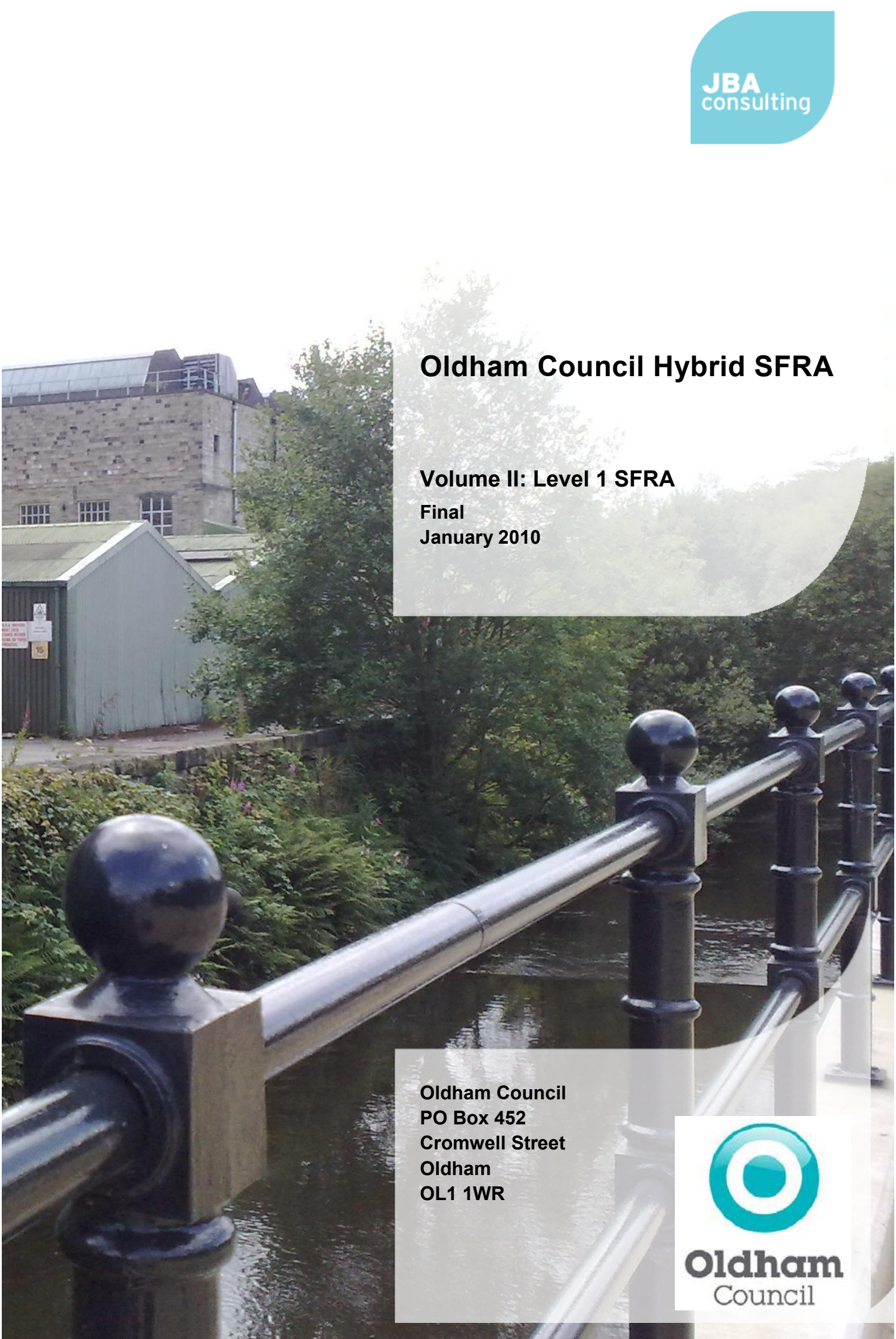

Oldham Council Hybrid SFRA

Volume II: Level 1 SFRA

Final
January 2010

Oldham Council
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Structure of the Oldham SFRA

The Oldham SFRA is supplied as three Volumes, described in the table below. Readers should refer to Volume I: SFRA User Guide for guidance on how to use the information provided in the SFRA.

SFRA Volume	Title of volume	Contents
I	User Guide	Volume I has been developed to provide guidance on the use of the SFRA for Local Authority Spatial Planning, Regeneration, Development Management and Emergency Planning officers and Developers.
II	Level 1 SFRA	Volume II has used mostly existing data to make an assessment of flood risk from all sources now and in the future and builds on the Association of Greater Manchester Authorities (AGMA) Sub-Regional SFRA. It provides evidence for LPA officers to apply the Sequential Test and identifies the need to pass the Exception Test where required.
III	Level 2 SFRA	Volume III provides evidence on a key community basis. It provides more detailed information on flood risk from the River Tame, Diggle Brook, Chew Brook and Wince Brook, the Rochdale and Huddersfield Narrow Canals and surface water. The additional detail can also inform a sequential approach to development allocation within flood risk areas and mitigation options where appropriate.

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Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft v1.0 (October 2009)		Georgina Brownridge (Oldham Council), Sandrine Thomas (Environment Agency)
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Final (January 2010)	Comments from Oldham Council and the Environment Agency	Georgina Brownridge (Oldham Council), Sandrine Thomas and Sylvia Whittingham (Environment Agency)

Contract

This report describes work commissioned by Oldham Council, on behalf of Oldham Council, by a letter dated 20 July 2009. Oldham's representative for the contract was Georgina Brownridge. Hannah O'Callaghan and Christoff Power 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 Oldham Council.

Acknowledgments

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Executive Summary

Level 1 SFRA Purpose and Approach

Flood risk in the borough arises from a number of different sources. It is, rightly, a constraint to development, and great care is needed over the type and form of new development in these flood risk areas.

The Oldham Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) is presented across three separate report Volumes:

- Volume I: User Guide
- Volume II: Level 1 SFRA
- Volume III: Level 2 SFRA

The Level 1 SFRA provides a spatial assessment of flood risk within key urban areas, which expands on the detail included in the Association of Greater Manchester Authorities (AGMA) sub-regional Level 1 SFRA. Together these sources will assist the Local Development Framework (LDF) and the policies and proposals produced for the development and use of land within the borough.

The Bury, Rochdale and Oldham (BRO) Level 2 SFRA included part of Oldham Council (Beal catchment). The Oldham Level 2 SFRA has incorporated the findings of the BRO SFRA to provide a stand alone SFRA for Oldham Council.

This volume of the SFRA introduces the key sources and mechanisms of flood risk and measures that are taken to manage the risk. The Level 1 SFRA then provides sufficient data and information to inform the application of the Sequential Test by the Council. This information includes:

- Flood Zone Maps
- Flood Risk Management Maps
- Climate Change Maps
- Strategic Depth Maps

To aid the LPA in undertaking the Sequential Test, a spreadsheet has been developed which provides the results of a spatial assessment for each proposed development site against Flood Zones and surface water susceptibility zones from the Level 2 SFRA surface water modelling. The analysis includes area and percentage cover of each zone and the proposed development land use.

Recommendations for Level 2 Assessment

Taking into account the level of flood risk and development needs, the Level 1 SFRA recommends that investigations into the residual risk from flooding should be undertaken as part of the Level 2 SFRA (Volume III). This will provide the necessary evidence base for the application of the Exception Test at key development sites at risk. The following risks should be assessed:

- Wince Brook - culvert blockages
- Diggle Brook - flood depth and hazard at the Diggle School site
- Chew Brook - flood risk to the Robert Fletcher site
- River Tame - post development scenario at Frenches Wharf development site
- Rochdale Canal and Huddersfield Narrow Canal - overtopping and breach scenarios
- Surface water flooding

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Abbreviations

ABD	Areas Benefiting from Defences
AEP	Annual Exceedance Probability
AGMA	Association of Greater Manchester Authorities
ASSWF	Areas Susceptible to Surface Water Flooding
BSF	Building Schools for the Future
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plans
EA	Environment Agency
FEH	Flood Estimation Handbook
FFL	Finished Floor Levels
FRA	Flood Risk Assessment
FRM	Flood Risk Management
GIS	Geographic Information Systems
HMR	Housing Market Renewal
LDDs	Local Development Documents
LDF	Local Development Framework
LIDAR	Light Detection and Ranging
LPAs	Local Planning Authorities
LDF	Local Development Framework
NFCDD	National Flood and Coastal Defence Database
OS	Ordnance Survey
PEZ	Primary Employment Zones
PPS	Planning Policy Statement
RFRA	Regional Flood Risk Assessment
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SMP	Shoreline Management Plans
SOP	Standard of Protection
SUDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKCIP	United Kingdom Climate Impacts Programme
UU	United Utilities
WCS	Water Cycle Study

1 Introduction

1.1 Background

1.1.1.1 JBA Consulting was commissioned in July 2009 by Oldham Council to undertake a Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) following on from the Greater Manchester Sub-Regional SFRA completed in August 2008. This is a hybrid SFRA as it fills in the gaps from the Level 1 SFRA and fulfils the criteria for a Level 2 SFRA.

