PRELIMINARY FLOOD RISK ASSESSMENT
Preliminary Assessment Report

Sefton Metropolition Borough Council

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Environment Agency

United Utilities

Sefton Council

CAPITA SYMONDS

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RELATED DOCUMENTS

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Executive Summary

Background
This report has been prepared for Sefton Metropolitan Borough Council (Sefton MBC) primarily to deliver the first step of the Flood Risk Regulations (2009).

Sefton MBC is defined as a Lead Local Flood Authority (LLFA) under the Flood Risk Regulations (the Regulations). The first step of the Regulations is for LLFAs to undertake a Preliminary Flood Risk Assessment (PFRA), comprising this document, the supporting spreadsheet and GIS layers that show areas that are at flood risk. The timetable for production of PFRAs and subsequent documents and strategies is defined by the Floods Directive. Some of the information within this report will also assist Sefton MBC to manage local flood risk, in accordance with their duties under the Flood and Water Management Act 2010 (the Act).

The PFRA process is aimed at providing a high level overview of past and future flood risk within a local area, primarily considering surface water, groundwater, ordinary watercourses and canals. The methodology for producing this PFRA has been based on the EA's Final PFRA Guidance and Defra's Guidance on selecting Flood Risk Areas, both published in December 2010.

The assessment of historical flooding is based on records collated by Sefton MBC and also historical flood outlines provided by the EA. The assessment of future flooding has been based on national datasets provided by the Environment Agency. The EA's Areas Susceptible to Surface Water Flooding (AStSWF) dataset is the agreed local surface water information used to assess the consequences of future flooding. Surface water flooding is the source of flooding that is expected to have the most significant consequences across Sefton when compared to other local sources of flooding.

Indicative Flood Risk Areas
At a national level, the Environment Agency has used a methodology that was set out by Defra to identify broad indicative Flood Risk Areas across England where flooding could result in 'significant harmful consequences'. Ten indicative Flood Risk Areas have been identified and of the ten one is for Liverpool, including parts of the Sefton administrative area that lie within the southern part of the borough (Crosby, Sefton & Maghull).

Significant harmful consequences were assessed at a national scale and are based on a set of National Indicators developed by Defra:

- Human health – 30,000 people or 150 critical services (e.g. schools, hospitals, etc) impacted;
- Economic activity – 3,000 non-residential businesses impacted; and
- Impacts on environmental designations, heritage sites and with a risk of pollution.

LLFAs have been free to develop their own relevant thresholds, based on these indicators, for events that are considered to represent locally significant consequences.

Review of Indicative Flood Risk Areas
Information relating to past flood events, caused by flooding from local sources, was collated and analysed. Comprehensive details on the extents of flooding and therefore consequences of these events were largely unavailable, however, based on the evidence that was collected, eleven past flood events could be determined with any certainty to have had 'significant harmful consequences' at the local scale. Details have been included in Annex 1 of the Preliminary Assessment Spreadsheet.

Following consultation with the Environment Agency and United Utilities (UU), the Flood Risk Area boundary originally identified by the EA in the Sefton MBC study area has been amended slightly to reflect five areas that have been identified to be at significant local flood risk.

Glossary

Term	Definition
Aquifer	Water bearing rock, sand or gravel capable of yielding significant quantities of water.
Asset Management Plan (AMP)	In the context of water services, a plan for managing water and sewerage company (WaSC) infrastructure and other assets in order to deliver an agreed standard of service.
AStSWF	Areas Susceptible to Surface Water Flooding – The first generation broad scale national mapping of surface water flooding prepared for the Environment Agency.
Catchment Flood Management Plan (CFMP)	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Civil Contingencies Act 2004	This Act delivers a single framework for civil protection in the UK. As part of the Act, Local Resilience Forums must put into place emergency plans for a range of circumstances including flooding.
CLG	Government Department for Communities and Local Government
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Critical Drainage Area (CDA)	Areas of significant flood risk, characterised by the amount of surface runoff that drains into the area, the topography and hydraulic conditions of the pathway (e.g. sewer, river system), and the receptors (people, properties and infrastructure) that may be affected.
Culvert	A buried or underground channel or pipe that carries a watercourse below the level of the ground.
Defra	Department for Environment, Food and Rural Affairs
DEM	Digital Elevation Model – three dimensional digital representation of unfiltered topography surface of an area.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 10 years.
DTM	Digital Terrain Model – three-dimensional digital representation of a bare earth surface (i.e. with buildings, trees removed)
EA	Environment Agency – Who's play a central role in delivering the environmental priorities of central government and the Welsh Assembly Government through functions and roles
Indicative Flood Risk Areas	Areas determined by the Environment Agency as potentially having a significant level of 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.
FMfSW	Flood Map for Surface Water – second generation mapping prepared for the Environment Agency on the risk of surface water flooding
Flood defence	Infrastructure used to protect an area against floods. For example, floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG.
Flood Risk Regulations (FRR)	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Flood and Water Management Act	An Act of Parliament passed into law in 2010 which forms part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, a major recommendation of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a river or stream.

Term	Definition
IDB	Internal Drainage Board - Internal Drainage Boards (IDBs) are independent bodies responsible for land drainage in areas of special drainage
IUD	Integrated Urban Drainage
LDF	Local Development Framework
Lead Local Flood Authority	Local Authority responsible for taking the lead on local flood risk management
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
Local Resilience Forum	A multi-agency forum, bringing together all the organisations that have a duty to cooperate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner.
LPA	Local Planning Authority
LRF	Local Resilience Forum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency
Ordinary Watercourse	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, IDBs
Partner	A person or organisation with responsibility for the decision or actions that need to be taken.
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial Flooding	Flooding from water flowing over the surface of the ground; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with additional flow.
PPS25	Planning and Policy Statement 25: Development and Flood Risk
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Risk Management Authority (RMA)	As defined by the Floods and Water Management Act
River Basin District (RBD)	A River Basin or Basins used for both strategic planning and reporting to the European Commission for the Water Framework Directive. There are eleven RBDs in England and Wales.
Sewer Flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
SIRS	Sewer Incident Recording System
Sefton MBC	Sefton Metropolitan District Council
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems
Sustainable Drainage Systems	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Surface Water	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

Term	Definition
	system or public sewer.
SWMP	Surface Water Management Plan
UU	United Utilities Ltd
WaSC	Water and Sewerage Company
WIRS	Water incident Recording System

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1 Introduction

1.1 What is a Preliminary Flood Risk Assessment?

1.1.1 A Preliminary Flood Risk Assessment (PFRA) is a high-level screening exercise used to identify areas where the risk of flooding from local sources is considered to be significant and warrants further examination and management through the production of flood risk and flood hazard maps and flood risk management plans. Local sources are identified as those not including main rivers, the sea or large raised reservoirs.

1.1.2 The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010. The PFRA involves collecting existing and readily available information on past and future (potential) floods, assembling the information into a Preliminary Assessment Report (PAR) and identifying Flood Risk Areas.

1.1.3 The PFRA has been based on information from a number of available sources such as the Environment Agency's national information, for example Areas Susceptible to Surface Water Flooding (AStSWF), existing local products, such as the Knowsley Council and Sefton Council Strategic Flood Risk Assessment (SFRA), and information available data from the ongoing Sefton Surface Water Management Plan (SWMP).

1.1.4 This PAR for Sefton Metropolitan Borough Council (Sefton MBC) provides a high level summary of significant flood risk, describing both the probability and harmful consequences of past and future flooding.

1.2 Background

1.2.1 The primary driver behind the PFRA is the Flood Risk Regulations 2009, which came into force on the 10th December 2009 and which transpose the European Union (EU) Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) into domestic law in England and Wales and to implement its provisions.

1.2.2 In particular the Regulations place duties on the Environment Agency and Local Lead Flood Authorities to prepare a number of documents across an ongoing 6-year cycle including:

- Preliminary Flood Risk Assessments – deadline 22nd June 2001
- Flood hazard and flood risk maps – deadline 22nd June 2013
- Flood Risk Management Plans – deadline 22nd June 2015

1.2.3 The purpose of the PAR under the Regulations is to provide the evidence for identifying Flood Risk Areas[1]. The report will also provide a useful reference point for all local flood risk management and informs local flood risk strategies.

1.2.4 The scope of the PFRA is to consider past flooding and potential future flooding from local sources of flooding other than main rivers, the sea and reservoirs. In particular this includes surface runoff, groundwater, canals and ordinary watercourses and any interaction these have with drainage systems.

[1] Flood Risk Areas are defined in guidance available at http://archive.defra.gov.uk/environment/flooding/documents/interim2/flood-risk-method.pdf

1.3 Objectives

1.3.1 The key objectives of the PFRA are summarised as follows:

- Identify relevant partner organisations involved in future assessment of flood risk; and summarise means for future and ongoing stakeholder engagement
- Provide a summary of the systems used for data sharing and storing and the provision for quality assurance, security and data licensing arrangements
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information
- Assess historic flood events within the study area from local sources 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 Sefton's Local Flood Risk Management Strategy
- Review the Indicative Flood Risk Areas provided by the Environment Agency and where necessary provide explanation and justification for any additions required to the Indicative Flood Risk Areas

1.4 Study Area

1.4.1 The study area for this Preliminary Assessment Report (PAR) is defined by the administrative boundary of Sefton Metropolitan Borough Council. The geographical extent of the study area is illustrated in Figure 1-2. Sefton is bordered to the east by Knowsley Borough Council and West Lancashire County Council, to the west by the Irish Sea; and to the south by Liverpool.

1.4.2 The administrative area of Sefton Metropolitan Borough has a total area of 155 square kilometres with 36 kilometres of coastline, extensive areas of sand dunes, coastal salt marsh and a diverse mixture of industrial, commercial and urban development coupled with rural green belt divides. It has a major port and extensive commuter travel into Liverpool from the key urban areas of Southport, Formby, Crosby, Litherland, Maghull and Bootle. Sefton has a total population of approximately 300,000.

1.4.3 The primary watercourse within Sefton is the River Alt, which flows from Liverpool and Knowsley in the south east towards Formby, before turning south west to discharge at Hightown. The River Alt drains a catchment of approximately 235km^2 and includes a large number of smaller watercourses, including Downholland Brook, Dovers Brook and Whinny Brook. Along the north eastern boundary of Sefton, a number of watercourses, including Fine Jane's Brook and Three Pools Waterway, discharge to the sea via Crossens.

1.4.4 The hydrology of the wider area, as described in the Alt Crossens CFMP, is very artificial and water levels are controlled under different winter and summer regimes to prevent flooding, to provide irrigation and to prevent peat shrinkage.

1.4.5 The topography of the study area is also complex. A low lying ridge up to 20m AOD runs north east to south west from the southern edge of Southport around the western edge of Formby, which results in most rivers flowing inland away from the coast. South of Formby there is low lying land at 3m to 4m AOD through which the Alt discharges to the sea. This low lying area extends south westwards where very low land at a level of 2m to 3m AOD splits higher ground in Maghull and Litherland/Bootle, both of which are 35m AOD in places.

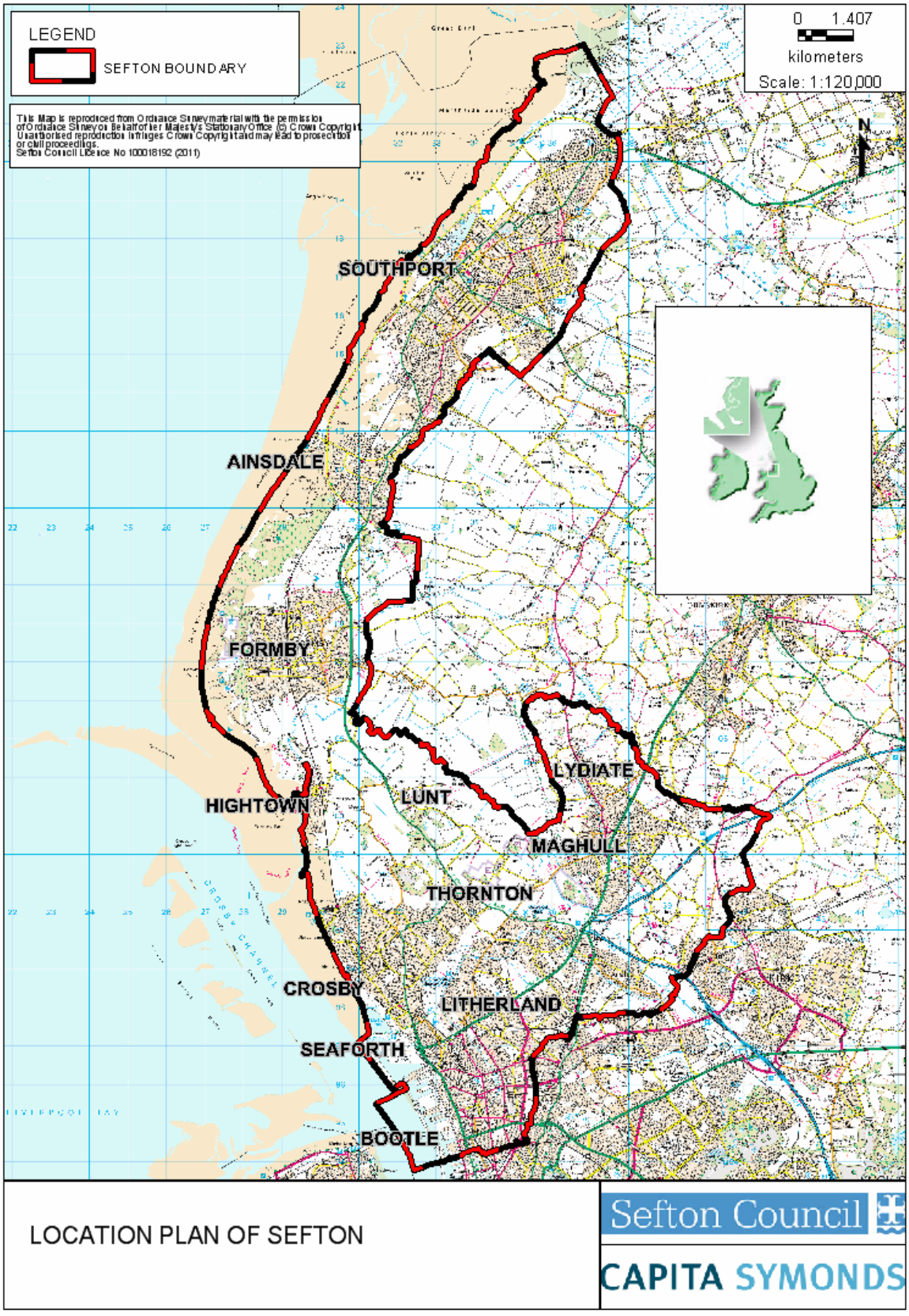


Figure 1-2: Sefton Metropolitan Borough Council Administrative Area

2 LLFA Responsibilities

2.1 Introduction

2.1.1 The Flood Risk Regulations 2009, which came into force on the 10th December 2009, define new responsibilities for flood risk management. Under this legislation, all Unitary Authorities are designated 'Local Lead Flood Authorities' (LLFA) and have formally been allocated a number of key responsibilities with respect to local flood risk management.

