Proposed Flood Risk Area Changes

Flood Risk Area	Number of Residential Properties	Number of non-Residential Properties	Number of Critical Services
Indicative FRA	36962	8221	379
Proposed FRA	36933	8213	378

Figure 6-2: Change to the Greater Manchester indicative Flood Risk Area

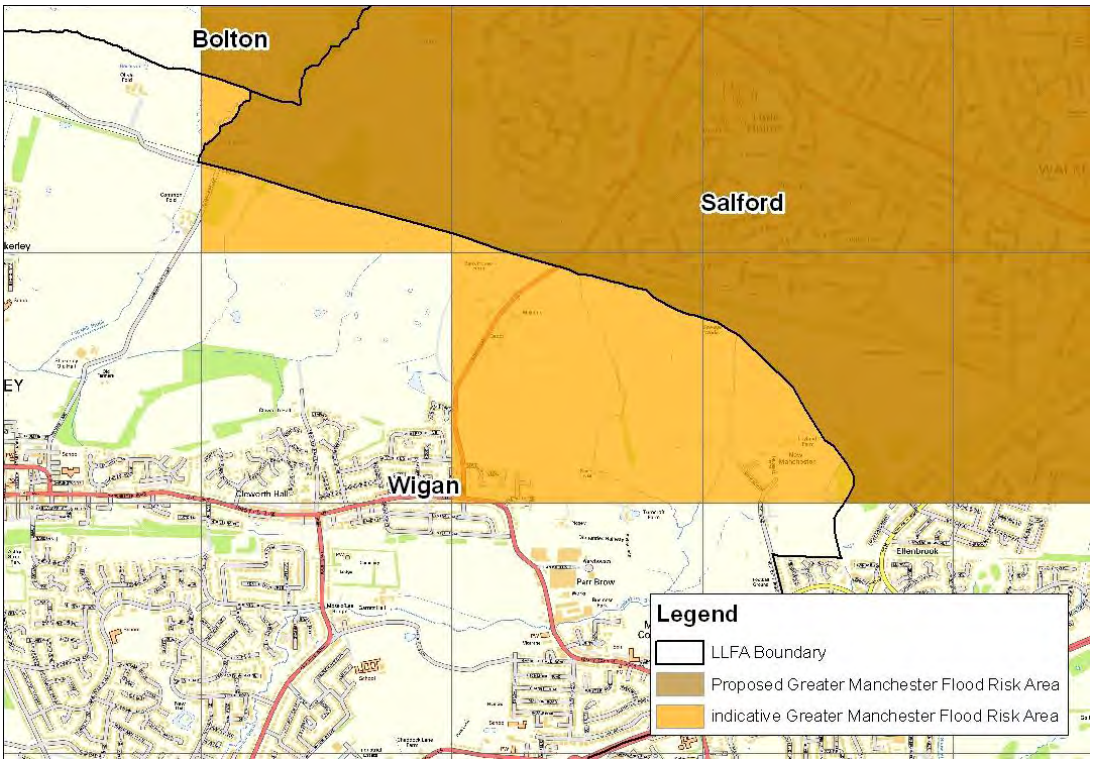


Figure 6-3: Areas above Flood Risk Threshold Clusters

Figure 6-4: Greater Manchester Flood Risk Area

7. Next Steps

7.1 Introduction

As the Greater Manchester Flood Risk Area covers the administrative area of Tameside BC the next stage of the Regulations has been triggered, meaning that Tameside BC as a Local Lead Flood Authority will have to produce flood hazard and risk maps and a flood risk management plan within the allotted timeframe.

The PFRA cycle will start again in 2016, so it is important to ensure that information is maintained and kept up to date for future use and to support other assessments of flood risk (such as SWMPs, SFRAs) and as part of local strategies. In the next cycle, more information will be mandatory for floods that occur after 22 December 2011.

Tameside BC will lead the PFRA review, and must submit the PFRA to the Environment Agency by the 22nd of June 2017. They will then submit it to the European Commission by the 22nd of December 2017 using the same review procedure described above.

7.2 Flood hazard and flood risk maps

Flood hazard maps and flood risk maps will have to be prepared by the Tameside BC, covering the area identified in this PFRA as a Flood Risk Area. These maps will have to be completed by the 22nd June 2013.