1.1.1.2 The SFRA has been prepared in accordance with current best practice, Planning Policy Statement 25 Development and Flood Risk (PPS25)[1] and the PPS25 Practice Guide[2].

1.1.1.3 The SFRA is presented across three separate report Volumes:

- Volume I: User Guide
- Volume II: Level 1 SFRA
- Volume III: Level 2 SFRA

1.1.1.4 This document (Volume II) is sufficiently detailed to inform the application of the Sequential Test and to identify whether the Exception Test is likely to be necessary. Mostly existing data was used to make an assessment of flood risk from all sources now and in the future.

1.2 Scope & Objectives

1.2.1.1 Flooding is a natural process and does not respect political demarcations or administrative boundaries; it is influenced principally by natural elements of rainfall, tides, geology, topography, rivers and streams and man made interventions such as flood defences, roads, buildings, sewers and other infrastructure. As was seen in the summer 2007 floods, flooding can cause massive disruption to communities, damage to property and possessions and even loss of life.

1.2.1.2 For this reason it is very important to try and avoid developing in flood risk areas in the first instance. Where this is not possible then the vulnerability of the proposed land use to flooding should be considered and measures taken to minimise flood risk to people, property and the environment. This is the thrust of the risk based sequential approach to managing flood risk and it is the backbone of PPS25.

1.2.1.3 Current Government policy requires local authorities to demonstrate that due regard has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner and where new development is exceptionally necessary in flood risk areas, the policy aim is to make it safe without increasing flood risk elsewhere. Where possible flood risks should be reduced overall.

1.2.1.4 A SFRA is a planning tool that enables a council to select and develop sustainable site allocations away from areas vulnerable to flooding. The assessment focuses on the existing and proposed site allocations within the borough but also sets out the procedure to be followed when assessing additional sites for development in the future.

1.2.1.5 It is recognised that considerable land use pressures for regeneration, inward investment and economic growth exist across the borough. Revisions to the Regional Spatial Strategy (RSS) and the associated Regional Flood Risk Assessment (RFRA) should be consistent with the SFRA and guide the council in their strategies, policies and decision making in respect of their Local Development Frameworks (LDFs).

[1] Communities and Local Government (2006) Planning Policy Statement 25: Development and Flood Risk
[2] Communities and Local Government (2008) Planning Policy Statement 25: Development and Flood Risk – Practice Guide

1.2.1.6 In addition to informing site allocations, the Level 1 and Level 2 SFRA will inform decision making on non-allocated planning applications, strategic flood alleviation measures and other measures to reduce flood risk to existing development, planning requirements for new development and emergency planning.

1.2.1.7 The key objectives of this SFRA are to:

- Investigate and identify the extent and severity of flood risk to the area at present and in the future, under the terms of PPS25,
- Contribute to the council's Sustainability Appraisal (SA) and LDF,
- Enable the Council to apply the Sequential Test and the Exception Test,
- Provide strategic flood risk guidance and advice to planners and developers,
- Help the council to identify specific locations where further and more detailed flood risk data and assessment work is required. This includes the scope for Surface Water Management Plans (SWMPs) and/or Water Cycle Studies (WCSs),
- Identify the level of detail required for site-specific Flood Risk Assessments (FRAs),
- Inform the emergency planning process,
- Improve stakeholder joint working and the sharing of data, information and the understanding of flood risk, and
- Provide a reference document.

1.2.1.8 There is a recent trend developing since the publication of the PPS25 Practice Guide in 2008 that SFRAs are more than a land use planning tool, and can provide a much broader and inclusive vehicle for integrated, strategic and local Flood Risk Management (FRM) assessment and delivery. Since publication of the Pitt Review, it is apparent that SFRAs will provide the central store for data, information and consideration for all flood risk issues from all sources at a local level; and provide the linkage between Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs), Regional Flood Risk Appraisals (RFRAs), SWMPs and appropriate sustainable land uses over a number of planning cycles.

1.2.1.9 SFRAs need to be fit for the future to help communities meet the considerable FRM and climate change related challenges that are ahead.

1.3 Study Area

1.3.1.1 Oldham Council is one of ten metropolitan districts that comprise the conurbation of Greater Manchester. At the sub-regional level, Oldham Council is part of the Greater Manchester 'New Growth Point'. This is a programme to increase levels of housing building across the sub-region as part of the Government's aspiration for 3 million new homes by 2020. It may see an increase of 20% on the Council's Regional Spatial Strategy (RSS) annual average housing figures (2011-2017).

1.3.1.2 The key areas where continued development and regeneration is expected within the study area include: Oldham Town Centre, Foxdenton, Hollinwood and the Housing Market Renewal (HMR) areas.

1.3.1.3 The Bury, Rochdale and Oldham (BRO) Level 2 SFRA only included a small part of Oldham Council, the Beal catchment. This is located in the north of the borough, and drains northwards into the River Roch (Rochdale Council). The Oldham Level 2 SFRA has incorporated the findings of the BRO SFRA to provide a stand alone SFRA for Oldham Council.

2 Flood Risk in Oldham

2.1 Introduction

2.1.1.1 This section assesses flood risk in the borough from all sources, now and in the future. It makes use of all the data and information collected during the consultation process that is relevant to a Level 1 SFRA. It defines the fluvial Flood Zones and assesses flood risk from other sources, providing information for the council to be able to apply the Sequential Test.

2.1.1.2 The Greater Manchester sub-regional SFRA went some way to introducing the concept of flood risk and the hydrological links between catchments and administrative boundaries. Its findings highlighted the need for Oldham Council and the Environment Agency to work together on flooding problems, particularly where actions could exacerbate flooding in downstream communities. Managing the network of tributaries is complicated, but important, as they could also increase flooding problems in downstream areas.

2.1.1.3 The sub-regional SFRA showed that Oldham Council is at the top of the Irk, Medlock, Beal and Tame catchments and there are no councils that are hydrologically upstream. However, this means that development within the borough could potentially affect downstream councils.

2.1.1.4 As discussed below, flood risk is not just constrained to fluvial sources and can be present from a number of sources. The need for consistent development policies with neighbouring authorities controlling run-off or development in floodplains within contributing districts is therefore crucial as this would have wider benefits within the Greater Manchester districts and beyond.

2.2 Fluvial Flood Risk

2.2.1.1 According to the Greater Manchester sub-regional SFRA, a significant source of flood risk across the region is from fluvial flooding; however, the scale of risk in Oldham Council is smaller than other councils in the sub-region.

2.2.1.2 During the summer and autumn months flooding is less frequent as numerous reservoirs in the upper river catchments store water. However, following a wet autumn, when the reservoir capacity is full, the watercourses are under more pressure in the following winter months and the catchment becomes much more susceptible to flooding. The steep catchment slopes and narrow river valleys means that large volumes of floodwater travel quickly through the confined river system causing flash flooding.

2.2.1.3 Oldham is heavily urbanised in places and many watercourses have been culverted or diverted (such as Wince Brook) to make space for urban growth. Some watercourses were in-filled or disconnected as the need for water supply to mills or other industries ceased. These watercourses are referred to as hidden or lost. The condition or standard of culverted or hidden watercourses are often unknown but they can provide a significant source of flood risk. Flow can easily become restricted due to sedimentation and blockage of structures when water backs up behind the blockage and overtops the channel or surcharges the culvert.

2.2.1.4 Geomorphological processes (e.g. sedimentation) are apparent in some of the rural catchments such as the River Tame. However, the Environment Agency advised that the link between sedimentation and flooding is not strong enough to warrant further assessment within the SFRA.

2.2.1.5 The borough contains around 90km of inland designated Main River (Environment Agency responsibility). This does not include ordinary watercourses or other privately owned streams or drains. Ordinary watercourses are those that are not designated as Main River and therefore come under the control of the local authority, who have Permissive Power to carry out works should this be deemed necessary.

2.2.1.6 The watercourses in the SFRA study area fall with the River Irwell and Upper Mersey catchments. The Main Rivers across the borough include:

- River Beal (River Irwell catchment)
  - Pencil Brook
  - Old Brook
  - Brook Street
  - Brushes Clough
- River Irk (River Irwell catchment)
  - Long Clough
  - Plumpton Brook
  - Springs Brook
  - Wince Brook
- River Medlock (River Irwell catchment)
  - Lords Brook
  - Wood Brook
  - Taunton Brook
  - Thornton Brook
- River Tame (Upper Mersey catchment)
  - Diggle Brook
  - Hull Brook
  - Pickhill Brook
  - White Brook
  - Chew Brook
  - Clough Lane

The key watercourses in terms of flood risk are discussed in greater detail below.