2.2 Leadership & Partnership

2.2.1 As a Unitary Authority, Sefton MBC is responsible for leading local flood risk management, including establishing an effective partnership with stakeholders such as the Environment Agency, United Utilities Ltd, British Waterways and others.

2.2.2 A partnership between Sefton MBC, the Environment Agency and United Utilities has been developed through the preparation of the ongoing SWMP and it is recommended that this partnership be developed further. It is recommended that representatives from British Waterways be invited to attend future meetings in addition to representatives from other relevant third parties. Regular meetings should be held to facilitate the delivery of the future requirements of the Flood Risk Regulations and the actions that will come out of the SWMP.

2.2.3 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).

2.2.4 Local Governance arrangements for Sefton are presenting in Figure 2-1, overleaf

2.3 Stakeholder Engagement

2.3.1 Sefton MBC has engaged stakeholders representing the following organisations and authorities:

- Environment Agency
- United Utilities Ltd
- Liverpool Council

2.3.2 The Environment Agency and United Utilities have been actively engaged in the PFRA and in the ongoing SWMP process and have assisted in the preparation of this document. British Waterways has not been actively engaged at this time but will be consulted in future developments and as part of the development of a local flood risk management strategy.

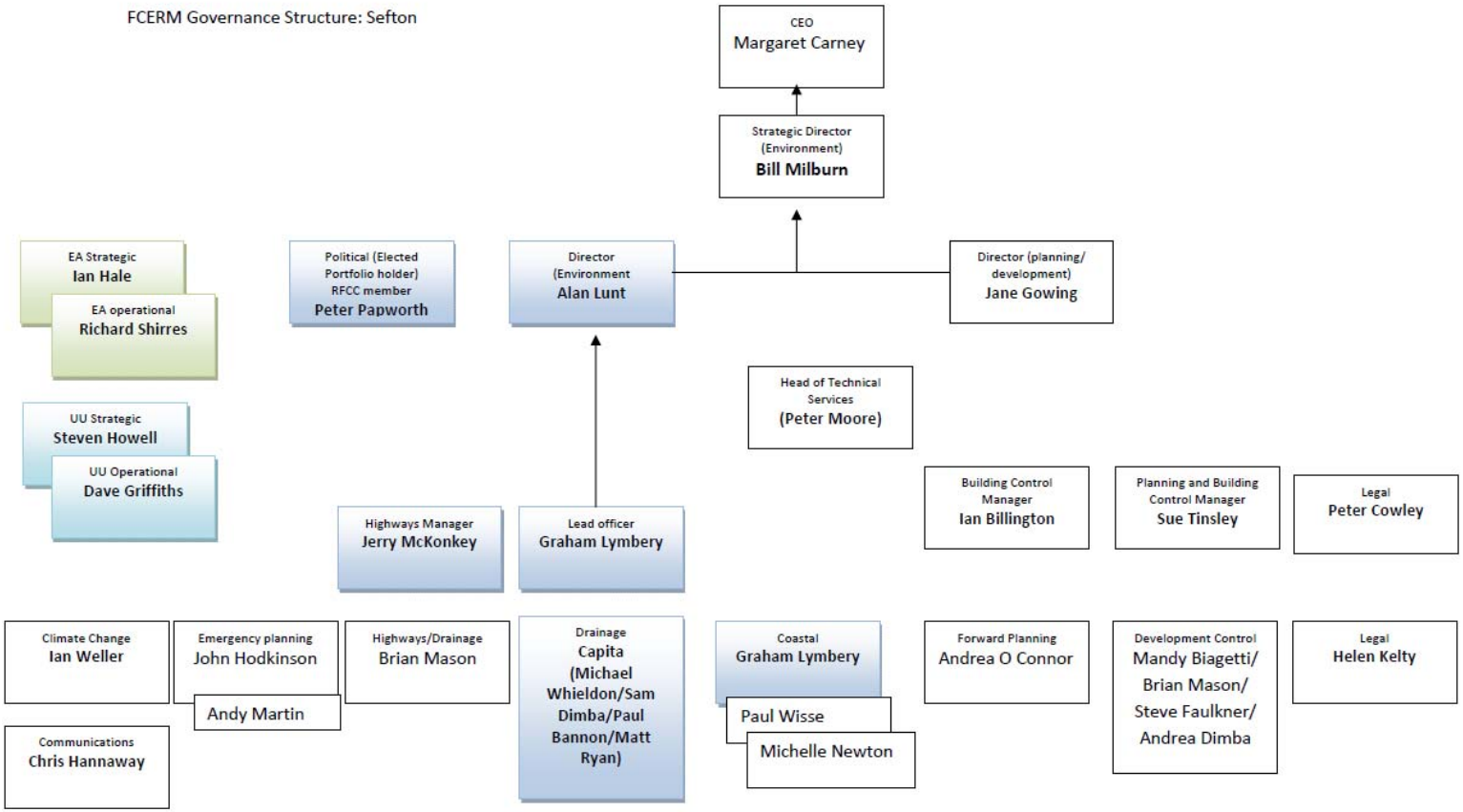


Figure 2-1: Local Flood Risk Management Governance in Sefton

2.3.3 Members of the public may also have valuable information to contribute to the PFRA to enable an improved understanding and management of local flood risk within the study area. Members of the public have not been engaged at this time, however, it is recognised that public engagement can afford significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chances of acceptance of options and decisions proposed in future flood risk management plans. Public engagement will be undertaken as part of future aspects of the SWMP process and in the development of a local flood risk management strategy.

2.4 Other Responsibilities

2.4.1 Aside from forging partnerships and coordinating and leading on local flood management, there are a number of other key responsibilities that have arisen for Local Lead Flood Authorities from the Flood & Water Management Act 2010. These responsibilities include:

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what they have done or intend to do with respect to the incident, notifying risk management authorities where necessary and publishing the results of any investigations carried out.
- **Asset Register** – LLFAs also have 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.
- **SuDS Approving Body** – LLFAs are designated the SuDS Approving Body (SAB) for any new drainage system, and therefore must approve, adopt and maintain any new sustainable drainage systems (SuDS) within their area. This responsibility is anticipated to commence from April 2012.
- **Flood risk management strategies** – LLFAs are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area. The local strategy will build upon information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments.
- **Works powers** – LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater, consistent with the local flood risk management strategy for the area.
- **Designation powers** – LLFAs, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood risk management. Once designated, the owner must seek the consent of the LLFA to alter, remove or replace it.

3 Methodology & Data Review

3.1 Data Sources & Availability

3.1.1 Table 3-1 provides a summary of the data sources that were collected from partner organisations and provides a description of the dataset and whether it was used during the PFRA.

Table 3-1: Data Sources

Source	Dataset	Description	Quality (Scale 1 to 4)*	Obtained	Used
Environment Agency	Flood Map (Flood Zones)	Shows extent of flooding from rivers with a catchment area greater than 3km^2 during a 1 in 100yr flood and 1 in 1000yr flood. Shows extent of flooding from the sea during 1 in 200yr and 1 in 1000yr flood events. Ignores the presence of defences.	2	✓	✓
	Historic Flood Map	Attributed spatial flood extent data for flooding from rivers, sea and groundwater.	3	✓	✓
	Areas Susceptible to Surface Water Flooding	A national outline of surface water flooding held by the EA and developed in response to Pitt recommendations.	3	✓	✓
	Flood Map for Surface Water	A second generation of surface water flood mapping which was released at the end of 2010.	3	✓	✗
	Areas Susceptible to Groundwater Flooding	Broad-scale mapping showing the proportion of areas within a 1km^2 grid cell that is susceptible to groundwater flooding.	4	✓	✓
	National Receptors Dataset	A nationally consistent dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations.	1	✓	✓
	Indicative Flood Risk Areas	National mapping highlighting key flood risk areas, based on the definition of 'significant' flood risk agreed with the Defra.	3	✓	✓
	Source protection zones	Show the risk of contamination that might cause pollution in the area. The maps show three main zones (inner, outer and total catchment).	3	✗	✗
	Asset data	Details on the location and extent of flood defences.	2	✗	✗
	Alt Crossens Catchment Flood Management Plan	Catchment Flood Management Plans (CFMPs) give an overview of the flood risk from all sources across each river catchment, recommending ways of managing those risks now and over the next 50-100 years.	2	✓	✗
	Mersey Estuary Catchment Flood Management Plan		2	✓	✗

Source	Dataset	Description	Quality (Scale 1 to 4)*	Obtained	Used
	Lower Mersey and North Merseyside Groundwater Resources Study (2009)	A report consolidating the current knowledge of the Permo-Triassic Sandstone Aquifer system of the Lower Mersey and North Merseyside area.	2	✓	✓
Sefton MBC	Strategic Flood Risk Assessment (SFRA)	SFRAs may contain useful information on historic flooding, including local sources of flooding from surface water, groundwater and flooding from canals.	2 to 4	✓	✓
	Flooding incidents database	Records of flooding incidents from all sources collated by Sefton MBC.	2	✓	✓
United Utilities	DG5 Register for United Utilities areas	DG5 Register logs and records of sewer flooding incidents in each area.	2	✓	✓
	SIRS / WIRS	Sewer Incident Reporting System / Water Incident Reporting System	2	✓	✓
	Sewer pipe network	GIS dataset providing the georeferenced location of surface water, foul and combined sewers. Includes pipe size and some information on invert levels.	2	✓	✗
British Waterways	British Waterway's canal network	Detailed GIS information on the British Waterway's canal network, including the location of canal centrelines, sluices, locks, culverts, etc.	2	✗	✗
	Records of canal breaches and overtopping events	Records of historical canal overtopping and drainage misconnections.	2	✗	✗
British Geological Society	Geological datasets	Licensed GIS datasets including: • Geological indicators of flooding; • Susceptibility to groundwater flooding; • Permeability; • Bedrock and superficial geology.	2 to 4	✗	✗

* Scale of 1 is best possible, no better data available, e.g. LiDAR, rain gauge data. Scale of 4 is poor, a heroic assumption, e.g. ground roughness for 2D models

3.2 Limitations

Records of Past Floods

3.2.1 The most significant data gap across the borough relates to records of past 'local' flooding incidents. Recording of past incidents of surface water, sewer, groundwater or ordinary watercourse flooding has been inconsistent.

3.2.2 Sefton MBC's flooding incidents database now follows a standard reporting system. Before the current system (Mayrise) was developed incidents were recorded on spreadsheets and there are gaps in the data collected. Local flood records are available from February 2001 to March 2002, from August 2004 to September 2004, and for events on 21st January 2008 and between

the 19th and 22nd July 2010. The records have been digitised into a GIS layer and some information is available to indicate the influence of blockage or other sources.

3.2.3 United Utilities has provided its current surface water DG5 register, which provides street-level data on flooding incidents and the year of occurrence. The DG5 dataset does not include the number of properties considered to be at risk from external or internal flooding (i.e. those that are at risk but which have not flooded are not identified) and it only includes those likely to flood more frequently than once in 30 years.

3.2.4 In addition, United Utilities has also provided its Sewers Incident Reporting System (SIRS) (pre-2008) and Water Incident Reporting System (WIRS) (post-2008) databases, containing detailed information on the location and cause of flooding incidents over the last 21 years although both have some incomplete records and in some cases multiple causes of flooding. All United Utilities incidents databases have been digitise into GIS where grid reference data is available and these are presented in Figure A-2 in Appendix A.

3.2.5 The Environment Agency's Historic Flood Map shows 2 incidents within the borough. No information is available regarding the date, duration or source of flooding for these incidents. These are presented in Figure A-3 and in an enlarged Figure A-3.1 in Appendix A

3.2.6 A canal breach is known to have occurred in October 1994, flooding parts of Maghull. British Waterways has not been consulted for information at this time but will be consulted in the future.

Future Groundwater Flooding

3.2.7 Groundwater flooding data provided for the PFRA included the Environment Agency's 'Areas susceptible to groundwater flooding' dataset. This is a very broad scale map (1 km^2 grid) intended to give a broad feel for wider areas that may be at risk of groundwater flooding. Only isolated locations within the susceptible area are likely to suffer groundwater flooding.

3.2.8 The Lower Mersey and North Merseyside Groundwater Resources Study indicates that the Alt in particular has a significant contribution to its baseflow by local groundwater from the Permo-Triassic Sandstone, suggesting that those areas within the Alt Catchment are more at risk than others.