A flood hazard map is a map which identifies flood risk areas and shows:

- the likely extent (including water level or depth) of possible floods,
- the likely direction and speed of flow of possible floods, and
- whether the probability of each possible flood occurring is low, medium or high

A flood risk map is a map showing in relation to each flood risk:

- the number of people living in the area who are likely to be affected in the event of flooding,
- the type of economic activity likely to be affected in the event of flooding,
- any industrial activities in the area that may increase the risk of pollution in the event of flooding,
- any relevant protected areas that may be affected in the event of flooding,
- any areas of water subject to specified measures or protection for the purpose of maintaining the water quality that may be affected in the event of flooding, and
- any other effect on
    - human health,
    - economic activity, or
    - the environment (including cultural heritage)

7.3 Flood risk management plan

A flood risk management plan will have to be prepared by Tameside BC, covering the area identified in this PFRA as a Flood Risk Area. The plan will have to be completed by the 22nd June 2015. A flood risk management plan must include

- a map showing the boundaries of the flood risk area
- a summary of the conclusions drawn from the flood hazard maps and flood risk maps for the area

- a description of the proposed timing and manner of implementing the measures, including details of the bodies responsible for implementation
- a description of the way in which implementation of those measures will be monitored
- and where the person preparing the report thinks it appropriate, information about how the implementation of measures under the flood risk management plan and the river basin management plan for the area will be coordinated

Work currently being undertaken by all ten Greater Manchester authorities on the Greater Manchester SWMP will provide an extremely useful document to support the flood risk management plan.

7.4 Local flood risk management strategy

The PFRA (and any subsequent maps and plans) will form part of the local flood risk management strategies that LLFAs are required to prepare under the Flood and Water Management Act 2010. Local strategies will set out how LLFAs will manage the local flood risks in their areas and will cover areas not identified as being at significant flood risk under the Flood Risk Regulations 2009.

The LLFA will be responsible for ensuring the strategy is put in place but the local partners can agree how to develop it in the way that suits them best. The Act sets out the minimum that a local strategy must contain, and the LLFA is required to consult on the strategy with risk management authorities and the public. Local partnerships between other risk management authorities (including United Utilities, the Environment Agency and neighbouring LLFAs) will be critical.

Local flood risk includes surface runoff, groundwater, and ordinary watercourses (including lakes and ponds). This PFRA has identified a number of areas at risk of local flooding in Tameside outside of the Greater Manchester Flood Risk Area. These should provide the focus of the local strategy especially where the analysis shows an overlap between past flood incidents and future flood risk areas.

Tameside BC will need to consider the full range of measures consistent with a risk management approach in developing their local flood risk strategy. Resilience and other approaches, which minimise the impact of flooding, are expected to be a key aspect of the measures proposed.

Other local flood risk studies, such as the Level 1 and Level 2 SFRAs and the Greater Manchester SWMP will be essential building blocks for the delivery of integrated local flood risk management in Tameside and should be fully integrated into the strategy along with flood management works planned by the Environment Agency and United Utilities.

7.5 Flood incident investigations and register

In order to fulfil their role as a LLFA, Tameside BC is required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information. The council's internal flood incident register should be maintained and updated as new incidents occur. Table 7-1 lists a number of fields to be recorded for each incident.

It is recommended that a centralised database be kept up to date by Tameside BC, as a LLFA. This will prove beneficial during the PFRA review process, the flood risk management plan, local strategy and any subsequent review of the Tameside BC SFRA and the Greater Manchester SWMP.

Table 7-1: Historic Incident Register Summary

Field	Description
Start Date	Date and time
Duration	Days

Field	Description
Location	Address, town, postcode and Easting / Northing
Probability	Estimate return period
Main Source	Main rivers, surface runoff, groundwater, ordinary watercourses and any interaction these have with drainage systems and other sources of flooding including sewers.
Additional Source	Main rivers, surface runoff, groundwater, ordinary watercourses and any interaction these have with drainage systems and other sources of flooding including sewers.
Main Mechanism	Natural exceedance, defence exceedance, failure, blockage etc
Flood consequence data	Number of residential/commercial/people/critical services affected
Risk of flooding	Low, medium or high
Response	Action taken i.e. evacuation
Incident registered by	LLFA, United Utilities, Highway etc.

A. Summary of Areas above Future Flood Risk Thresholds

The PFRA is a high level screening exercise and information shown in these tables goes beyond the level of detail required. However, these tables provide useful information for the LLFA local flood management strategy and plan. The numbers contained in these tables were derived nationally by the Environment Agency for the purpose of this PFRA only and should be calculated again at a local level to improve their accuracy during any future study.