2.2.2 River Beal

2.2.2.1 The River Beal rises in Higginshaw and runs in a northerly direction through open fields criss-crossing the Oldham - Rochdale railway as it meanders in the direction of Newtown and Shaw. Once past Shaw and whilst maintaining its northerly course, the river runs through a relatively open and wooded area towards the Piethorne Brook confluence at Milnrow in Rochdale, taking in Old Brook (upstream of the A663 Milnrow Road Bridge in Shaw) on the way.

2.2.2.2 In the upper reach, the floodplain is 50m to 100m wide within greenfield land for the 1 in 100 year flood event (FZ3). Through Shaw the floodplain becomes more constrained by the channel, but can flood out of bank at a depot at Linney Lane. However the 1 in 1000 year event is more extensive, especially around Shaw.

2.2.3 River Irk

2.2.3.1 The River Irk rises near Shaw. It passes through Haggate and Chadderton Fold before flowing through Middleton (Rochdale Council) and then southwards towards Manchester city centre, where it joins the River Irwell.

2.2.3.2 The floodplain of the River Irk is relatively well constrained through the borough for both the 1 in 100 year and 1 in 1000 year flood events.

2.2.4 Wince Brook

2.2.4.1 Wince Brook is a tributary to the River Irk which flows south of Chadderton through Foxdenton Farm and has been heavily culverted under recent development and the Rochdale Canal before becoming an open watercourse again west of Brookside Business Park.

2.2.4.2 The existing Environment Agency Flood Zones are limited to the downstream end of Wince Brook and part of Springs Brook. The Level 1 SFRA has refined this by producing a 1-dimensional ISIS model for Wince Brook and using the existing HEC-RAS model for Springs Brook. Map 1.1 shows that flood risk is constrained by the natural channel and therefore is limited along the watercourse. Floodwater overtops the bank along the upstream reach through Foxdenton Farm and Foxdenton Park. However, the flood outlines are similar for all flood events.

2.2.4.3 As Wince Brook is culverted under the canal and other recently developed land, there is a residual risk from culvert blockages during high flow events.

2.2.5 River Medlock

2.2.5.1 The River Medlock rises in the hills to the east of the borough. It flows through the steep-sided wooded gorge that separates Lees from Ashton-under-Lyne and the Daisy Nook Country Park. The tributaries to the Medlock that flow through the borough include Lords Brook, Taunton Book, Thornton Brook and Wood Brook (all Main Rivers) and Lumb Clough Brook and Snipe Clough (Ordinary Watercourses).

2.2.5.2 The lower reaches of the river join the River Irwell in Manchester and have been heavily culverted.

2.2.5.3 The floodplain is constrained in the upper parts of the Medlock, which flows through the east parts of the borough. However, as the watercourse meanders along the boundary of Oldham and Tameside, the floodplain (FZ2) widens to approximately 50m. There is a risk of flooding to a sewage treatment works near Lords Brook and Daisy Nook Hall, which is located within Flood Zone 3.

2.2.6 Snipe Clough

2.2.6.1 This culverted watercourse flows southwards through Oldham Town Centre. It was formerly known as Sheepwashes Brook but is now a public sewer, up to 3m in diameter in places. It feeds into two large storage tanks at Warren Lane. Excess surface water overflows from here into Glodwick Brook, a tributary of the River Medlock.

2.2.6.2 The existing Environment Agency Flood Zones extend from Mumps Station to the confluence with the River Medlock.

2.2.6.3 As this is a culverted reach and part of the public sewer network, the flood risk is relatively unknown. Therefore a 2-dimensional model (using JFLOW) was constructed taking into account the sewer capacity and two storage tanks.

2.2.6.4 The new flood outlines indicate that the Snipe Clough culvert and the storage tanks have a standard of protection up to the 25 year flood event. Once Snipe Clough discharges into Glodwick Brook flows start to come out of bank (1 in 25 year event) across this greenbelt land.

2.2.6.5 The 1 in 100 year flood event results exceeds the culvert capacity and therefore floodwaters surcharge around Glodwick Brook. During the 100 year plus climate change event, floodwaters surcharge to a greater extent so that excess surface water is routed overland for 500m upstream of Glodwick Brook. During an extreme flood event (1 in 1000 year) floodwater could potentially surcharge along the culvert to Rhodes Bank (within Oldham Town Centre).

2.2.7 River Tame

2.2.7.1 The River Tame rises near Denshaw in the northeast of the borough. The river flows generally south through Delph and Saddleworth in Oldham Council and then through Mossley, Stalybridge and Hyde in Tameside Council.

2.2.7.2 Significant tributaries to the Tame are Hull Brook, Diggle Brook, Pickhill Brook, White Brook, Chew Brook and Clough Lane.

2.2.7.3 The steep upper reaches of the Tame are constrained by the channel resulting in narrow floodplains. Flood Zone 3 extends in the villages of Delph, Uppermill and Greenfield, as well as downstream of the Chew Brook confluence. Flood Zone 2 is more extensive and results in flood risk to a number of properties along the Tame and its tributaries.

2.2.8 Hidden and culverted watercourses

2.2.8.1 There are other watercourses within the Greater Manchester area which are not captured on Environment Agency maps. Many modified small streams, brooks and culverts are now hidden below ground and their condition is deteriorating; they become blocked with debris and are the cause of much localised flooding following heavy rainfall. Some of these have been mapped by Ashworth in 1987 and are referred to as the *'hidden rivers of Manchester'.* Oldham Council is currently identifying the location of the hidden watercourses across the borough.

2.2.8.2 Due to the heavily urbanised nature of Greater Manchester, only a few of the watercourses are in their natural form. Many of the main river channels have been straightened and canalised to accelerate the flow of water and have been culverted over significant lengths. Many of the channels and culverts have a limited hydraulic capacity and are prone to blockages which can lead to flooding. The blockages are caused by silt deposition from the rural upstream sections of the catchments, vegetation falling into the river or through fly tipping where debris is dumped in the channels.

2.2.8.3 The Greater Manchester sub-regional SFRA identified and mapped culverted watercourses using the National Flood and Coastal Defences Database NFCDD and hidden watercourses with aid from Manchester University. The majority of hidden watercourses are located in South Manchester; however, Oldham Council has 11.7km of culverted watercourses[3]. The Environment Agency is currently preparing the South Manchester Flood Risk Management Strategy which will investigate this risk further.

2.3 Flooding from Land

2.3.1.1 The Environment Agency has recently produced a national map of Areas Susceptible to Surface Water Flooding (ASSWF), which identifies areas susceptible to surface water flooding during an extreme rainfall event (1 in 200 year). This is valuable as it provides an indication of the likelihood of surface water flooding, separated into areas at less, intermediate or high susceptibility.

2.3.1.2 Urban drainage modelling is a complex field, varying from simple topographic analysis, to routing of water over an elevation model (which is how the national ASSWF map has been produced), to network models of the sewer system linked to overland routing, to fully integrated river, sewer and overland models. SFRAs require a strategic assessment of the likelihood of surface water flooding for which overland routing is suitable and appropriate.

2.3.1.3 The Level 2 SFRA provides refined surface water mapping for Oldham using overland routing modelling. This has used more detailed topographic data and represents buildings and roads. As per the national map this provides an indication of the likelihood of surface water flooding, separated into areas at less, intermediate or high susceptibility. Surface water flooding in Oldham tends to be highly localised and relatively frequent following intense rainfall, causing disruption to local communities. There are a number of highly localised flooding issues. In January 2008, houses and roads in Uppermill and Greenfield were affected by surface water flooding.

[3] AGMA (2008) Greater Manchester Sub-Regional SFRA – lengths calculated using NFCDD (2007)

2.4 Flooding from Sewers

2.4.1.1 The information available from United Utilities (UU) included DG5 records, location of drainage areas and sewers records. United Utilities have flood risk data but this was not made available for the SFRA. However, the imminent Flood and Water Management Bill is likely to make this data accessible for future flood risk management studies.

2.4.1.2 Oldham Council should continue to liaise with United Utilities in conjunction with the Environment Agency and the wider Greater Manchester Authorities to explore how they can contribute to the understanding of flood risk now or in the future. The successful development of Surface Water Management Plans will rely on the release of UU flood risk data and close partnership between all parties.

2.4.1.3 In Greater Manchester, Oldham Council was one of the local authorities with the least number of recorded flood incidents with a total of 56 properties on the DG5 register. Whilst the register can give an idea of those areas with limited drainage capacity, it must be acknowledged that it is a register of properties that have already been flooded due to exceedance, blockage or failure of sewer systems, not properties at risk of flooding. In addition to this, sewer flooding problems may have been investigated and resolved since the register was compiled. For these reasons the DG5 register alone has limited usefulness in predicting future flooding locations.

2.5 Flooding from Groundwater

2.5.1.1 There are relatively few reported incidents of groundwater flooding in the borough. The Environment Agency water resources team were consulted as part of the Greater Manchester sub-regional SFRA and stated that *'the risk posed by groundwater flooding is likely to remain remote within the sub-region; however, the impacts of increased development in Greater Manchester must be carefully assessed.'*

2.6 Flooding from Reservoirs

2.6.1.1 This SFRA was not able to obtain a copy of the Environment Agency Reservoir Register, which identifies those reservoirs under the Reservoirs Act due to "implications for national security".