Future Surface Water Flooding

3.2.9 The Environment Agency data sets 'Areas Susceptible to Surface Water Flooding' and second generation 'Flood Map for Surface Water' are national scale assessments suitable for broadly identifying surface water flood risk. The datasets are of a resolution suitable for the PFRA, however are limited in their use in addressing the next stages of the Flood Risk Regulations (2009), e.g. Hazard Maps.

3.3 Security, Licensing and Use Restrictions

3.3.1 All of the datasets collected from stakeholders have been collated and stored in a central / local server that is password protected. The data collected is licensed either for the purposes of undertaking this PFRA only or are licensed for the purposes of local flood risk management.

3.3.2 The future use of some of the datasets, in particular, the records of property flooding held by the United Utilities Ltd as well as the records of property flooding collected by Sefton MBC, are restricted because the information they provide could be considered as sensitive.

3.3.3 It is recommended that all third party data owners be contacted to discuss future use of their data and to ensure that the data used is the most up-to-date.

Table 3-2: Data Licencing

Source	Dataset	Used	Licence Description
Environment Agency	Flood Map (Flood Zones)	✓	Local Flood Risk Management
	Historic Flood Map	✓	Preliminary Flood Risk Assessment
	Areas Susceptible to Surface Water Flooding	✓	Local Flood Risk Management
	Flood Map for Surface Water	✗	Local Flood Risk Management
	Areas Susceptible to Groundwater Flooding	✓	Preliminary Flood Risk Assessment
	National Receptors Dataset	✓	Local Flood Risk Management
	Indicative Flood Risk Areas	✓	Preliminary Flood Risk Assessment
	Alt Crossens Catchment Flood Management Plan	✗	Local Flood Risk Management. Available via: http://www.environment-agency.gov.uk/cy/ymchwil/cynllunio/33606.aspx
	Mersey Estuary Catchment Flood Management Plan	✗	Local Flood Risk Management. Available via: http://www.environment-agency.gov.uk/cy/ymchwil/cynllunio/33600.aspx
	Lower Mersey and North Merseyside Groundwater Resources Study (2009)	✓	Local Flood Risk Management
Sefton MBC	Strategic Flood Risk Assessment (SFRA)	✓	Free to download at: http://www.sefton.gov.uk/default.aspx?page=8353
	Flooding incidents database	✓	Local Flood Risk Management
United Utilities	DG5 Register for United Utilities Areas	✓	Local Flood Risk Management – not for distribution
	SIRS / WIRS	✓	Local Flood Risk Management – not for distribution
	Sewer pipe network	✗	Local Flood Risk Management – not for distribution

3.4 Quality Assurance

3.4.1 Table 3.1, above, includes data quality flags based on a simple scoring system outlined in Defra's Technical Guidance for undertaking surface water management plans[2]. The scoring system applies a value ranging from 1 for the best available data that could not easily be improved upon to 4 for what are essentially assumptions.

3.4.2 As indicated, elements of most of the datasets are known to be of lesser quality and they would benefit from being replaced as soon as new data becomes available or, with respect to the data collected by third parties, they would benefit from improvements to the data collection systems.

[2] Defra (2010) *Surface Water Management Plan Technical Guidance*

This is particularly the case for records collated by Sefton MBC and the opportunity should be taken to discuss data collection across all partners and the needs of future flood risk management so that a consistent approach to data collection is made.

4 Past Flood Risk

4.1 Summary of Past Floods

4.1.1 To assist LLFAs in determining Flood Risk Areas, the Environment Agency produced indicative Flood Risk Areas based on an assessment of 1km grid squares. A square was classified as being a 'place where flood risk is an issue' if more than 200 people or 20 businesses or 1 critical service are flooded to a depth of greater than 0.3m during a 1 in 200 year storm event (using the FMfSW dataset).

4.1.2 The criteria for determining local significance when proposing new or expanding Flood Risk Areas has been left to each LLFA, though it was recommended that some measure of equivalent risk was applied. The Merseyside group of authorities have determined that flood events that resulted in impacts to 20 people (equivalent to 8 or more properties) should be considered as having had locally significant harmful consequences. The threshold of 20 properties was chosen as it is an order of magnitude less than was required to identify a $1km^2$ grid cell as being a 'place where flood risk is an issue' in the national assessment of indicative Flood Risk Areas that was undertaken by the Environment Agency.

4.1.3 A full list of historical flood events from surface water, sewer, canal or groundwater sources is presented in Appendix A Table A-1. Table 4-1 provides a summary of the past floods that are understood to have had locally significant consequences.

Table 4-1: Historic Significant Floods and Consequences

Date	Main source of flooding	Description	Data Source	Significant harmful consequences?
19/07/2010 to 22/07/2010	Surface Water	A total of 77 surface water flooding incidents affected properties in Aintree, Birkdale, Bootle, Brighton-le-Sands (formerly Blundell Sands), Crosby, Formby, Litherland, Maghull, Melling, Netherton, Seaforth, Sefton, Southport, Thornton and Waterloo. Impacts in Maghull were locally significant in isolation.	SMBC	Yes (Local)
06/10/2009 to 08/10/2009	Surface Water	9 records of flooding in Maghull and Southport	UU (WIRS)	Yes (local)
21/01/2008	Surface water / ordinary watercourse	An intense storm system produced surface water flooding across Sefton. There were 98 records of flooding in Ainsdale, Aintree, Brighton –le-Sands (formerly Blundell Sands), Bootle, Crosby, Crossens, Formby, Lunt, Lydiate, Maghull, Melling, Netherton, Southport and Thornton. Impacts in Formby, Maghull and Southport were locally significant in isolation.	SMBC	Yes (Local)
20/07/2007 to 22/07/2007	Surface water	Flooding incidents reported across Sefton (75 in total). Some internal flooding of properties. Incidents	SMBC	Yes (local)

Date	Main source of flooding	Description	Data Source	Significant harmful consequences?
		concentrated in Crosby, Sefton & Maghull		
30/11/2004	Surface Water	55 records of flooding in Ainsdale, Aintree, Birkdale, Bootle, Formby, Litherland, Maghull, Melling, Seaforth and Southport. Impacts in Maghull and Southport were locally significant in isolation.	SMBC	Yes (local)
01/08/2004	Surface Water	10 residential properties were recorded having suffered internal and external flooding in Southport.	SMBC	Yes (Local)
30/04/2001	Surface water / ordinary watercourse	Records of 5 properties flooding are held by Sefton MBC, though it is understood that nearer 25 properties were impacted.	SMBC	Yes (Local)
12/04/2001	Surface Water	59 residential properties were recorded having suffered internal and external flooding at Claremont Avenue area in Maghull and 10 residential properties were recorded having suffered internal and external flooding at Hawksworth Drive area in Formby.	SMBC	Yes (Local)
24/11/1996 to 25/11/1996	Surface Water	11 records of flooding in Litherland, Maghull and Southport	UU (SIRS)	Yes (local)
01/10/1994	Canal	The Maghull Brook culvert collapsed where the culvert passes beneath the Leeds to Liverpool canal. Inundation of the canal water into the culvert led to the progressive failure of the culvert and resulted in the canal bursting its bank. Over 200 properties are understood to have flooded	SMBC	Yes (local)
31/07/1994 to 03/08/1994	Surface Water	8 records of flooding in Southport and Waterloo	UU (SIRS)	Yes (local)
24/01/1994 to 27/01/1994	Surface Water	9 records of flooding in Bootle, Crosby, Formby, Litherland and Waterloo	UU (SIRS)	Yes (local)
13/12/1993 to 15/12/1993	Surface Water	8 records of flooding in Aintree, Formby, Lydiate, Maghull and Southport	UU (SIRS)	Yes (local)

4.2 Interactions with Other Flooding Sources

4.2.1 Flooding is often the result of water combining from more than one source. Flooding in a watercourse can be influenced and affected by flooding in a downstream watercourse or high water levels in the sea that prevents it from discharging. Water can also build up in a drainage system, resulting in flooding, because it is prevented from discharging normally by high levels at the point of discharge.

4.2.2 Past flooding can often be from an unknown source, because records are insufficient to identify where the water came from, or it can be a result of interactions between different sources some of which may not have been identified.

4.2.3 From the records available to Sefton MBC there is no direct evidence that past floods in Sefton have been a result of interactions between local flooding sources and flooding from the sea, though it should be acknowledged that because significant areas of Sefton are pumped it is highly likely that levels in main rivers have been affected by the sea level at the time, which may have consequently impacted local sources of flooding.

4.2.4 There is some evidence that past floods, particularly in Formby, have been related to high water levels within Main Rivers, particularly the River Alt and its tributaries, and there is some evidence that past floods have related to ordinary watercourses, for example Dobb's Gutter in Formby.

4.2.5 There is also no direct evidence that any of the local flooding sources are related to groundwater, though this may again be due to a lack of information rather than a lack of connection between the two, as groundwater is known to influence baseflows in the River Alt.

4.2.6 A breach of the Leeds and Liverpool Canal in October 1994 resulted in significant inundation of properties in Maghull. The canal breach resulted in the progressive collapse of the culvert through which the Maghull Brook passed, however, it is not clear whether the brook then contributed to this flooding or whether the inundation was due entirely to the water within the canal.

4.2.7 Table A-1 in Appendix A presents the full list of notable recorded flood events that have impacted more than one property or area coincidentally within Sefton between September 1992 and July 2010. Figures A-1 and A-2 present maps of the records available from Sefton MBC and United Utilities and Figure A-3 presents the Environment Agency's Historical Flood Map.

5 Future Flood Risk

5.1 Introduction

5.1.1 The Environment Agency has several national datasets showing risk of flooding from surface water, groundwater and main rivers and ordinary watercourses that are available to LLFAs:

- Areas Susceptible to Surface Water Flooding (AStSWF);
- EA Flood Map for Surface Water (FMfSW);
- Areas Susceptible to Groundwater Flooding (AStGWF); and
- EA Flood Zone Map

5.2 Locally Agreed Surface Water Information

5.2.1 The national Areas Susceptible to Surface Water Flooding dataset has been used for the PFRA to define future flood risk. In accordance with the PFRA guidance (2010), this dataset, combined with known historic flooding records, represents the locally agreed surface water information for Sefton.

5.2.2 Figures B-1, included in Appendix B, shows the Areas Susceptible to Surface Water Flooding Less Risk, Intermediate Risk and More Risk classifications.

5.2.3 In addition to these national datasets more locally specific surface water information is available for the study area as part of a SWMP. As part of this study, direct rainfall modelling has been undertaken to simulate surface water flooding in parts of the study area.

5.3 Summary of Future Flood Risk

5.3.1 Table 5-1 shows a summary of potential future floods from all local sources and an indication of whether they could result in significant consequences. More detailed information is provided in the spreadsheet included as Annex 2.

Table 5-1: Summary of Potential Future Floods and Consequences

Main source of flooding	Probability	Description	Data Source	Significant consequences?
Surface Water / Ordinary watercourses	Less (0.1 to 0.3m deep)	Environment Agency's Areas Susceptible to Surface Water Flooding maps. A national map identifying areas more susceptible to surface water flooding based primarily on topography and depth. The study used a 1 in 200 probability rainfall depth for a 6.5 hour duration storm applied to a composite 5m DTM. There was no allowance made for drainage.	Environment Agency Areas Susceptible to Surface Water Flooding	Yes
	Intermediate (0.3 to 1.0m deep)			Yes
	More (>1.0m deep)			No

Main source of flooding	Probability	Description	Data Source	Significant consequences?
	Unknown	Historical records of surface water flooding	Sefton MBC	Locally significant only
			United Utilities	Locally significant only
			Environment Agency Historical Flood Map	No
Groundwater	Unknown	Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid. Flood plains are not explicitly identified; the mapping identifies where groundwater is likely to emerge, and not where the water is subsequently likely to flow or pond.	Environment Agency Areas susceptible to groundwater flooding	No

Ongoing Studies

5.3.2 A Surface Water Management Plan is currently under development for the whole of the Sefton Metropolitan Borough Council area. Results from this study will be used to inform the second cycle of the PFRA process and the production of flood hazard and flood risk maps for this area.

Locally Agreed Surface Water Information

5.3.3 A significant area amounting to over 21% of the Sefton borough is classified as being Less Susceptible to surface water flooding. This is a reflection of the generally flat topography with minor features that are shown to either form flow paths or shallow areas of ponding.

5.3.4 The areas classified as having an Intermediate Susceptibility to surface water flooding typically correlate to those areas where ponding could collect to deeper depths, for example in Southport, but also correlates well to the location of ordinary watercourses or watercourses that have now been subsumed into the surface water drainage system, for example Maghull Brook and Rimrose Brook.

5.3.5 The areas that are classified as being More Susceptible to surface water flooding are again associated with main rivers, such as the River Alt, some ordinary watercourses, such as Rimrose Brook, and areas of deeper ponding. Many of these are shown to lie in the dune areas to the west of Formby and Southport.

5.3.6 Using the AStSWF dataset, the number of buildings at risk of surface water flooding within Sefton has been estimated by analysing the underlying Ordnance Survey Mastermap data. The results indicate that 99,600 buildings lie in the areas classified as Less Susceptible, 29,400 buildings lie in areas classified as having an Intermediate Susceptibility and 2,400 buildings lie in areas classified as More Susceptible.

5.3.7 To put these values into context, there are approximately 173,000 buildings within the borough and approximately 70% of these are residential dwellings. This suggests that there are in the region of 163,100 people at risk in the Less Susceptible areas, 48,200 people at risk in areas of Intermediate Susceptibility and 3,900 people at risk in More Susceptible areas.

5.3.8 Further details on the potential harmful consequences of future flooding are included in Annex 2 of the Preliminary Assessment Spreadsheet.