Table A- 1: Summary of Areas above Flood Risk Thresholds in Tameside

Grid Square ID	Number of People at Risk	Number of Critical Services at Risk	Number of Non-Residential Properties at Risk
X388Y398	346	0	8
X389Y394	290	0	3
X389Y397	227	3	5
X389Y398	297	0	11
X390Y395	264	0	1
X390Y398	386	1	26
X391Y395	147	2	45
X391Y397	108	2	11
X391Y398	222	0	2
X392Y392	21	1	30
X392Y394	232	1	10
X392Y395	290	2	27
X392Y397	14	0	34
X392Y398	185	3	20
X393Y392	103	0	25
X393Y394	293	1	10
X393Y396	7	1	32
X393Y397	28	0	23
X393Y398	707	1	57
X393Y399	180	1	65
X394Y392	108	2	4
X394Y393	211	0	0
X394Y394	161	1	44
X394Y395	75	1	26
X394Y396	239	0	11
X394Y397	328	0	3
X394Y398	14	2	47
X394Y399	660	3	36
X394Y400	573	1	2
X395Y393	211	0	20
X395Y394	683	2	23
X395Y395	124	1	29
X395Y396	178	6	31
X395Y397	445	2	3
X395Y398	232	1	91
X395Y399	190	2	15
X395Y400	285	1	2
X396Y393	0	2	2
X396Y397	246	1	8
X396Y398	1172	1	137
X396Y402	285	0	4
X397Y398	407	3	45
X397Y399	115	2	16

Grid Square ID	Number of People at Risk	Number of Critical Services at Risk	Number of Non-Residential Properties at Risk
X397Y401	337	1	40
X397Y402	197	3	31
X398Y401	89	2	1
X400Y395	87	0	25
X400Y396	260	2	13
X401Y395	269	3	63
X401Y396	33	2	37
Total	**12559**	**66**	**1254**

B. Preliminary Assessment Report Spreadsheet

B.1 Annex 1: Records of past floods and their significances

Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report.

B.2 Annex 2: Records of future floods and their consequences

Please refer to Annex 2 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes a complete record of future flood risk within each LLFA, including details of the potential consequences of flooding to key risk receptors within the borough.

B.3 Annex 3: Records of Flood Risk Areas and their rationale

Please refer to Annex 3 of the Preliminary Assessment Spreadsheet attached with this report.

C. PFRA Review Checklist

C.1 Review checklist

Please refer to the spreadsheet attached to this report, which contains the Review Checklist that has been provided by the Environment Agency to act as a checklist for reviewing PFRA submissions.

References

1. 4NW (2010) North West Regional Flood Risk Appraisal
2. AGMA (2008) Sub-Regional Strategic Flood Risk Assessment for Greater Manchester
3. Bolton Level 1 Update and Bolton Town Centre Level 2 Strategic Flood Risk Assessment (2010)
4. Bury Rochdale Oldham Strategic Flood Risk Assessment (2009)
5. Communities and Local Government (2010) PPS25: Practice Guide
6. Defra (2010) Surface Water Management Plan Technical Guidance
7. Defra / WAG (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities.
8. Environment Agency (2008) Calder Catchment Flood Management Plan
9. Environment Agency (2008) Douglas Catchment Flood Management Plan
10. Environment Agency (2008) Irwell Catchment Flood Management Plan
11. Environment Agency (2008) Mersey Estuary Catchment Flood Management Plan
12. Environment Agency (2008) Upper Mersey Catchment Flood Management Plan
13. Environment Agency (2010) Preliminary Flood Risk Assessment: Final Guidance (Report – GEHO1210BTGH-E-E).
14. Environment Agency (2011) Preliminary Flood Risk Assessment: Annexes to the Final Guidance Version 2 (Report – GEHO1210BTHF-E-E).
15. Environment Agency Building Trust with Communities
16. Manchester Salford Trafford Level 2 Hybrid Strategic Flood Risk Assessment (2010)
17. Oldham Hybrid Strategic Flood Risk Assessment (2010)
18. Stockport Level 1 Update and Stockport Town Centre Level 2 Strategic Flood Risk Assessment (2010)
19. The Pitt Review (2008) Learning lessons from the 2007 floods
20. Wigan Hybrid Strategic Flood Risk Assessment (October 2010 draft)

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