2.6.1.2 However, discussions with Oldham Council and a review of OS mapping shows there a number of large reservoirs within or upstream of the borough. Table 2-1 identifies the main reservoirs and urban areas at risk immediately downstream of them.

Table 2-1: Key Reservoirs

Reservoir Name	Local Authority	Downstream Area
Chew	Oldham Council	Greenfield / Grasscroft
Dovestone	Oldham Council	Greenfield / Grasscroft
Yeoman Hey	Oldham Council	Greenfield / Grasscroft
Greenfield	Oldham Council	Greenfield / Grasscroft
Diggle	Oldham Council	Diggle
Brun Clough	Oldham Council	Diggle
Castleshaw Lower	Oldham Council	Delph
Castleshaw Upper	Oldham Council	Delph
New Years Bridge	Oldham Council	Denshaw
Dowry	Oldham Council	Denshaw
Crookgate	Oldham Council	Denshaw

Reservoir Name	Local Authority	Downstream Area
Readycon Dean	Oldham Council	Denshaw
Black Moss	Oldham Council, Kirklees Council	Diggle
Rooden	Rochdale Council	Denshaw

2.7 Flooding from Canals

2.7.1.1 There are two canals in the borough:

1. The Rochdale Canal is navigable from Littleborough and runs parallel to the River Roch and then turns south west through Chadderton, before joining the Bridgewater Canal in Central Manchester.
2. The Huddersfield Narrow Canal. The canal passes through Saddleworth along the Tame valley to the Ashton Canal at Ashton-under-Lyne.

2.7.2 Rochdale Canal

2.7.2.1 Through the borough, the Rochdale Canal extends from Chadderton to Failsworth. The owner of the canal is The Waterways Trust but British Waterways has a contract to operate and maintain the canal. The canal was restored in 2002. The pound lengths (canal section between two locks) are generally short through the borough.

2.7.2.2 Rochdale Canal failed in 1923 and caused flooding following a storm in the River Irk catchment. Debris in the River Irk blocked a culvert at the aqueduct and 8 people lost their lives in the event. Another failure occurred in 2003 at the embankment beside the aqueduct. Floodwater was confined to farmland, which is in the natural floodplain.

2.7.2.3 Within the study area the embankments are the highest in the location of the River Irk and these are classified as principal embankments by British Waterways. There are other high embankments in the location of Wince Brook and White Gate. Principal embankments have a more stringent inspection regime than other canal embankments.

2.7.2.4 We anticipate that the main factors which influence flood risk on the Rochdale Canal are:

- Overtopping of canal embankments during an extreme flood event. The canal intercepts some surface water from the catchments to the east. However, no detailed modelling has been undertaken and the flow into the canal during a large flood event is unknown.
- Breach of raised canal embankments. It is likely that embankments are made from local sand. If the puddle clay lining of the canal were to fail the embankment commonly fails quickly in that location. If overtopping were to occur then once vegetation is eroded (which would provide some resistance to failure) the embankment could fail.
- The numerous cross drains in culvert under the canal, which, depending on capacity, may cause floodwater in an extreme event to build up behind the canal leading to embankment failure. A failure of this nature has happened several times in Chadderton.
- The short pound lengths which limit the volume of available floodwater from the canal should a breach occur.

2.7.3 Huddersfield Narrow Canal

2.7.3.1 Through the borough, the Huddersfield Canal extends from Diggle to Mossley. British Waterways owns and operates the canal. The canal was reopened in May 2001. The Huddersfield Narrow Canal is mainly fed by Diggle Reservoir. The pound lengths are generally short. Through the northern part of the borough the canal runs through the Standedge tunnel.

2.7.3.2 There are principal embankments at Diggle. There are no records held by British Waterways of failures by either overtopping or breach on the Huddersfield Narrow Canal through the borough. Breach of the embankments upstream of Diggle could result in canal flows flooding into Diggle Brook and increase local flood levels.

2.7.3.3 We anticipate that the main factors which influence flood risk on the Huddersfield Narrow Canal are:

- Overtopping of canal embankments during an extreme flood event. If overtopping were to occur then once vegetation is eroded (which would provide some resistance to failure) the embankment could fail.
- Breach of raised short lengths of canal embankments. If the puddle clay lining of the canal were to fail the embankment commonly fails quickly in that location.
- The numerous cross drains in culvert under the canal, which, depending on capacity, may cause floodwater in an extreme event to build up behind the canal leading to embankment failure.
- The main canal feed is from Diggle Reservoir. However, no detailed modelling has been undertaken of the extreme event and the flow into the canal during a large flood event is unknown.
- The short pound lengths which limit the volume of available floodwater from the canal in a breach situation.

2.8 Historical Flooding

2.8.1.1 Records of past flooding are useful for looking at the sources, seasonality, frequency and intensity of flooding. Table 2-2 provides an overview of significant historical flood events in the borough. Historical records are often anecdotal and incomplete and it can be difficult to determine accurately the frequency and consequences of events, but they are useful for providing background information. More recent gauged records and registers of flooded properties are more valuable for estimating flood frequency and severity at different locations.

2.8.1.2 Flood risk can change over time because of natural variations in climate, changes in land use and the changes in flood risk management activity. Over the last few hundred years, developments have been increasingly built on the floodplain and farming practices that promote rapid run-off of rainwater into rivers have become widespread. Due to these changes, flood risk might be higher today than it was in the past, although any flood risk management work that is undertaken helps to reduce this.

2.8.1.3 The Environment Agency also maintains a National Historic Flood Map which records known flood extents. Locations shown as being affected in the past are also listed in Table 2-2.

Table 2-2: Historical Flood Events

Date	Source	Consequences	Data source
2009	River Tame	Flash floods: Grotton Hollow, Greenfield, Scouthead, school closed in Springhead	Oldham Evening Chronicle / Oldham Council
2008	River Tame	Roads and houses flooded in Uppermill and Greenfield	Oldham Council
2003	River Irk / Rochdale Canal	Flooding of farmland due to embankment failure	British Waterways
2002	River Tame	Channel obstruction / blockage. Buckley Drive, Denshaw	Flood Event Outline, EA

Date	Source	Consequences	Data source
2000	River Tame	Oldham Road, Uppermill	Flood Event Outline, EA
1998	Pickhill Brook	Flooding up to 1.2m due to overtopping of the brook and a small reservoir. Church Road, Uppermill	Flood Event Outline, EA
1992	River Beal	Property flooding	Oldham Council
1991	River Beal	Flooding in Shaw	Beal, Roch & Tributaries FMS
1983	River Tame	Flooding roads and properties in Uppermill and Saddleworth	Upper Mersey CFMP
1983	River Beal	Flooding in Shaw	Beal, Roch & Tributaries FMS
1980	River Beal	Flooding in Shaw	Beal, Roch & Tributaries FMS
1978	River Beal	Flooding in Shaw	Beal, Roch & Tributaries Flood Mapping
1967 & 1968	River Beal	Flooding in Shaw	Beal, Roch & Tributaries FMS
1964	River Beal	350 properties flooded or evacuated in Shaw	River Irwell CFMP
1923	River Irk / Rochdale Canal	Embankment on canal failed and 8 people died, at the aqueduct	British Waterways

2.9 Flood Defences

2.9.1.1 The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future, is an issue that needs to be considered as part of the risk based sequential approach and in the light of this, whether proposed land allocations are appropriate and sustainable. In addition, detailed FRAs will need to explore the condition of defences thoroughly, especially where these defences are informal and contain a wide variation of condition grades. Proposed development sites may depend of the presence of flood defence assets to minimise flood risk. It is important that all of these assets are maintained to a good condition.

2.9.1.2 There are several sections of raised defences adjacent to development sites in Delph and at Frenches Wharf in Greenfield. Figure 2-1 shows an informal raised defence along the River Tame at Frenches Wharf.

Figure 2-1: Raised Defence at Frenches Wharf, River Tame

2.10 Flood Warning Areas

2.10.1.1 There are currently no Flood Warning Areas (FWA) within the borough. The Upper Mersey Flood Forecasting Improvement Report reveals plans to implement 15 new flood warning areas in the Upper Mersey catchment. This will provide flood warning to 75% of the designated properties at risk. The proposed warning areas include Delph on the River Tame[4].

2.11 Effects of Climate Change

2.11.1.1 Peak flows in fluvial floods are likely to increase by around 20% over the next 50 to 100 years. This translates into higher water levels. Table B.2 of PPS25 provides recommended national precautionary sensitivity ranges for peak rainfall intensity and peak river flow:

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%		+20%	

2.11.1.2 Climate change projections (UKCIP02 scenarios) also suggest that winters will become wetter over the whole of England, by as much as 20% by the 2050s. A shift in the seasonal pattern of rainfall is also expected, with summers and autumn becoming much drier than at present. Snowfall amounts will decrease significantly throughout the UK, but the number of rain-days and the average intensity of rainfall are expected to increase.