Flooding from ordinary watercourses

5.3.9 The Environment Agency Flood Map was reviewed to assess whether it provided useful information on flooding from ordinary watercourses. In Sefton, the EA's Flood Map is generally restricted to areas on the Main River network which is the responsibility of the Environment Agency and therefore they were not considered to provide information on flooding from ordinary watercourses. Instead the assessment of flooding from ordinary watercourses has primarily been based on the national surface water flooding datasets.

5.3.10 As the extent of flooding is often topographically defined flooding from surface runoff and small ordinary watercourses is likely to be similar in many cases. This is the case in Sefton, where flooding is shown along the path of existing ordinary watercourses, and perhaps more noticeably along the path of historical watercourses that are now largely incorporated into the drainage system and built over. This relationship is particularly clear in mapping of those areas with an Intermediate Susceptibility to surface water flooding.

Groundwater

5.3.11 There is no local information available which provides evidence on future groundwater flood risk across Sefton. The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding, has been used to form the basis of the assessment of future flood risk from groundwater. This dataset is illustrated in Figure B-2 (Appendix B) and areas at high risk from groundwater flooding are identified.

5.3.12 The data shows that groundwater flood risk across Sefton mainly arises from the permeable superficial deposits along the coast (Formby, Ainsdale and Southport), where large areas of the Borough (>75%) are potentially susceptible to groundwater flooding.

5.3.13 Local groundwater monitoring data does exist in 19 locations within the borough however the information held has not been reviewed to assess whether it can provide an indication of whether groundwater has contributed to historical surface water flooding. It is recommended that this be undertaken to inform future flood risk management.

5.3.14 The Alt Crossens CFMP indicates that there are parts of the borough in which groundwater emergence may have been influenced by the cessation of pumping from former mines. The lower Alt catchment is identified as one of the areas at risk. This conclusion is supported by the Lower Mersey and North Merseyside Groundwater Resources study, which indicates that there was a significant proportion of baseflow in the River Alt that came from the Permo-Triassic Sandstone.

5.3.15 The consequences of rising groundwater may not necessarily impact the location at which it emerges but are likely to be an increased probability and duration of flooding in those areas affected by flowing and ponding water in general, as identified in the AStSWF maps.

Canals

5.3.16 British Waterways has not been contacted for information on future flood risk for this study. British Waterways is currently working on a study to better understand the future flood risk from canals, which will be available to inform the second cycle of the PFRA process.

Sewers

5.3.17 Detailed information on the probability and consequences of future sewer flooding, based on detailed modelling of the sewer network, is not available for this PFRA. United Utilities has

provided some information from their sewer network models which indicates that the capacity of the network varies greatly across the borough and in places is as low as capacity for a 1 in 1 year storm event. There are sections of the network in all parts of Sefton that have an existing capacity of less than 1 in 5.

5.3.18 Analysis indicates that most, but not all, historical records of surface water flooding from UU and Sefton MBC's databases coincide with these sections of low capacity network. Similarly, most, but not all, DG5 records also coincide with these areas of low capacity. The consequences of climate change are discussed below, however, it is likely that future flooding will increase the probability of flooding as a result of larger areas of the network reaching capacity.

5.4 Impact of Climate Change

The Evidence

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

5.4.2 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. Locally, sea levels have risen at a rate of 2mm/yr throughout the 20th Century, though this is understood to be a combination of both sea level rise and land subsidence.

5.4.3 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.

5.4.4 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%.

Key Projections for North West River Basin District

5.4.5 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 very likely to be up between 38 and 45cm 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.

5.4.6 The North West River Basin District is presented in 5-1.

5.4.7 A study into the UKCP09 Predictions for the Formby-Southport Area[3] indicate similar patterns, with:

- Winter precipitation increases of around 20% (may be between 8 and 60%)
- Precipitation on the wettest day in winter up by around 15 to 20% for short (6-hour) storm events and unlikely to be more than 30%
- Relative sea level very likely to be up between 38 and 45cm from 1990 levels (not including extra potential rises from polar ice sheet loss)

Implications for Flood Risk

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

5.4.9 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.

5.4.10 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. As indicated in Section 5.3.15, there are sections of the sewer network in which the hydraulic capacity is frequently exceeded and this will only be exacerbated by more intense rainfall as a result of climate change.

5.4.11 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.

Adapting to Change

5.4.12 Past emission 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.

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

5.4.14 A draft Climate Change Adaptation Plan[4] is available for Sefton Metropolitan Borough Council, which identifies flooding as one of the key risks associated with climate change. Risks were identified to assets (buildings and infrastructure), to the environment, to the councils ability to deliver services and of additional demand for resources and services. Opportunities were identified for reducing flood risk by increasing green infrastructure.

[3] Clarke, Dr. D (2009) UKCP09 Predictions for the Formby-Southport Area: Draft Report for IMCORE Project
[4] Quantum (2011) Adapting to Climate Change: Assessment of Risks for Sefton MBC (Draft)

5.4.15 Adaptation actions were identified across all services of the council. These actions included the ongoing preparation of the Surface Water Management Plan and future development of a Flood Risk Management Plan under the Flood Risk Regulations. In addition to this, adaptation actions also included:

- Assessing flood risk to properties and assets
- Identifying and incorporating flood resilience/resistance measures into assets
- Green Infrastructure Policy
- LDF policies on development in flood risk areas
- LDF policies on flood resilience/resistance measures
- Maintain exist flood management mechanisms
- Assess flood risk to key transport routes
- Communicate the need for work on flood risk reduction
- Communicate with residents and business and assist those at most risk to take steps to minimise the risk
- Assess response to large scale or repeated flooding affecting vulnerable groups
- Develop a plan involving external service providers to manage the post-flood recovery phase

5.5 Long Term Developments

5.5.1 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.

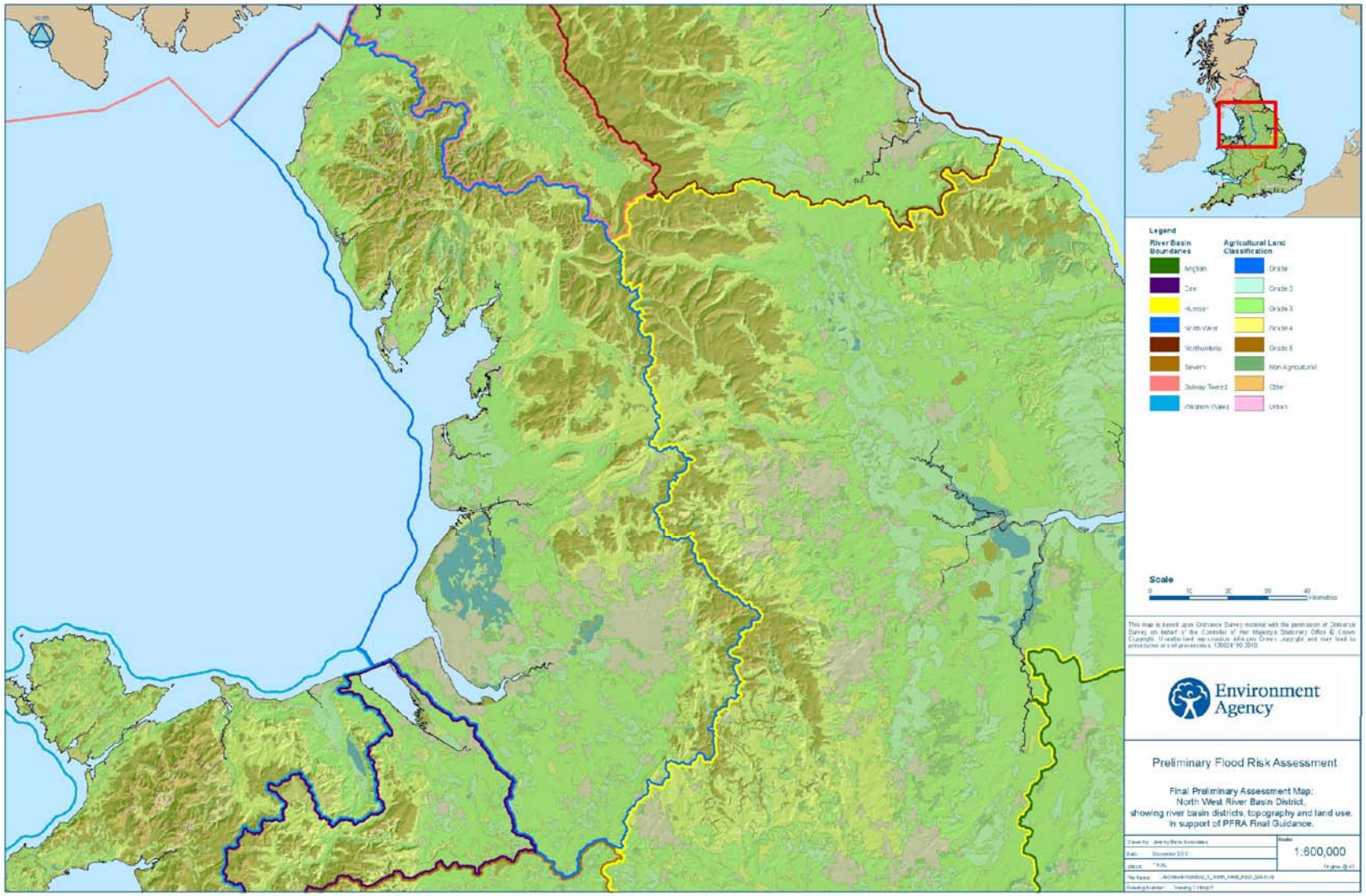
5.5.2 In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. 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."

5.5.3 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).

5.5.4 A review of proposed development locations identified in the SFRA indicates that some industrial and transport related development is planned in Southport and Formby and that these typically contain some areas at a Low or Intermediate Susceptibility to surface water flooding. There is generally part of the network in or nearby the areas that has low capacity (<5yrs) and some sites lie near DG5 locations. Development may therefore have the potential to increase the pressure on the local drainage systems.

5.5.5 There are also some developments proposed in the Maghull area that typically contain some areas at a Low or Intermediate Susceptibility to surface water flooding. A development near Dovers Brook in particular lies at the downstream side of an area with significant historical records of surface water flooding and with a number of DG5 properties. This development could contribute to an increased pressure on the local drainage systems.

5.5.6 The majority of new development, however, is proposed in Bootle, Litherland and around Aintree. Most locations contain some areas at a Low or Intermediate Susceptibility to surface water flooding and some lie in areas with low capacity in the surface water sewer system (<5yrs). However, a few stand out as also lying in areas with historical flooding issues and DG5 properties. These are located to the west of Dunnings Bridge Road and Heysham Road, the areas north and south of Princess Way and Croxteth Avenue in Seaforth and areas to the east of the Leeds and Liverpool Canal along Hawthorne Road and areas by Wadham Road. Development in these areas may therefore have the potential to increase the pressure on the local drainage systems.



5-1: North West River Basin District

6 Review of Indicative Flood Risk Areas

6.1 Extent of Flood Risk Areas

6.1.1 In order to ensure a consistent national approach, Defra has identified significance criteria and thresholds to be used for defining flood risk areas. Guidance on applying these thresholds has been released in Defra's document "Selecting and reviewing Flood Risk Areas for local sources of flooding". In this guidance document, Defra has set out agreed key risk indicators and threshold values which must be used to determine Flood Risk Areas.

6.1.2 The methodology is based on using national flood risk information to identify 1km squares where local flood risk exceeds a defined threshold; these areas within Sefton are illustrated in Figure 6-1. Where a cluster of these grid squares leads to an area where flood risk is concentrated and over 30,000 people are predicted to be at risk of flooding, this area has been identified as an Indicative Flood Risk Area.

6.1.3 Of the ten national Indicative Flood Risk Areas, two fall in the North West and one of them is the Liverpool Indicative Flood Risk Area, shown in Figure 6-2.

6.2 Review Comments

6.2.1 Figure 6-2 shows the geographical extent of the indicative Flood Risk Area for Liverpool. As discussed in the previous section, the proposed Flood Risk Area includes southern areas of Sefton and also covers most of Liverpool District.

6.2.2 The Indicative Flood Risk Areas have been reviewed in the context of the locally agreed surface water information, including historical records of flooding within the borough, which generally supports the current extent of the Indicative Flood Risk Area.

6.2.3 Recognising that some communities have experienced past flooding that is considered to be locally significant but which are not adequately identified within the AStSWF Map, and following discussions with the Environment Agency and United Utilities, the decision has been taken to include these additional communities in order to more accurately reflect local conditions. Sefton MBC's proposed Flood Risk Areas are presented in Figure C-1 in Appendix C, though this does not affect the Indicative Flood Risk Area.