[4] Environment Agency (2008) Upper Mersey CFMP

2.11.1.3 Rainfall intensity and the increase in the number of rain-days could have significant implications for surface water flooding and should be considered when designing drainage systems for new developments.

2.11.1.4 Recently, a new set of climate change projections (UKIP09) have been published; however, there is currently no Defra guidance on how to use the projections within flood and coastal risk management, including sensitivity ranges for flood risk modelling.

3 Level 1 SFRA Mapping

3.1 Introduction

3.1.1.1 The Oldham SFRA User Guide (Volume I) has provided detailed guidance for Spatial Planners, Development Management officers, developers and emergency planners on their responsibilities within regional and local flood risk management as defined within PPS25 and the use of the SFRA as a supporting tool.

3.1.1.2 The SFRA has provided a broad overview of flood risk from all sources as described in the previous chapter. This broad assessment is assisted greatly by the use of Strategic Flood Risk Maps providing information on flood risk factors that need to be taken into account. All sets of maps need to be interpreted consistently by various users and the section below provides a useful explanation.

3.1.1.3 The set of Strategic Flood Risk Maps provided in the Oldham Level 1 SFRA are shown in Table 3-1:

Table 3-1: Level 1 SFRA Maps

Level 1 SFRA Maps	Reference
Flood Zones	Map 1.1 (A-G)
Flood Risk Management	Map 1.2 (A-G)
Climate Change Sensitivity	Map 1.3 (A-G)
Strategic Flood Depth	Map 1.4 (A-G)
Reservoir Screening	Map 1.5 (A-G)

3.2 Flood Zones Maps

3.2.1.1 The PPS25 Flood Zones are largely based on information provided in the Environment Agency Flood Map. Version 3.14 of the Environment Agency Flood Zones issued in June 2009 has been used, whilst the functional floodplain has been delineated using the method outlined below.

This map illustrates:

- Main Rivers
- Critical ordinary watercourses
- Flood Zone 2
- Flood Zone 3a
- Flood Zone 3b (Functional Floodplain)
- Council development allocations (Housing, Employment and Mixed)

3.2.1.2 It should be noted that this map includes the SFRA modelled outputs for the Wince Brook and Snipe Clough. These are based on the most recent assessment and are different to the EA Flood Zones in these areas that can be accessed on the Environment Agency website.

3.2.1.3 This key map should be used to facilitate the application of the Sequential Test by Spatial Planners, Development Management officers and individual developers according to PPS25, as discussed previously in the User Guide (Volume I).

3.2.1.4 The further suite of Strategic Flood Risk Maps discussed below should be used to support the Flood Zone Maps in Sequential Testing. They will also be useful when applying the Exception Test, especially when considering other sources of flood risk and assessing whether the development site would be safe now and in the future.

3.2.2 Functional Floodplain

3.2.2.1 The Functional Floodplain (Flood Zone 3b) is based on the outline produced during the Greater Manchester sub-regional SFRA. It has been reviewed and updated where new modelled 1 in 25 year flood outlines are available. The modelled outlines were then edited using the following methodology:

- Removal of developed (brownfield) land
- Removal of major transport infrastructure (e.g. motorways and railways)
- Removal of 'dry islands' defined using the 'size standards' within the Environment Agency Strategic Flood Risk Management Specification for Flood Risk Mapping[5]

3.2.2.2 The Greater Manchester Sub-Regional SFRA included the river centreline as part of the functional floodplain; however the technique adopted resulted in a number of errors. This has been redone using more precise OS MasterMap data.

3.2.2.3 Where modelled data was not available, the Greater Manchester sub-regional SFRA based the functional floodplain outline on the extent of Flood Zone 3. Whilst it has been acknowledged that there is the potential for some inaccuracies in Flood Zone 3 on minor watercourses, in particular non-main rivers due to scale and misalignment issues, the Environment Agency and Local Authorities still required this outline to be included in the functional floodplain. As this is a worst case scenario, the confidence of the functional floodplain outline has been provided which relates to the source of information. For example modelled 1 in 25 year outlines will have a higher confidence rating than a Flood Zone 3 outline used on a minor watercourse.

3.2.2.4 For those functional floodplain outlines which have a lower confidence rating, it is important that they are assessed in more detail at a site-specific FRA level if development is planned in the future.

3.2.2.5 The approach used to define the functional floodplain for each watercourse is summarised in Table 3-2.

Table 3-2: Functional Floodplain Mapping

Watercourse	Data Source	Confidence
Main Rivers	Watercourses shown on OS MasterMap	High
River Tame	Upper Mersey Model 2008	High
River Irk	Irk Flood Risk Mapping Study	High
River Beal	Roch and Tributaries Model	Medium
Wince Brook	Wince Brook SFRA Model	High
Snipe Clough	Snipe Clough SFRA Model	Medium
Other	Flood Maps, Flood Zone 3	Low

3.3 Flood Risk Management Measures Maps

3.3.1.1 Residual risks are the risks that remain after all risk avoidance, substitution and mitigation measures have been taken into account. The residual risks in the borough are therefore related to the occurrence of events of low probability, such as extreme flood events greater than the design capacity of the constrained river system or failure of these flood defences.

3.3.1.2 A map of flood risk management measures has been produced and includes:

- The location of river flood defences (based on NFCDD)

[5] Environment Agency (2006) Strategic Flood Risk Management Specification for Flood Risk Mapping release 1.2

- Areas Benefitting from Defences (only available for locations where the ABD has been modelled)

3.3.1.3 This map is very important when considering the residual risks associated with flooding.

3.4 Climate Change Sensitivity Maps

3.4.1.1 Climate change sensitivity maps show fluvial flood extents from Main Rivers (undefended), for a 1 in 100 year flood event with a 20% increase in flows. Where modelled data was not available, the extent of Flood Zone 2 has been used as a proxy for climate change.

Table 3-3: Climate Change Mapping

Watercourse	Data Source	Confidence
River Tame, Diggle and Chew Brook	River Tame and Tributaries FRM Study 2006	High
Pickhill Brook	Flood Map Updates Study	High
River Beal	Roch and Tributaries Model	Medium
Wince Brook	Wince Brook SFRA Model	High
Snipe Clough	Snipe Clough SFRA Model	Medium
Other	Flood Maps, Flood Zone 2	Low

3.4.1.2 The confidence rating relating to the above data sources relates more to the hydrological input rather than the modelling technique. The Wince Brook model has a higher confidence rating than the Snipe Clough model because a detailed river survey was carried out. For Snipe Clough a number of assumptions were made related to the hydrology, culvert capacity and storage tanks.

3.4.1.3 PPS25 requires the sensitivity of new developments to climate change to be considered as part of an appropriate FRA and these maps provide an early indication of this sensitivity. In addition emergency evacuation routes can be identified in these mapping outputs and planned for outside of the current flood extent, so as not to be overwhelmed and put at risk in the future.

3.4.1.4 The sensitivity of a particular location and land use to climate change can be factored into decisions regarding floor levels, building uses and safe access and egress etc. Greater changes in extents can be associated with greater increases in flood risk. In these areas, where this risk cannot be avoided, or substituted, mitigation measures are likely to be extensive. For some developments, the FRA may not be able to demonstrate continued safety for occupants as required by the Exception Test in PPS25.

3.5 Strategic Flood Depth Maps

3.5.1.1 Whilst the Environment Agency Flood Map provides an indication of flood extent from rivers and coasts, it does not show the variation of risk across a flood zone, in particular flood depths.

3.5.1.2 For those areas at risk of flooding in Flood Zone 3 (1 in 100 year flood event) a depth map has been produced. It must be reiterated that the results produced are indicative of actual flood depths and therefore have been categorised using the scale below.

Flood depths:

3.5.1.3 The depths are estimated by interpolating a constant peak water surface over a topographical grid. They do not take account of flow routes or defence overtopping which 2D modelling would provide.

3.5.1.4 The variation of flood depths within the floodplain will allow for a greater understanding of flood mechanisms and aid further Sequential Testing and indicate the likelihood of a development remaining safe during flood events.

3.5.1.5 The Level 2 SFRA has assessed flood depths and hazards using detailed 1D-2D hydraulic models where available. Where this has been done, their output should supersede in depth information provided in this Level 1 SFRA. However, where hydraulic models were not available, this information should give a useful overview of potential depths.

3.6 Reservoir Screening

3.6.1.1 The reservoirs that are within or could have a major impact on Oldham have been mapped using data from the council and OS MasterMap.

3.6.1.2 Reservoir inundation mapping for reservoirs under the 1975 Reservoirs Act is covered by the Civil Contingencies Act and the information has a national security status. The National Protocol for the Handling, Transmission and Storage of Reservoir Inundation (Flood) Maps for England and Wales classifies reservoir inundation mapping according to map types and reservoir inundation mapping would not be available for public release. For this reason the SFRA has not taken the analysis of reservoir flood risk forward, including mapping the extent of inundation that may be expected following a reservoir breach.

3.7 Surface Water Flooding Maps

3.7.1.1 The national Areas Susceptible to Surface Water Flooding map shows surface water flood extents assuming a 1 in 200 year rainfall event. The Level 2 SFRA provides refined surface water mapping for Oldham using overland routing modelling. This has used more detailed topographic data and represents buildings and roads. As per the national map this provides an indication of the likelihood of surface water flooding, separated into areas at less, intermediate or high susceptibility. For this reason the national Areas Susceptible to Surface Water Flooding map has not been reproduced in the SFRA and the reader should refer to the Level 2 SFRA surface water flooding mapping (Volume III Map 5.1 and 5.2 (A to G)).

3.7.1.2 These maps are extremely helpful in supplementing the PPS25 Flood Zone Maps as they show where localised, flash flooding can cause problems, even if the Main Rivers are not in flood. This is often due to high intensity rainfall events, which exceed the capacity of sewer systems. As a result, surface water is unable to drain away safely and flooding results. These maps are also excellent in identifying major flow routes due to the topography of the land which may intercept critical infrastructure or travel through major developments.

3.7.1.3 These maps are helpful in supporting the Flood Zone Maps during the Sequential Test as indicated above to assess the relative degree of vulnerability and where surface water flooding is sufficiently hazardous to jeopardise the principle of development. In particular they show where susceptible areas are and if development allocations are proposed in these susceptible areas then appropriate avoidance, substitution and mitigation measures are needed.

3.7.1.4 The capacity of the sewer system in removing a volume of the rainfall or infiltration rates on greenfield land has not been included. The map therefore takes a 'worst case' conservative approach in that it assumes that the sewer system is already full, blocked or has failed and that the ground is already saturated prior to rainfall. In such extreme events as summer 2007, it was seen that the drainage system had a limited effect on the location of flooding and saturated ground conditions increased the intensity of the flooding.

4 Site Specific Allocations

4.1 Introduction

4.1.1.1 The suitability of development allocations needs to be assessed based on the Sequential Test and Exception Test included in PPS25. The Sequential Test is based on development allocations, their situation in regards to flood risk, that level of risk and also the development's vulnerability to that risk. When allocating or approving land for development in flood risk areas, those responsible for making development decisions are expected to demonstrate that there are no suitable alternative development sites located in lower flood risk areas (i.e. the sequential approach). Exceptionally, proposed development sites can be taken forward, if the conditions of the Exception Test are fulfilled (refer to Vol I - User Guide).

4.1.1.2 This Level 1 SFRA aids the application of the Sequential Test and, where needed, the Level 2 SFRA will provide an additional layer of information to complete the Sequential Test.

4.1.1.3 The SFRA User Guide has provided guidance for Spatial Planners, Development Management officers and developers in how to apply the test. The following section provides summary tables of sites assessed in the Level 1 SFRA. One of the main outputs of this assessment is the Sequential Test Spreadsheet discussed below.

4.2 Development Site Sequential Test

4.2.1.1 A Sequential Test Excel spreadsheet has been produced including all of the proposed allocations provided by the council assessed against PPS25 Flood Zones. As an extra layer of information, the surface water vulnerability zones from the Level 2 SFRA refined surface water modelling have been included on the Sequential Test spreadsheet.

4.2.1.2 The council should use this information when applying the Sequential Test as described in the SFRA User Guide. As part of the guidance they should also use information on flood risk from other sources in their allocation of development.

Figure 4-1: Screenshot of Sequential Test Spreadsheet

Oldham Strategic Flood Risk Assessment

Sequential Test

Assessed Developments

Sources of allocated developments used for Sequential testing:

1 Building Schools for the Future
2 Business & Industry
3 Land Reserved for Future Development
4 Major Developed Site in Greenbelt
5 Strategic Sites
6 Town, District & Major Shopping Locations
7 Oldham Town Centre
8 Other Protected Open Land
9 Primary Employment Zones
10 Mixed Used Developments
11 SHLAA

Summary Table

			Flood Zone Coverage								Surface Water Susceptibility					
			Flood Zone 1		Flood Zone 2		Flood Zone 3a		Flood Zone 3b		Low		Intermediate		High	
	Number of Sites	Area (m²)	Area (m²)	Numbe	Area (m²)	Numbe	Area (ha)	Numbe	Area (m²)	Numbe	Area (m²)	Numbe	Area (m²)	Numbe	Area (m²)	Numbe
Building Schools for the Future	3	167182.0	143934.2	1.0	11437.6	2.0	3033.1	2.0	2777.2	1.0	3057.1	3.0	13436.6	2.0	6653.4	2.0
Business & Industry	24	697139.4	671870.2	18.0	13223.1	6.0	3021.9	4.0	3084.1	4.0	44307.1	23.0	42382.3	17.0	6531.0	5.0
Land Reserved for Future Development	7	403277.3	403277.3	7.0	0.0	0.0	0.0	0.0	0.0	0.0	8388.8	4.0	5673.1	2.0	2124.2	2.0
Major Developed Site in Greenbelt	1	53813.9	28558.6	0.0	24868.0	1.0	238.1	1.0	155.1	1.0	9585.0	1.0	4074.1	1.0	3207.7	1.0
Strategic Sites	2	1135824.6	1113542.9	1.0	4260.1	1.0	2242.3	1.0	15779.3	2.0	55197.5	2.0	28342.7	2.0	14169.3	2.0
Town, District & Major Shopping Locatio	17	574370.1	564307.8	14.0	3070.8	3.0	667.4	1.0	324.0	1.0	55768.1	15.0	22043.7	12.0	2868.9	2.0
Oldham Town Centre	1	1165701.6	1164713.3	1.0	382.3	1.0	0.0	0.0	0.0	0.0	81173.5	1.0	57325.1	1.0	7813.7	1.0
Other Protected Open Land	27	3308856.1	3083972.8	15.0	63476.7	10.0	118328.3	10.0	37078.3	11.0	112217.0	22.0	137008.3	20.0	73460.8	14.0
Primary Employment Zones	33	6313077.7	6581673.2	23.0	200646.4	10.0	108519.3	10.0	28232.7	10.0	610733.8	33.0	309636.0	31.0	88396.2	19.0
Mixed Used Developments	4	39797.4	56160.0	2.0	14303.2	2.0	25360.1	2.0	3968.0	2.0	7818.4	3.0	14297.2	3.0	6331.0	2.0
SHLAA	899	11068270.7	10571361.2	824.0	265750.2	70.0	179217.1	55.0	51342.3	45.0	514557.7	453.0	403841.3	262.0	153124.5	104.0
Total	1018	25593376.7	24383383.6	906.0	620024.3	106.0	440627.7	86.0	143341.1	77.0	1503410.0	560.0	1038667.0	353.0	371340.7	154.0