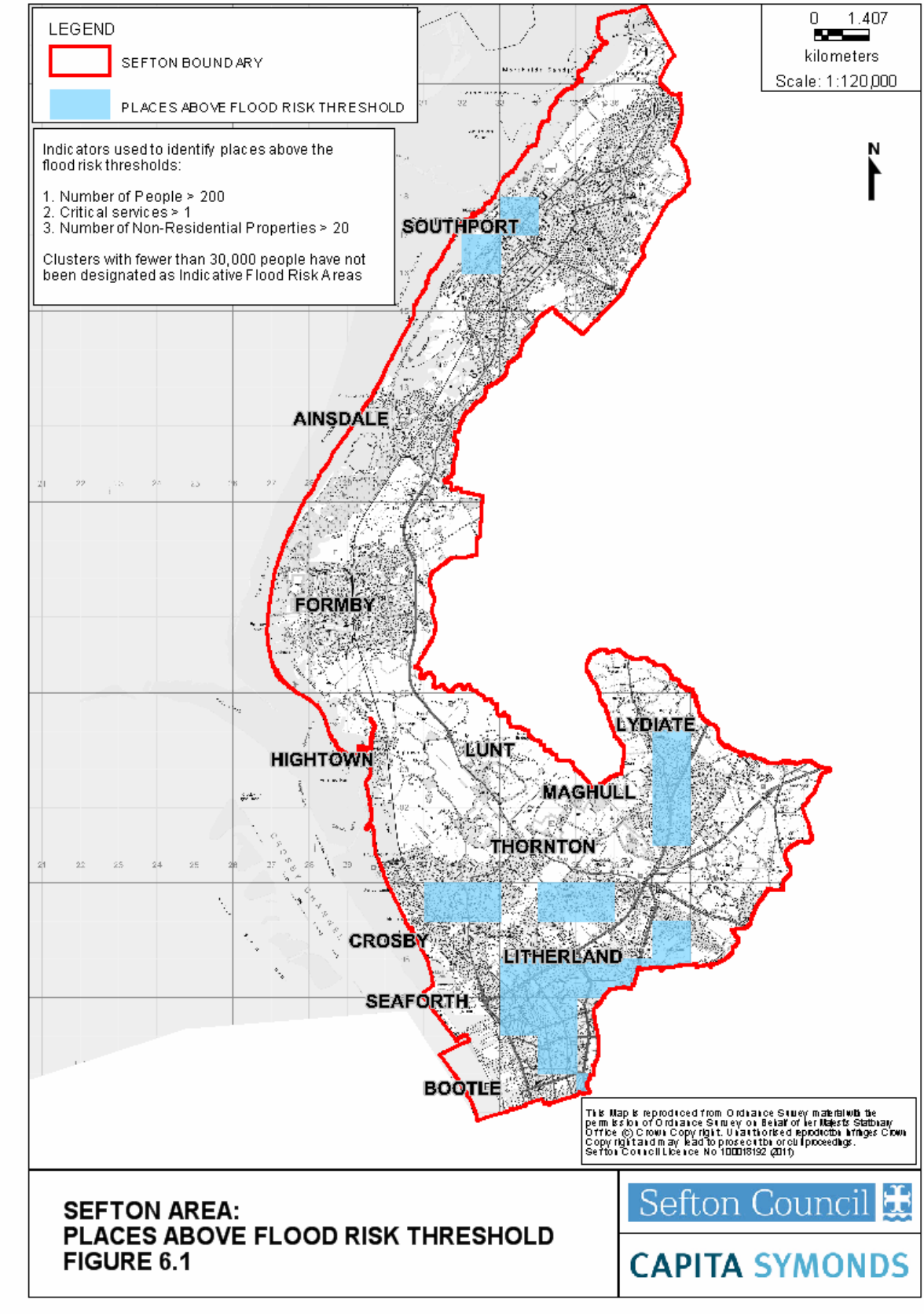


Figure 6-1: Sefton Areas Above Flood Risk Threshold

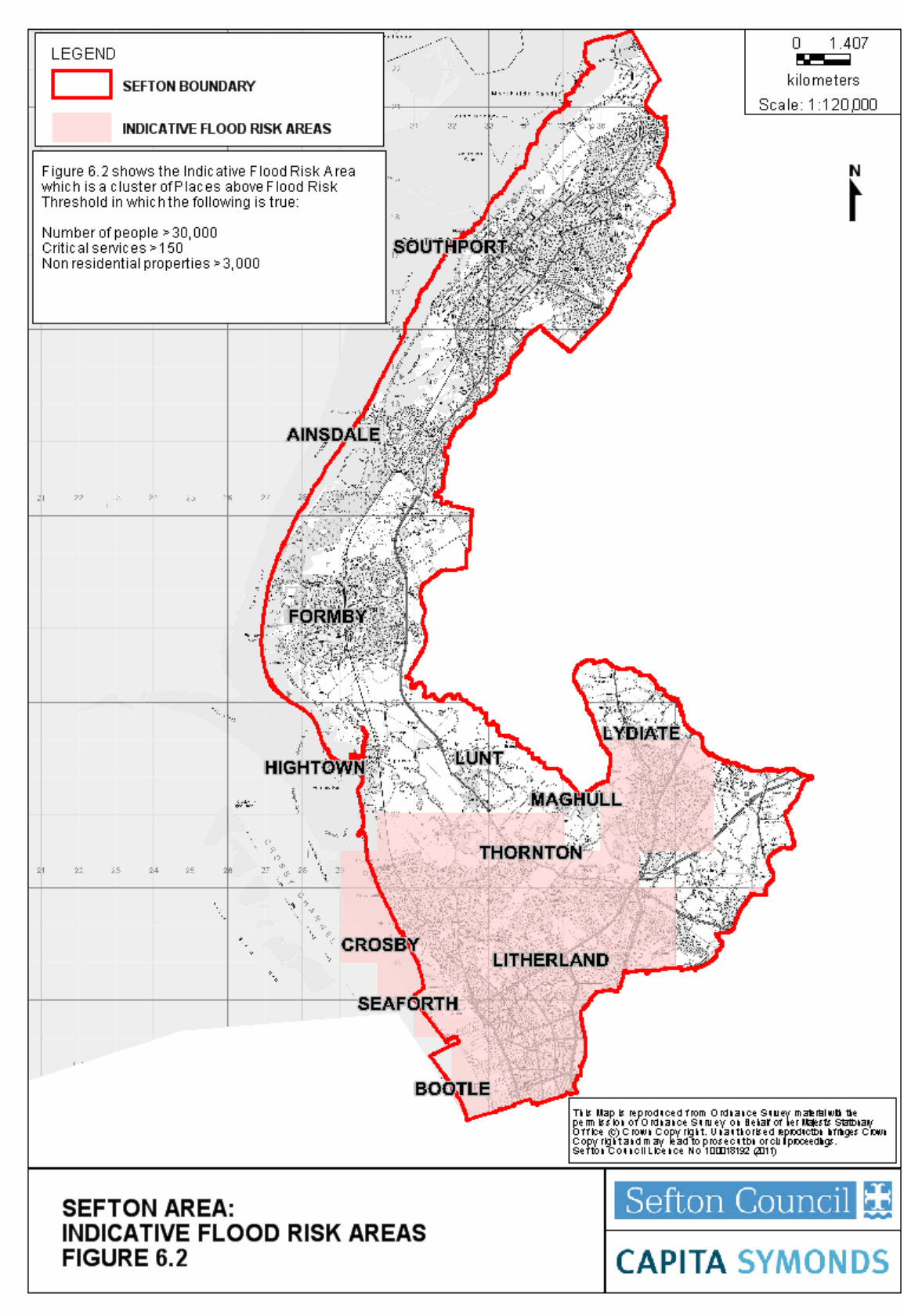


Figure 6-2: Liverpool Indicative Flood Risk Area with New Flood Risk Areas identified by Sefton MBC.

7 Identification of Flood Risk Areas

7.1 Amendments to Flood Risk Areas

7.1.1 Five minor changes to the boundary of the Indicative Flood Risk Area have been made to avoid partial exclusion of a number of communities in which locally agreed significance criteria have been exceeded and which aren't identified in the AStSWF map.

7.1.2 These five changes are based on historical flood events in which more than 8 properties were flooded in conjunction with a predicted risk of future flooding, as shown by the locally agreed surface water

7.1.3 Future cycles of the PFRA process will use the outputs from the Sefton SWMP to define areas at significant risk from future flooding and for the production of flood hazard and flood risk maps for this area.

Area 1: Beresford Drive

7.1.4 Flooding in Beresford Drive was known to have affected more than 8 properties and the area is currently shown in both the FMfSW and the AStSWF datasets to be impacted by flooding. There are local records of flooding from both Sefton MBC and UU records.

7.1.5 Future flooding in isolation is likely to result in "locally harmful consequences".

Area 2: Hawksworth Drive

7.1.6 Flooding in Hawksworth Drive in January 2008 was known to have affected more then 8 properties, however, the area is not currently shown in the AStSWF dataset to be impacted by flooding. There are local records of flooding from both Sefton MBC and UU records dating back to the early 1990s.

7.1.7 Future flooding in isolation is likely to result in "locally harmful consequences".

Area 3: Hoggs Hill Lane

7.1.8 Flooding records from Sefton MBC and UU indicate locally significant flooding in January 2008 as well as numerous times dating back to the early 1990s. The area is currently shown in the AStSWF dataset to be impacted by flooding.

7.1.9 Future flooding in isolation is likely to result in "locally harmful consequences".

Area 4: Willow Hey

7.1.10 Flooding records from Sefton MBC and UU indicate locally significant flooding at numerous times dating back to the early 1990s, particularly focussed in 32 to 34 Willow Hey. The area is currently shown in the FMfSW dataset to be impacted by flooding, as well as the AStSWF dataset.

7.1.11 Future flooding in isolation is likely to result in "locally harmful consequences".

Area 5: Claremont Avenue

7.1.12 Flooding records from Sefton MBC and UU indicate locally significant flooding at numerous times dating back to the early 1990s, some of which is associated with historical drains that run at the back of gardens. The area is currently shown in the FMfSW dataset to be impacted by flooding, as well as the AStSWF dataset.

7.1.13 Future flooding in isolation is likely to result in “locally harmful consequences”.

7.2 Amended Flood Risk Area

7.2.1 Figure C-1 in Appendix C illustrates the Local Flood Risk Areas proposed. The amendments are also presented in Annex 3, which outlines the consequences of flooding within the Flood Risk Area and the rational for inclusion.

8 Next Steps

8.1 Scrutiny & Review

8.1.1 The scrutiny and review procedures that must be adopted when producing a PFRA are set out in the Flood Risk Regulations. Meeting quality standards is important in order to ensure that the appropriate sources of information have been used to understand flood risk and the most significant flood risk areas are identified for future assessment. Scrutiny and review also ensures that the standards of the EU Floods Directive are met.

8.1.2 The Regulations specify that the Environment Agency and the Lead Local Flood Authority must review the PFRA and associated Flood Risk Areas and that subsequent to this review, either partner may prepare a revised PFRA. The first review cycle of the PFRA will be led by Sefton Metropolitan Borough Council and must be submitted to the Environment Agency by the 22nd of June 2017. The Environment Agency will then submit it to the European Commission by the 22nd of December 2017. Subsequent reviews must be undertaken at intervals of no more than 6 years.

8.2 Data Collection & Management

8.2.1 As identified in Section 3.2, there are a number of data gaps that limit the capacity to accurately summarise the risk of flooding in Sefton from 'local' sources.

8.2.2 Key activities that will assist with addressing these gaps prior to the next round of PFRAs (expected in 2016) include:

- Investigation and recording of significant past flooding incidents (as discussed below);
- Refining of the Sefton SWMP modelling in critical drainage areas to improve the understanding of flood mechanisms and flood hazard, and therefore whether the consequences of future flooding in these areas should be classified as significant;
- Work in partnership with flood risk management organisations (e.g. United Utilities, the Environment Agency and British Waterways) to refine and share information on groundwater flooding, sewer flooding and canal flooding.

8.2.3 In order to fulfil their role as Local Lead Flood Authority, Sefton Metropolitan Borough Council is required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information. They must also create a register of structures or features that are considered to have an effect on flood risk.

8.2.4 At present reports of flooding incidents received by any Sefton MBC department are collated in the 'Mayrise' recording system. It is recommended that a proforma for recording incidents be developed and provided to the council departments and partner organisations to ensure consistency in the format and detail of information collated. Sefton MBC would be responsible for collating the data into a single database at regular intervals.

8.2.5 It is anticipated that there will be areas identified through the SWMP process in which incorporation of the sewer network into the existing models will benefit the understanding of flood risk mechanisms and hazards. The SWMP process will identify these areas and recommend options to improve the understanding of flood risk such that future significant flood risks can be identified where necessary.

8.3 Other FRR Requirements

8.3.1 In accordance with the Flood Risk Regulations, Sefton MBC will prepare Flood Hazard and Flood Risk Maps for Flood Risk Areas, followed by a Flood Management Plan.

8.3.2 The Surface Water Management Plan currently being prepared for Sefton is expected to deliver many of the requirements in the first cycle of the Flood Risk Regulations. Once guidance on Flood Hazard Mapping and Flood Risk Management Plans is issued, Sefton MBC will review its Surface Water Management Plan to determine compliance and any further work required.

8.3.3 As a minimum the Flood Hazard Maps must show the information below and must relate to High, Medium and Low probabilities of flooding for sources other than those for which the Environment Agency has responsibility:

- Flood extent (including level and depth); and
- Direction and velocity;

8.3.4 High probability is classed as defined as an annual probability of more than 1%, medium probability is defined as an annual probability between 1% and 0.1% and low probability is defined as an annual probability of less than 0.1%.

8.3.5 The Flood Risk Maps must show the information below and must also relate to High, Medium and Low probabilities of flooding for sources other than those for which the Environment Agency has responsibility:

- The number of people living in the area 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 likely to be affected in the event of flooding;
- Any relevant protected areas likely to be affected in the event of flooding;
- Any areas of water subject to specified measures or protection of water quality likely to be affected in the event of flooding; and
- Any other effect on human health, economic activity and the environment

8.3.6 Flood Hazard Maps and Flood Risk Maps must be published by December 22nd 2013 and the first review must take place by the Environment Agency and the LLFA by the 22nd December 2019. Subsequent reviews must be undertaken at intervals of no more than 6 years.

8.3.7 A Flood Risk Management Plan (FRMP) must also be prepared by the LLFA for review by the Environment Agency and publication by 22nd December 2015.