Main Table

					Flood Zone Coverage								Surface Water Susceptibility					
					Flood Zone 1		Flood Zone 2		Flood Zone 3a		Flood Zone 3b		Low		Intermediate		High	
Site ID	Name	Land Use	Development Site	Area (m²)	Area (m²)	%	Area (m²)	%	Area (m²)	%	Area (m²)	%	Area (m²)	%	Area (m²)	%	Area (m²)	%
HOU001	Ryefields Drive	Housing	SHLAA	11263.0	11263.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	451.7	4.0	1064.1	9.4	0.0	0.0
HOU002	Land at Pickhill Brook, Uppermill	Housing	SHLAA	13183.4	13183.4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	2408.5	18.3	382.0	2.9	0.0	0.0
HOU003	Land at Clifton Street, off Chew Valley Road, Greenfield	Housing	SHLAA	800.0	800.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	287.8	36.0	0.0	0.0	0.0	0.0
HOU004	11 & 13 Strawberry Lane, Lydgate	Housing	SHLAA	313.4	313.4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU005	Globe Farm, Huddersfield Road, Standedge	Housing	SHLAA	504.1	504.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU006	Land at Denshaw Vale, Denshaw	Housing	SHLAA	2226.0	2226.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	48.9	2.2	457.5	20.6	321.9	14.5
HOU007	Tamewater Mill, Delph New Road, Dobcross	Housing	SHLAA	11441.5	11178.6	97.7	263.0	2.3	0.0	0.0	0.0	0.0	2691.3	23.5	1403.1	12.3	0.0	0.0
HOU008	Land off Midgrove Lane, Delph	Housing	SHLAA	472.6	472.6	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU009	Long House, Long Lane, Dobcross	Housing	SHLAA	5011.1	5011.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU010	Stoneswood House Residential Home, Oldham Road, Delph	Housing	SHLAA	17246.6	17246.6	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU011	Lumb Mill, Huddersfield Road, Delph	Housing	SHLAA	12864.9	12388.0	96.3	476.9	3.7	0.0	0.0	0.0	0.0	989.7	7.7	1059.8	8.2	2.3	0.0
HOU012	Ballybunion, Redwood Road, Uppermill	Housing	SHLAA	1751.9	1751.9	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU013	Land adjacent 160 Huddersfield Road	Housing	SHLAA	480.3	0.0	0.0	480.3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	456.3	95.0	24.0	5.0
HOU014	Land adjacent to Higher Moordale, off Huddersfield Road, Diggle	Housing	SHLAA	717.7	717.7	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU015	Victoria Works, Wool Road, Dobcross	Housing	SHLAA	2520.6	13.9	0.6	2504.8	99.4	1.8	0.1	0.0	0.0	15.5	0.6	2392.8	94.9	112.0	4.4
HOU016	The Coaching House, Woods House, 3 Sugar Lane, Dobcross	Housing	SHLAA	115.4	115.4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU017	Land between Cranbrook Street and Brewerton Road	Housing	SHLAA	4881.8	4881.8	100.0	0.0	0.0	0.0	0.0	0.0	0.0	917.7	18.8	271.5	5.6	0.0	0.0
HOU018	Hartford Mill, Edward Street	Housing	SHLAA	13164.5	13164.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	818.2	4.3	355.1	1.9	0.0	0.0
HOU019	Land at Gainsborough Avenue	Housing	SHLAA	2477.4	2477.4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU020	Land at Laneside Ave, Shaw	Housing	SHLAA	2670.3	2670.3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.4	0.0	0.0	0.0	0.0
HOU021	Site B Rowley Clough	Housing	SHLAA	36451.4	31985.8	87.7	0.0	0.0	4465.7	12.3	0.0	0.0	176.9	0.5	203.8	0.6	30.7	0.1
HOU022	Whittaker Street, Royton	Housing	SHLAA	17503.3	17503.3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU023	Youth Centre, Royton	Housing	SHLAA	1336.3	1336.3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HOU024	Land off Birch Hill Close	Housing	SHLAA	1334.4	1142.6	59.1	0.0	0.0	791.8	40.9	0.0	0.0	37.4	1.9	0.0	0.0	0.0	0.0
HOU025	Land at Roundthorn Road	Housing	SHLAA	1293.5	1293.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	1.3	41.5	3.2	0.0	0.0
HOU026	Land at School House Road	Housing	SHLAA	5150.3	5150.3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	244.7	4.8	0.0	0.0	0.0	0.0
HOU027	OPOL11 (b) Greenacres	Housing	SHLAA	684306.5	628737.8	91.8	5584.5	0.8	44337.7	6.6	5646.6	0.8	18379.1	2.7	38854.6	5.7	14473.4	2.1

4.2.1.3 Table 4-1 (from the Sequential Test spreadsheet) provides a summary of sites investigated which are at risk of fluvial flooding. The Flood Zones do not include overlapping zones, for example, Flood Zone 2 is just the area outside of Flood Zone 3.

4.2.1.4 Over 96% of the total area proposed for development in the borough is at low probability of flooding and within Flood Zone 1. A small proportion (<2%) of the sites are at high risk of flooding and within Flood Zone 3. This indicates that fluvial flood risk may not be a significant constraint to bringing the development sites forward.

Table 4-1: Summary of Development Sites at Risk of Fluvial Flooding

Development Site			Flood Zone 2		Flood Zone 3a		Flood Zone 3b	
Site Name	**No. Sites**	**Total Area (km²)**	**Area (km²)**	**No.**	**Area (km²)**	**No.**	**Area (km²)**	**No.**
Building Schools for the Future	3	0.17	0.01	2	>0.01	2	>0.01	1
Business and Industry	24	0.70	0.02	6	>0.01	4	>0.01	4
Land Reserved for Future Development	7	0.40	0.00	0	0.00	0	0.00	0
Major Developed Site in Greenbelt	1	0.05	0.02	1	>0.01	1	>0.01	1
Strategic Sites	2	1.13	>0.01	1	>0.01	1	0.02	2
Town, District & Major Shopping Locations	17	0.80	0.01	3	>0.01	1	>0.01	1
Oldham Town Centre	1	1.17	>0.01	1	0.00	0	0.00	0
Other Protected Open Land	27	3.30	0.07	10	0.12	10	0.04	11
Primary Employment Zone	33	6.91	0.20	10	0.10	10	0.03	10
Mixed Used Developments	4	0.10	0.01	2	0.03	2	0.01	2
SHLAA	899	11.07	0.27	70	0.18	55	0.06	45
Total	**1018**	**25.8**	**0.61**	**106**	**0.43**	**86**	**0.16**	**77**

4.2.1.5 Table 4-2 (from the Sequential Test spreadsheet) provides a summary of sites investigated from the Sequential Test spreadsheet at risk of surface water flooding. The susceptibility zones include overlapping areas, for example, the less susceptible zone includes the intermediate and more susceptible areas.

4.2.1.6 Approximately 55% of the development sites across the borough are at least partially 'less susceptible' to surface water flooding with typical depths of 0.1m. Less (15%) of the development sites across the borough are at least partially 'more susceptible' to surface water flooding with typical depths of 1m.

Table 4-2: Summary of Development Sites at Risk of Surface Water Flooding

Development Site			Less susceptible		Intermediate susceptible		More susceptible	
Site Name	**No. Sites**	**Total Area (km²)**	**Area (km²)**	**No.**	**Area (km²)**	**No.**	**Area (km²)**	**No.**
Building Schools for the Future	3	0.17	0.01	3	0.01	2	0.01	2
Business and Industry	24	0.70	0.04	23	0.04	17	0.01	5
Land Reserved for Future Development	7	0.40	0.01	4	0.01	2	0.00	2
Major Developed Site in Greenbelt	1	0.05	0.01	1	0.00	1	0.00	1
Strategic Sites	2	1.13	0.06	2	0.03	2	0.01	2
Town, District & Major Shopping Locations	17	0.80	0.06	15	0.02	12	0.00	2
Oldham Town Centre	1	1.17	0.08	1	0.06	1	0.01	1
Other Protected Open Land	27	3.30	0.11	22	0.14	20	0.07	14
Primary Employment Zones	33	6.91	0.61	33	0.31	31	0.09	19
Mixed Used Developments	4	0.10	0.01	3	0.01	3	0.01	2
SHLAA	899	11.07	0.51	453	0.40	262	0.16	104
Total	**1018**	**25.8**	1.51	560	1.04	353	0.37	154

5 SFRA Recommendations

5.1 Introduction

5.1.1.1 Since publication of the Pitt Review, it is apparent that SFRAs will provide the central store for data, information and the consideration for flood risk issues relating to flooding from all sources at a local level; and provide the linkage between CFMPs, SMPs, RFRAs, SWMPs and appropriate sustainable land uses over a number of planning cycles. Therefore, SFRAs can be used as more than a land use planning tool. They can provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management, assessment and delivery.

5.1.1.2 Oldham Council must take a lead role in flood risk management and continue to work on this Level 1 SFRA and increase the understanding and information available on flood risk issues. There are a number of future plans which could provide this comprehensive understanding and acknowledgement of flood risk from all sources. These are outlined below with recommendations of whether or not they would benefit the borough.

5.1.1.3 The Sub-regional SFRA recommended that there should be consistent flood risk policies and guidance across all AGMA councils to ensure that the forthcoming large scale development and regeneration in the sub-region can occur in an efficient and sustainable way. The creation of an AGMA-wide Development and Flood Risk Guidance Document (similar to the recent Salford City Council Planning Guidance: Development and Flood Risk) would help to ensure that a consistent approach occurs throughout the sub-region.

5.1.1.4 Recommendations as a result of this Level 1 SFRA fall into four groups: the content of a Level 2 assessment, Surface Water Management Plans (SWMPs), Water Cycle Studies (WCS) and Green Infrastructure (GI).

5.2 Level 2 SFRA

5.2.1.1 This Level 1 SFRA has provided the evidence base to help Oldham Council apply the Sequential Test as set out in PPS25. Whilst the suite of Flood Risk Maps provided will help inform the decision making process and go some way in informing the likelihood of passing the Exception Test, they do not provide the local understanding and the level of detail required to carry out the Exception Test.

5.2.1.2 A detailed Level 2 SFRA should be produced to gain a greater understanding of the flood mechanisms, residual risks, and concentrate on specific locations, to provide the data needed to pass part c) of the Exception Test – whether the development will be safe. The Level 2 SFRA should concentrate on strategic development sites which coincide with areas at high risk of flooding.

5.2.1.3 The investigations carried out within the Level 2 SFRA will inform the "flood risk balance sheet" (Volume III) and confirm the sequential approach to site layout and the design of possible mitigation measures.

5.2.1.4 The scope of a Level 2 SFRA is provided in PPS25 and its Practice Guide. It should include the detailed nature of the flood hazard within a flood zone including:

- Flood probability
- Flood depth
- Flood velocity
- Rate of onset of flooding

5.2.1.5 The Level 2 SFRA should also provide information on flood defences including their location, standard of protection, condition and an assessment of defences breaching and overtopping.

5.2.2 Oldham Council

5.2.2.1 At the sub-regional level Oldham Council is part of the Greater Manchester 'New Growth Point'. It may see an increase of 20% on the Council's RSS annual average housing figures in the period 2011 - 2017, although the initial focus is on Manchester, Salford, Trafford and Bolton councils. The RSS supports regeneration and advocates that 80% of development should be on previously developed land. Oldham Council have a target to provide 289 new homes every year (net clearance), alongside developing commercial, industrial, recreational and public services (education, health etc.) sites. The focus of development is the Housing Market Renewal Area, potential housing sites (SHLAA) and mixed use Strategic Sites (i.e. Hollinwood and Foxdenton) and Oldham Town Centre.

5.2.2.2 The Level 2 SFRA should look at these key sites and provide the evidence base so that suitable allocations can be brought forward. To achieve this, the Level 2 SFRA should consider the following:

- The findings from the Bury, Rochdale and Oldham Level 2 SFRA should be integrated.
- The residual risk from Wince Brook by undertaking culvert blockage analysis.
- The condition and standard of protection of the existing defences/ assets adjacent to key development sites.
- The flood depth and hazard mapping along the River Tame at Frenches Wharf to inform emergency planning.
- Flood depth and hazard mapping for the Diggle Brook at the Diggle School site.
- Flood risk from the Chew Brook to the Robert Fletcher site at Greenfield.
- The risk of flooding from the Rochdale Canal and the Huddersfield Narrow Canal, including the implications of embankment breach.
- The risk of surface water flooding by refining the map of ASSWF and scoping CDAs.
- The potential interactions between different sources of flood risk.
- The cumulative impacts of planned development in the borough on flood risk to districts downstream.
- An Outline Mitigation Strategy (at a strategic level).

5.2.2.3 It should be noted that this Level 1 SFRA has been undertaken as part of a Hybrid Level 2 SFRA for Oldham. The Level 2 SFRA is provided as Volume III.

5.3 Surface Water Management Plans (SWMPs)

5.3.1.1 The ‘Pitt Review’, ‘PPS25’, the ‘Making Space for Water Integrated Urban Drainage’ pilots and the ‘Draft Flood and Water Management Bill’ recognise the need for clearer roles and responsibilities for different sources of flood risk, with the current legislative framework leading to a fragmented and piecemeal approach for managing urban flood risk. A local leadership role for local flood risk issues has emerged whereby local authorities will need to have in place a strategy to manage these risks, of which a Surface Water Management Plan (SWMP) is an integral part.

5.3.1.2 Surface water flooding is a major source of flood risk and as demonstrated by the summer 2007 floods can lead to serious flooding of property and possessions. These impacts can typically be mitigated through the implementation of established 'best practice' drainage techniques including Sustainable Urban Drainage Systems (SUDS) at the planning application stage. However, in some circumstances site constraints dictate that a catchment-wide, holistic approach to surface water flood management is required through urban catchment planning and strategic consideration of the design, construction, maintenance and improvement of sewers and watercourses. Local Authorities need to take a lead role and close liaison with Water Companies and the Environment Agency is essential to ensure a consistent and co-ordinated approach to surface water management. This may be best achieved by the production of appropriate Surface Water Management Plans (SWMPs).

5.3.1.3 SWMPs are developed by a partnership between a Local Authority, Water Company and the Environment Agency. They provide an opportunity to:

- Develop a framework for joint working and data sharing (which is a fundamental part of flood risk management under the draft Flood and Water Management Bill),
- Collate a central geographic database of drainage assets and flood risk issues,
- Assess the likelihood of surface water flooding through various modelling approaches,
- Assess the risk of surface water flooding to people, properties and the environment,
- Communicate this risk to local communities,
- Assess the costs and benefits of various flood risk reduction measures,
- Provide a drainage strategy for areas of significant development if appropriate, and
- Provide a framework for implementation and monitoring of the surface water strategy for a given area.

5.3.1.4 The Defra SWMP guidance is based on the Integrated Urban Drainage pilots undertaken as part of Making Space for Water and was recently tested by six national pilot studies. SWMPs should achieve the level of data sharing with water companies and analysis using detailed sewer network models that is the next stage down from the SFRA.

5.3.1.5 SFRAs provide the opportunity for local authorities to assess at a strategic level the risk from multiple sources of flooding, which can then feed into more detailed assessments where appropriate by both themselves and other operating authorities. This includes the identification of Critical Drainage Areas (CDAs). CDAs are those identified from historical flood events and/ or modelled data as having a significant risk from surface water flooding and include drainage catchments for the sewer network. Recommendations can then be made for the future provision of SWMPs in high risk locations or areas of significant development for which an integrated drainage solution is possible that can reduce flood risk both to the development and elsewhere.

5.3.2 Screening for Critical Drainage Areas

5.3.2.1 Future Water (Defra, 2008) sets out the role that SFRAs can have in identifying CDAs for which more detailed Surface Water Management strategies can be developed. The recent Defra Surface Water Management Plan Guidance (2009) supports the use of SFRAs in providing the evidence base for where SWMPs are required.

5.3.2.2 It is recommended that more detailed surface water modelling is undertaken for the entire borough as part of the Level 2 SFRA. The ASSWF map provides a good indication of areas at risk of surface water flooding but this should be refined so that it picks up flow paths along roads and around buildings.

5.3.2.3 The Level 2 SFRA should use the following data to screen for CDAs:

- Local authority incident records
- Discussions with Local Authority Drainage Engineers

- The national Areas Susceptible to Surface Water Flooding map
- Refined surface water flood maps produced for the Level 2 SFRA
- An assessment of properties at risk based on the SFRA surface water flood map
- United Utilities sewer records and drainage areas
- United Utilities DG5 register

5.3.2.4 This exercise should be used to inform recommendations for Surface Water management Plans.

5.3.2.5 Unfortunately, United Utilities flood risk data was not available for use in this SFRA. The sewer network can have a significant impact on the location of surface water and sewer flooding for more frequent events. It can also affect the distribution of water throughout urban catchments during flood events, passing excess flows from the combined network into watercourses through combined sewer overflows. Access to United Utilities flood risk data which would greatly enhance the definition of CDAs and recommendations for SWMPs.

5.4 Water Cycle Studies (WCS)

5.4.1.1 Water Cycle Studies (WCS) are an all encompassing study of the capacity in water supply and waste water infrastructure, aimed at those regions that are expecting growth. The main aim of a WCS is to ensure that new development can be supplied with the required water services it needs in a sustainable way.

5.4.1.2 To ensure that growth at a council scale can be supplied with sufficient water supply and wastewater treatment facilities, without detrimentally affecting the natural water cycle, it is essential to consider the water infrastructure needs as early in the planning process as possible. A WCS will provide Oldham Council and development organisations with the necessary planning tool for this purpose and the planning base to support their LDF.

5.4.1.3 A SWMP and a WCS should be twin tracked when they are prepared for the areas of interest. Whilst the SWMP would address surface water management, the remaining issues of water supply and sewage treatment should be included within the WCS.

5.4.1.4 A North West Water Cycle Scoping Study has recently been undertaken to inform and facilitate the undertaking of outline water cycle studies for the six North West Growth Points, of which Greater Manchester is one. The report recommends that a Water Cycle Study is undertaken for the River Mersey, which will include local authorities from AGMA, Mid Mersey, Mersey Heartlands and West Cheshire.

5.4.1.5 Until the River Mersey WCS is prepared, developers should consult with United Utilities about potential capacity issues in the water supply and sewage treatment networks.

5.5 Green Infrastructure Framework

5.5.1.1 The Green Infrastructure (GI) of Oldham is part of the council area's life support system. It is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe. In general GI consists of:

- Open Spaces – parks, woodlands, nature reserves, lakes
- Linkages – River corridors and canals, pathways and cycle routes and greenways
- Networks of "urban green" – private gardens, street trees, verges and green roofs

5.5.1.2 The identification and planning of GI is critical to sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development.

5.5.1.3 GI is also central to climate change action and is a recurring theme in planning policy statements, regional spatial strategy and the sub-regional SFRA.

5.5.1.4 With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. GI can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

5.5.1.5 This evidence base provided in this SFRA should be used to enhance the Greater Manchester Green Infrastructure Study. River corridors identified as functional floodplain are an excellent linkage of GI and can provide storage during a flood event. Areas identified within the urban environment or upstream of a critical surface water flood areas should be incorporated into council GI strategies. Opening up land to create flow paths or flood storage areas can help protect current and future property.

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Appendix

A . Maps

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Offices at

Atherstone
Doncaster
Edinburgh
Haywards Heath
Limerick
Newcastle upon Tyne
Northallerton
Northampton
Saltaire
Skipton
Tadcaster
Wallingford
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