8.3.8 The FRMP must include:

- Details of objectives to be met by the LLFA;
- The proposed measures for achieving those objectives;
- a map showing the boundaries of the flood risk area;
- a summary of the conclusions of the Flood Hazard and Flood Risk Maps; and
- A description of the timing and manner of implementation of the measures and on the way in which implementation will be monitored;

8.3.9 The objectives should reduce the likelihood of flooding and the adverse consequences of flooding on human health, economic activity and the environment. The proposed measures should include options to prevent flooding and to protect individuals, communities and the environment against flooding. Measures should also include mechanisms for flood forecasting and warning.

9 References

Environment Agency, December 2010, Preliminary Flood Risk Assessment (PFRA) Final Guidance, Report GEHO1210BTGH-E-E

Environment Agency, December 2010, Preliminary Flood Risk Assessment (PFRA) Annexes to the Final Guidance, Report GEHO1210BTHF-E-E

Capita Symonds Ltd, 2011, Surface Water Management Plan (Draft) for Sefton Metropolitan Borough Council

Atkins, June 2009, Knowsley Council and Sefton Council Strategic Flood Risk Assessment

Environment Agency, 2008, Alt Crossens Catchment Flood Management Plan – Final Plan

Clarke, Dr. D, 2009, UKCP09 Predictions for the Formby-Southport Area: Draft Report for IMCORE Project

Quantum, 2011, Adapting to Climate Change: Assessment of Risks for Sefton MBC (Draft)

ESI, 2009, Lower Mersey and North Merseyside Groundwater Resources Study: Final Report

Annexes

Annex 1: Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)

Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report. Please note that two flood events have been considered to have 'locally significant harmful consequences'.

Annex 2: Records of future floods and their significant consequences (Preliminary Assessment Spreadsheet)

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 Sefton, including details of the potential consequences of flooding to key risk receptors within the borough.

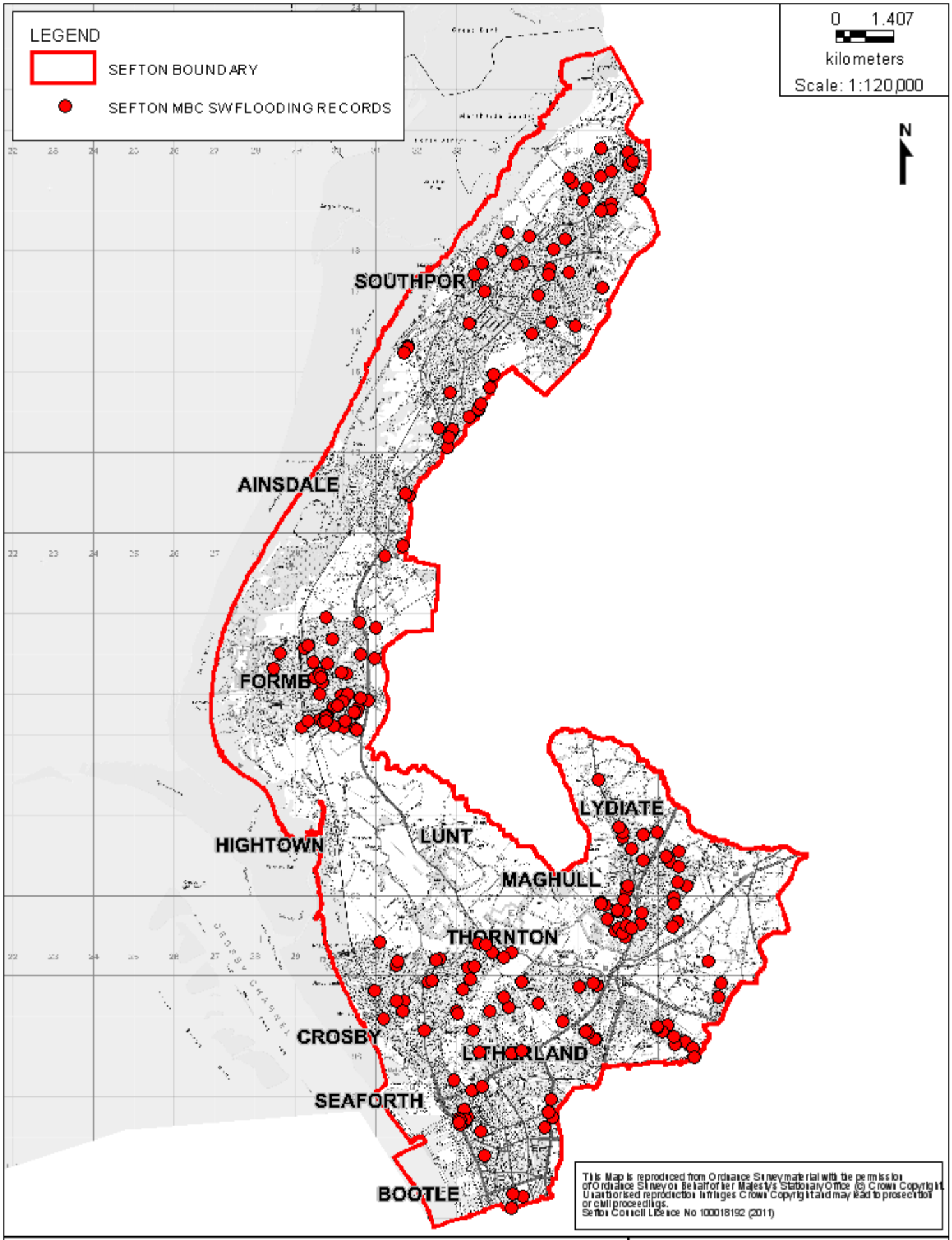
Annex 3: Records of Flood Risk Areas and its rationale (Preliminary Assessment Spreadsheet)

Please refer to Annex 3 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes information and details about the identified Flood Risk Area within Sefton.

Annex 4: Review Checklist

Please refer to Annex 4, 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.

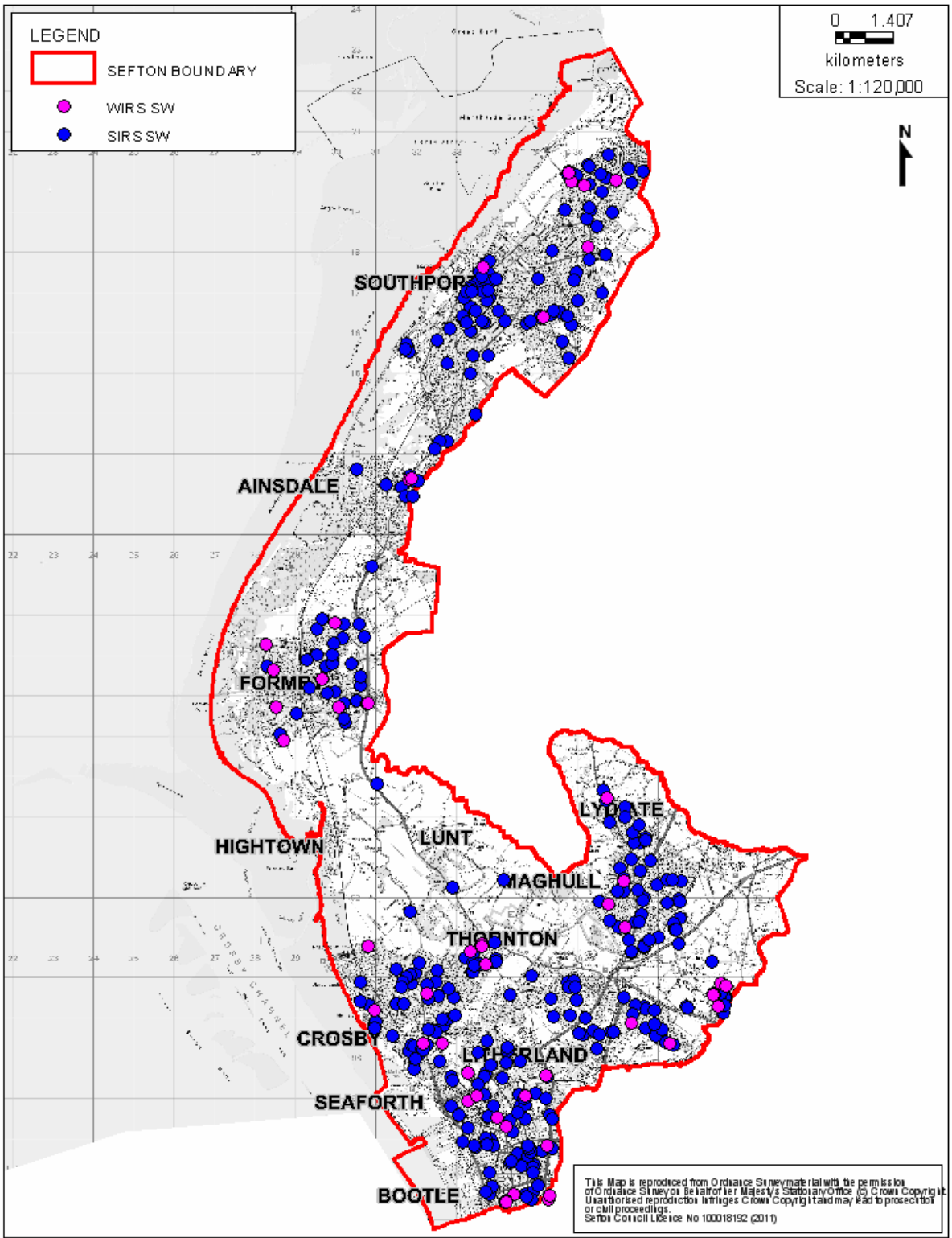
Appendix A Past Floods



SEFTON AREA:
SEFTON MBC SURFACE WATER FLOOD RECORDS
FIGURE A-1

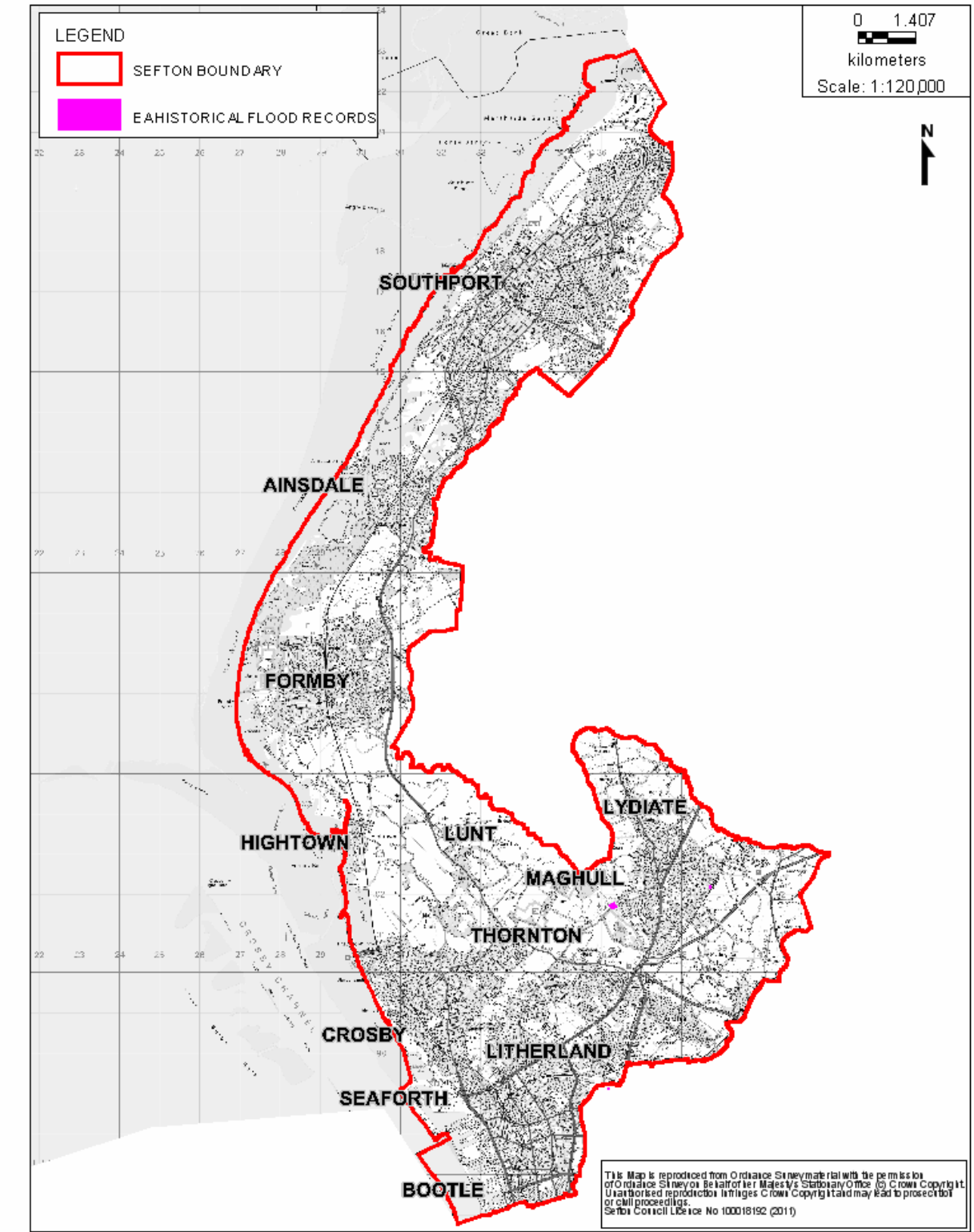
Sefton Council

CAPITA SYMONDS



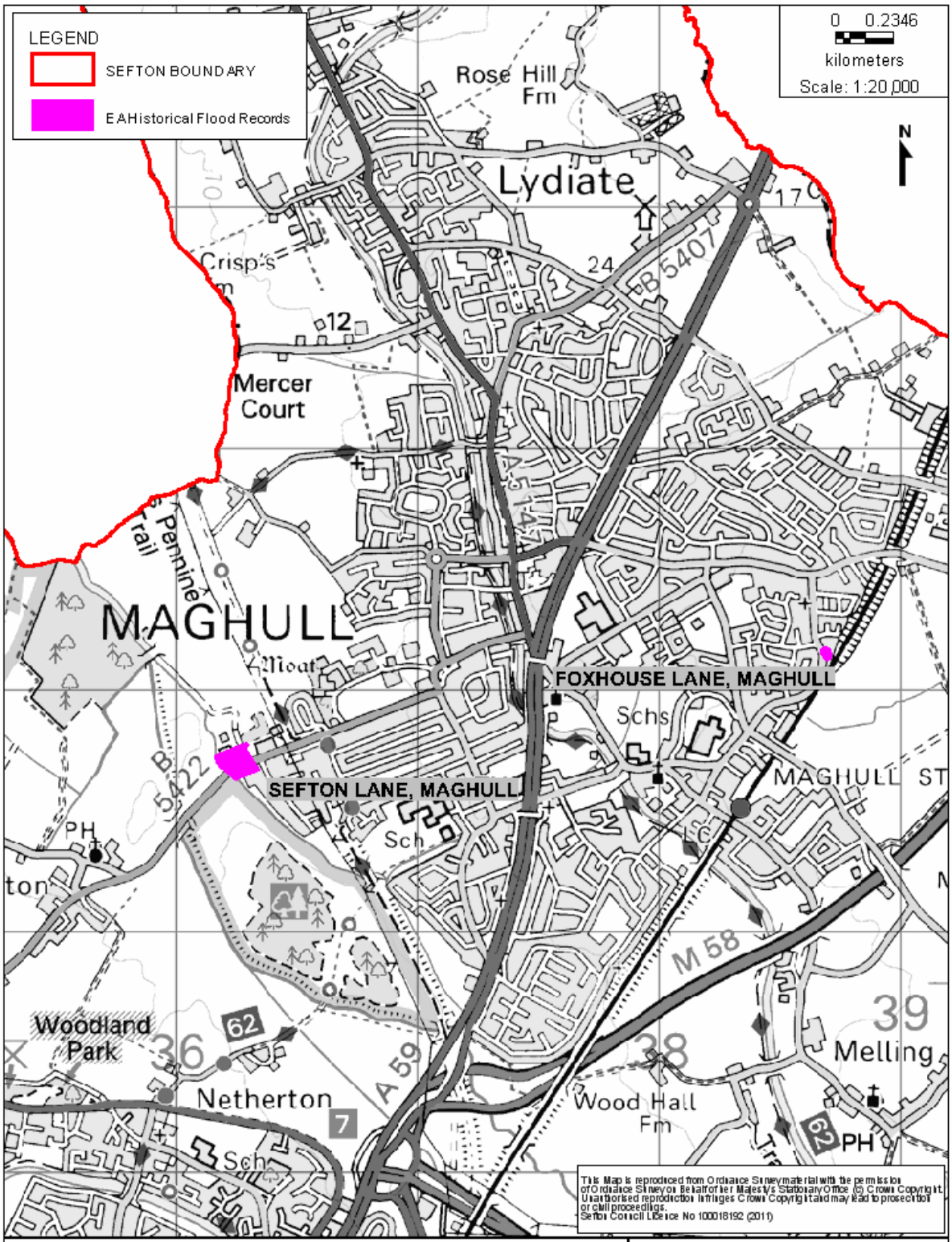
SEFTON AREA:
SEFTON MBC SEWER FLOODING RECORDS
1992 - 2010
FIGURE A-2

Sefton Council
CAPITA SYMONDS



SEFTON AREA:
ENVIRONMENT AGENCY
HISTORICAL FLOOD RECORDS
FIGURE A-3

Sefton Council
CAPITA SYMONDS



SEFTON AREA:
ENVIRONMENT AGENCY
HISTORICAL FLOOD RECORDS
FIGURE A-3.1

Sefton Council

CAPITA SYMONDS

Preliminary assessment report spreadsheet: instructions

Introduction:

This spreadsheet contains 3 sheets, for reporting details of a preliminary assessment report.
The sheets are labelled Annex 1, 2 and 3 and should remain so.
This Environment Agency's PFRA Guidance should be referred to when completing the Annexes.
Reporting information on past floods (Annex 1) is described in section 3.4 of the PFRA Guidance.
Reporting information on future floods (Annex 2) is described in section 3.5 of the PFRA Guidance.
Note that information might not be available for many of the optional fields in Annexes 1 and 2.
Reporting information on Flood Risk Areas (Annex 3) is described in section 4.4 of the PFRA Guidance.
If a PFRA does not identify a Flood Risk Area, Annex 3 does not have to completed.

Please select a Lead Local Flood Authority from the following list:

Note that only one LLFA name can be selected. Where several LLFAs are working together, select one of the LLFAs, and then list the others below. If a particular LLFA is leading the exercise then it should be identified in the box in row 15. If there is no particular lead then it does not matter which one is selected; for example you might enter the LLFA that comes first among the group alphabetically.

Select here:	Liverpool
Working with:	*(only complete this box where several LLFAs are working together to produce a PFRA)*

For Annexes 1, 2 and 3:

Mandatory content to meet European Commission reporting requirements is shown in **red**.
If an optional field is not applicable, record "Not applicable" or "NA".
If an optional field is not known, record "Unknown".

For Annex 1 in particular:

Note that only past floods with significant consequences need to be reported in Annex 1.
Each past flood record must have significant consequences for at least one type of consequence (human health, economic, environment, or cultural).
Some information on past floods is optional, but only for this first PFRA cycle. In future cycles, the European Commission will require more information to be reported for floods that occur after 22 Dec 2011. This is shown by the fields labelled "Optional for first cycle".
LLFAs should record the following information from 22 Dec 2011: Start date, Days duration, Probability, Main source, Main mechanism, Main characteristics, and Significant consequences of flooding.

ANNEX 1: Records of past floods and their significant consequences (preliminary assessment report spreadsheet)

Field:	Flood ID	Summary description	Name of Location	National Grid Reference	Location Description	Start date	Days duration	Probability	Main source of flooding	Additional source(s) of flooding
Mandatory / optional:	**Mandatory**	**Mandatory**	**Mandatory**	**Mandatory**	Optional	Optional for first cycle	Optional for first cycle	Optional for first cycle	Optional for first cycle	Optional
Format:	Unique number between 1-9999	Max 5,000 characters	Max 250 characters	12 characters: 2 letters, 10 numbers	Max 250 characters	'yyyy' or 'yyyy-mm' or 'yyyy-mm-dd'	Number with two decimal places	Max 25 characters	Pick from drop-down	Max 250 characters, same source terms
Notes:	A sequential number starting at 1 and incrementing by 1 for each record.	Description of the flood and its adverse or potentially adverse consequences. Where available, information from other fields (Start date, Days duration, Probability, Main source, Main mechanism, Main characteristics, Significant consequences) should be repeated here.	Name of the locality associated with the flood, using recognised postal address names such as streets, towns, counties. If the flood affected the whole LLFA, then record the name of the LLFA.	National Grid Reference of the centroid (centre point, falls within polygon) of the flood extent, or of the area affected if there is no extent information.	A description of the general location that was flooded.	The date when the flood commenced - when land not normally covered by water became covered by water.	The number of days (duration) of the flood - that land not normally covered by water was covered by water. Values should be within the range 0.01 - 999.99 (permitting records to the nearest quarter of an hour, where appropriate).	The chance of the flood occuring in any given year - record X from "a 1 in X chance of occurring in any given year". Where this is difficult to estimate, a range can be recorded.	Pick the source from which the majority of flooding occurred. Refer to the PFRA guidance for definitions of sources.	If flooding occurred from, or interacted with, any other sources (other than the Main source of flooding), report the source(s) here, using the same source terms.
Example:	1	On the 14 April 1998 an intense storm system produced surface water flooding across Essex, concentrated in the west of the county. The flooding lasted about 6 hours, and 23 residential properties were recorded as suffering internal flooding, in Epping and North Weald. The surface runoff exceeded the drainage capacity in several places, and so probably had a 1 in 30 to 1 in 50 chance of occuring in any given year.	Essex	SX1234512345	Several towns and villages across west Essex	1998-04-15	0.25	20-50	Surface runoff	
Records begin here:	1	In May 2008 a heavy rainfall event resulted in flooding to areas of Liverpool L6,11,12,14,18,25. The worst affected was Churchdown Road, L14, where 25 households were recorded to have suffered internal flooding. These properties are all within the top 20% of Areas of Social Deprivation.	Liverpool (Churchdown Road, L14)	SJ4149291707	Liverpool L14	2008-06-11		Modelling currently taking place as part of SWMP.	Surface runoff	
	2	On the 20th July 2010, heavy rainfall across North West England resulted in severe flooding to large parts of Liverpool. A total of 257 properties were recorded to have suffered internal flooding as a result of this rainfall. Internal flooding reports were grouped into areas at Deysbrook Area L12, East Prescot Road Area L14, Allerton Road Area L18, Wavertree Area L15 and Aigburth Area L17	Liverpool	SJ3930091100	Liverpool	2010-07-20		20-50	Surface runoff	
	3	Properties in Leyfield Road and Leyfield Close have been subject to internal flooding 3 times in 4 years, in July 2007, May 2008 and July 2010. Investigations indicate that flooding is caused by siltation and obstructions to the open section of Thornhead Brook.	Liverpool (Thornhead Lane, Leyfield Road, Leyfield Close L12)	SJ4059492644	Liverpool L12	2007-06		1 to 2	Ordinary watercourses	Obstructed watercourse does not allow surface water to discharge.
	4	Crawford Close is part of the wider Deysbrook Area, which suffers regular flooding incidents. Crawford Close has suffered flooding of varying extents on 9 occurances between 2000 and 2010. In August 2004 8 properties suffered internal flooding, reaching the locally significant criteria. A number of other locations in the Deysbrook area including Manderston Drive suffer flooding, however records do not show that the locally significant criteria of 8 properties has been reached at any date other than July 2010 for the location.	Liverpool (Crawford Close, Deysbrook L12)	SJ4078893347	Liverpool L12	2008-08-11		20-50	Surface runoff	Main river
	5	On the 21 January 2008 an intense storm system produced surface water flooding across Sefton. The flooding lasted about 2 days, and 25 residential properties were recorded having suffered internal and external flooding, at Park Road area in Formby. The surface runoff exceeded the drainage capacity in several places, and so probably had a 1 in 30 to 1 in 75 chance of occuring in any given year.	Sefton (Formby)	SD2935006240	Park Road Area, Formby	21/01/2008 2 days		20 - 75 (similar flooding occurred in 2001/2, 2004/5 and 2007/8)	Ordinary watercourses	Piped ordinary watercourse with insufficient capacity (225mm dia.)
	6	On the 30 April 2001 an intense storm system produced surface water flooding across Sefton. The flooding lasted about 3 days, and 21 residential properties were recorded having suffered internal and external flooding, at Melling Lane and Willow Hey Area in Maghull. The surface runoff exceeded the drainage capacity in several places, and so probably had a 1 in 30 to 1 in 100 chance of occuring in any given year.	Sefton (Maghull)	SD3830001320	Melling Lane & Willow Hey area, Maghull	30/04/2001 3 days		20 -100 (similar flooding occurred in 2002/03 and 2007/08)	Ordinary watercourses	Piped ordinary watercourse with insufficient capacity (225mm dia.)

Confidence in main source of flooding	Main mechanism of flooding	Main characteristic of flooding	**Significant consequences to human health**	Human health consequences - residential properties	Property count method	Other human health consequences	**Significant economic consequences**	Number of non-residential properties flooded	Property count method	Other economic consequences	**Significant consequences to the environment**	Environment consequences	**Significant consequences to cultural heritage**
Optional Pick from drop-down	Optional for first cycle Pick from drop-down	Optional for first cycle Pick from drop-down	**Mandatory** Pick from drop-down	Optional Number between 1-10,000,000	Optional Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Number between 1-10,000,000	Optional Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down
Pick a broad level of confidence in the Main source of flooding from; 'High' (compelling evidence of source - about 80% confident that source is correct), 'Medium' (some evidence of source but not compelling - about 50% confident that source is correct) 'Low' (source assumed - about 20% confident that source is correct) or 'Unknown'.	Pick a mechanism from; 'Natural exceedance' (of capacity), 'Defence exceedance' (floodwater overtopping defences), 'Failure' (of natural or artificial defences or infrastructure, or of pumping), 'Blockage or restriction' (natural or artificial blockage or restriction of a conveyance channel or system), or 'No data'.	Pick a characteristic from; 'Flash flood' (rises and falls quite rapidly with little or no advance warning), 'Natural flood' (due to significant precipitation, at a slower rate than a flash flood), 'Snow melt flood' (due to rapid snow melt), 'Debris flow' (conveying a high degree of debris), or 'No data'. Most UK floods are 'Natural floods'.	Were there any significant consequences to human health when the flood occurred, or would there be if it were to re-occur?	Record the number of residential properties where the building structure was affected either internally or externally by the flood, or that would be so affected if the flood were to re-occur.	Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from; 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.	If there were other Significant consequences to human health, describe them including information such as the number of critical services flooded.	Were there any significant economic consequences when the flood occurred, or would there be if it were to re-occur?	Record the number of non-residential properties where the building structure was affected either internally or externally by the flood, or that would be so affected if the flood were to re-occur.	Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from; 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.	If there were other Significant economic consequences, describe them including information such as the area of agricultural land flooded, length of roads and rail flooded.	Were there any significant consequences to the environment when the flood occurred, or would there be if it were to re-occur?	If there were Significant consequences to the environment, describe them including information such as national and international designated sites flooded, and pollution sources flooded.	Were there any significant consequences to cultural heritage when the flood occurred, or would there be if it were to re-occur?
High	Natural exceedance	Natural flood	Yes	23	Observed number		No				No		No
High	Natural exceedance	Natural flood	Yes	25	Observed number		No	N/A		N/A	No	N/A	No
High	Natural exceedance	Natural flood	Yes	247	Observed number		Yes		10	Observed number	Road closures	No	N/A	Yes
High	Blockage or restriction	Natural flood	Yes	10	Observed number		No	N/A		N/A	No	N/A	No
Medium-Low	Natural exceedance	Natural flood	Yes	8	Observed number		No	N/A			No	N/A	No
High-Medium	Natural exceedance	Natural flood	Yes	25	Observed number		No	N/A		N/A	No	N/A	No
Medium	Natural exceedance	Natural flood	Yes	21	Observed number		No	N/A		N/A	No	N/A	No
			Yes										

Cultural heritage consequences	Comments	Data owner	Area flooded	Flood event outline confidence	Flood event outline source	Survey date	Photo ID	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional Max 250 characters If there were Significant consequences to cultural heritage, describe them including information such as the number and type of heritage assets flooded.	Optional Max 1,000 characters Any additional comments about the past flood record.	Optional Max 250 characters	Optional Number with two decimal places The total area of the land flooded, in km^2	Optional Pick from drop-down Choose from; 'High' (data includes one of: Aerial video, Aerial photos, Professional survey, Flood level information, EA flood data recording staff notes), 'Medium' (data includes one of: EA/LA ground video, EA/LA ground photos, EA/LA flood event outline map, LA/professional partner officer site records, Public ground video), 'Low' (not confident) or 'Unknown'.	Optional Pick from drop-down	Optional 'yyyy' or 'yyyy-mm' or 'yyyy-mm-dd'	Optional Max 50 characters Provide references to relevant specific photographs, or to a set of relevant photographs. It may not be practical to reference all relevant photographs for each flood event.	Optional Max 250 characters Lineage is how and what the data is made from. Has this data been created by using data owned or derived from data owned by 3rd party (external) organisations? If yes please give details.	Optional Pick from drop-down Has the information been classified under the Government's Protective Marking Scheme? Include protective marking time limit where known. Note: If "Approved for Access" then report "Unmarked".	Optional Max 50 characters For use where organisations apply the Government's Protective Marking Scheme.	Auto-populated Max 42 characters This field will autopopulate using the LLFA name provided on the "Instructions" tab, and the Flood ID. It is an EU-wide unique identifier and will be used to report the flood information. Format: UK<ONS Code><P or F><LLFA Flood ID>. "ONS Code" is a unique reference for each LLFA. "P or F" indicates if the event is past or future. "LLFA Flood ID" is a sequential number beginning with 0001.
		Epping Forest District Council		Medium	Site survey	1998-04-20		Ordnance Survey AddressPoint; CEH 1:50k River Centreline; NextMap DTM.	Unmarked	Private	UKE10000012P0001
N/A		Liverpool City Council		High-Medium	Professional staff notes	2008-06			Unmarked	Private	UKE08000012P0001
St Georges Hall, Grade I listed building of national significance was flooded.		Liverpool City Council/ United Utilities		Medium	Professional staff notes		20/07/2010		Unmarked	Private	UKE08000012P0002
N/A		Liverpool City Council		High-Medium	Professional staff notes		20/07/2010		Unmarked	Private	UKE08000012P0003
N/A		Liverpool City Council		Medium-Low	Professional staff notes		11/08/2004		Unmarked	Private	
N/A		Sefton Metropolitan Borough Council (Capita Symonds)		Medium-Low	Professional staff notes		27/01/2008		Unmarked	Private	UKE08000012P0005
N/A		Sefton Metropolitan Borough Council (Capita Symonds)		Medium	Professional staff notes		06/05/2001		Unmarked	Private	

7	On the 1st August 2004 an intense storm system produced surface water flooding across Sefton. The flooding lasted about 2 days, and 10 residential properties were recorded having suffered internal and external flooding, at Beresford Drive in Southport. The surface runoff exceeded the drainage capacity in several places, and so probably had a 1 in 30 to 1 in 75 chance of occuring in any given year.	Sefton (Southport)	SD3560318336	Beresford Drive, Southport	01/08/2004 2 days	20-75	Surface runoff	Under capacity piped drainage system
8	On the 12 April 2001 an intense storm system produced surface water flooding across Sefton. The flooding lasted about 2 days, and 59 residential properties were recorded having suffered internal and external flooding, at Claremont Avenue area in Maghull. The surface runoff exceeded the drainage capacity in several places, and so probably had a 1 in 30 to 1 in 100 chance of occuring in any given year.	Sefton (Maghull)	SD3685801763	Claremonat Avenue area, Maghull	12/04/2001 2 days	20-100	Surface runoff	Piped ordinary watercourse with insufficient capacity (225mm dia.)
9	A total of 77 surface water flooding incidents reported in a number of locations from an intense storm system in July 2010. Over 40 residents from the Seaforth and Litherland area in Sefton had to be temporarily re-housed. This event also led to a breach in an embankment of the River Alt near to Maghull, which caused a number of issues.The surface runoff exceeded the drainage capacity in several places, and so probably a 1 in 30 to 1 in 200 chance of occuring in any given year.	Sefton (Seaforth & Litherland)	SJ3331996424	Seaforth Area	19/07/2010 4 days	20 -200	Surface runoff	Piped combined drainage system with insufficient capacity.
10	On the 12 April 2001 an intense storm system produced surface water flooding across Sefton. The flooding lasted about 2 days, and 10 residential properties were recorded having suffered internal and external flooding, at Hawkswirth Drive area in Formby. The surface runoff exceeded the drainage capacity in several places, and so probably had a 1 in 30 to 1 in 100 chance of occuring in any given year.	Sefton (Formby)	SD3050408822	Hawksworth Drive, Formby	12/04/2001 2 days	20-100	Surface runoff	Piped highway drain and surcharged ordinary watercourse
11	9 records of flooding in Maghull and Southport	Sefton (Maghull & Southport)	SD3440007200	Southport, Formby, Maghull and Crosby	06/10/2009 2 days	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.
12	Flooding incidents reported across Sefton (75 in total). Some internal flooding of properties. Incidents concentrated in Crosby, Sefton & Maghull	Sefton (Crosby, Sefton & Maghull)	SD3440007200	Crosby, Sefton & Maghull	20/07/2007 2 days	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.
13	55 records of flooding in Ainsdale, Aintree, Birkdale, Bootle, Formby, Litherland, Maghull, Melling, Seaforth and Southport. Impacts in Maghull and Southport were locally significant in isolation.	Sefton (Ainsdale, Aintree, Birkdale, Bootle, Formby, Litherland, Maghull, Melling, Seaforth & Southport)	SD3440007200	Ainsdale, Aintree, Birkdale, Bootle, Formby, Litherland, Maghull, Melling, Seaforth & Southport	30/11/2004 1 day	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.
14	11 records of flooding in Litherland, Maghull and Southport	Sefton (Litherland, Maghull & Southport)	SD3440007200	Litherland, Maghull & Southport	24/11/1996 2 days	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.
15	The Leeds and Liverpool Canal broke through into the Maghull Brook culvert at the point at which the culvert passes beneath the canal. Inundation of the canal water into the culvert led to the progressive failure of the culvert and resulted in the canal bursting its bank. Over 200 properties are understood to have flooded	Sefton (Maghull)	SD3727003130	Hickson Avenue	01/10/1994 1 day	20-200	Artificial infrastructure	Piped highway drain and surcharged ordinary watercourse
16	8 records of flooding in Southport and Waterloo	Sefton (Southport & Waterloo)	SD3440007200	Southport, Maghull, Crosby, Waterloo	31/07/1994 4 days	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.
17	9 records of flooding in Bootle, Crosby, Formby, Litherland and Waterloo	Sefton (Bootle, Crosby, Formby, Litherland & Waterloo)	SD3440007200	Bootle, Crosby, Formby, Litherland & Waterloo	24/01/1994 4 days	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.
18	8 records of flooding in Aintree, Formby, Lydiate, Maghull and Southport	Sefton (Aintree, Formby, Lydiate, Maghull & Southport)	SD3440007200	Aintree, Formby, Lydiate, Maghull & Southport	13/12/1993 3 days	20-75	Surface runoff	Piped combined drainage system with insufficient capacity.

Medium	Natural exceedance	Flash flood		10 Observed number	No	N/A	N/A	No	N/A	No
High-Medium	Natural exceedance	Natural flood	Yes	59 Observed number	No	N/A	N/A	No	N/A	No
High-Medium	Natural exceedance	Flash flood	Yes	77 Observed number	No	N/A	N/A	No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	10 Observed number	No	N/A	N/A	No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	9 Observed number	No	N/A		No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	75 Observed number	No	N/A		No	N/A	No
Medium	Natural exceedance	Flash flood	Yes Yes	55 Observed number	No	N/A		No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	11 Observed number	No	N/A		No	N/A	No
High	Failure	Flash flood	Yes	200 Estimate from map	No	N/A		No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	8 Observed number	No	N/A		No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	9 Observed number	No	N/A		No	N/A	No
Medium	Natural exceedance	Flash flood	Yes	8 Observed number	No	N/A		No	N/A	No

N/A	Sefton Metropolitan Borough Council (Capita Symonds)	Medium-Low	Professional staff notes	07/08/2004	Unmarked	Private	UKE08000012P0007
N/A	Sefton Metropolitan Borough Council (Capita Symonds)	Medium	Site survey	17/04/2001	Unmarked	Private	UKE08000012P0008
N/A	Sefton Metropolitan Borough Council (Capita Symonds)	High-Medium	Professional staff notes	25/07/2010	Unmarked	Private	UKE08000012P0009
N/A	Sefton Metropolitan Borough Council (Capita Symonds)	Medium-Low	Professional staff notes	17/04/2001	Unmarked	Private	UKE08000012P0010
N/A	United Utilities	Unknown	Unknown		Confidential	Private	UKE08000012P0011
N/A	Sefton Metropolitan Borough Council (Capita Symonds)	Unknown	Unknown		Confidential	Private	UKE08000012P0012
N/A	Sefton Metropolitan Borough Council (Capita Symonds)	Unknown	Unknown		Confidential	Private	UKE08000012P0013
N/A	United Utilities	Unknown	Unknown		Confidential	Private	UKE08000012P0014
N/A	Sefton Metropolitan Borough Council (Capita Symonds)	Medium	Professional staff notes		Unmarked	Private	UKE08000012P0015
N/A	United Utilities	Unknown	Unknown		Confidential	Private	UKE08000012P0016
N/A	United Utilities	Unknown	Unknown		Confidential	Private	UKE08000012P0017
N/A	United Utilities	Unknown	Unknown		Confidential	Private	UKE08000012P0018

ANNEX 2: Records of future floods and their consequences (preliminary assessment report spreadsheet)

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	**Mandatory**	**Mandatory**	**Mandatory**	**Mandatory**	Optional	Optional	Optional	**Mandatory**	**Mandatory**	Optional	Optional
Format:	Unique number between 1-9999	Max 1,000 characters	Max 250 characters	12 characters: 2 letters, 10 numbers	Max 250 characters	Max 250 characters	Max 250 characters	Max 25 characters	Pick from drop-down	Max 250 characters, same source terms	Pick from drop-down
Notes:	A sequential number starting at 1 and incrementing by 1 for each record.	Description of the future flood information and how it has been produced. Cover Regulation 12(6) requirements of (a) topography, (b) the location of watercourses, (c) the location of flood plains that retain flood water, (d) the characteristics of watercourses, and (e) the effectiveness of any works constructed for the purpose of flood risk management. Information from other relevant fields (Probability, Main source, Name) should be repeated here.	Name of the locality associated with the flood, using recognised postal address names such as streets, towns, counties. If the flood affects the whole LLFA, then record the name of the LLFA.	National Grid Reference of the centroid (centre point, falls within polygon) of the flood extent, or of the area affected if there is no extent information. If the flood affects the whole LLFA, then record the centroid of the LLFA.	A description of the general location that could be flooded.	Name of the model or map product or project which produced the future flood information	Background, or additional information on the probability of the flood modelled - such as whether Probability refers to probability of rainfall or water on the ground.	The chance of the flood occuring in any given year - record X from "a 1 in X chance of occurring in any given year".	Pick the source which generates the majority of flooding. Refer to the PFRA guidance for definitions of sources.	If the flood is generated by, or interacts with, any other sources (other than the Main source of flooding), report the source(s) here, using the same source terms.	Pick a broad level of confidence in the Main source of flooding from; 'High' (compelling evidence of source - about 80% confident that source is correct), 'Medium' (some evidence of source but not compelling - about 50% confident that source is correct) 'Low' (source assumed - about 20% confident that source is correct) or 'Unknown'.
Example:	1	See records below for examples of description of assessment method.	Essex	SX1234512345		Flood Map for Surface Water - 1 in 200 deep	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff		High
Records begin here:	1	• Topography is derived from LIDAR (in larger urban areas, on 1, 2 and 3m grids; original accuracy ± 0.15m) and Geoperspective data (original accuracy ± 1.5m), processed to remove buildings and vegetation, then degraded to a composite 5m DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; no allowance made for manmade drainage. The DTM may miss flow paths below bridges. • Areas that may flood are defined by dynamically routing a 6.5 hour duration storm with 1 in 200 chance of occurring in any year, over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 is used throughout, to allow broad scale effects of buildings and other obstructions to be approximated. • No allowance made for drainage, pumping or other works constructed for the purpose of flood risk management. • The 'less susceptible' layer shows where modelled flooding is 0.1-0.3m deep; you must not interpret this as depth of flooding, rather as indicative of susceptibility to flooding because of modelling uncertainties.	Liverpool and Sefton	SJ3662097780		Areas Susceptible to Surface Water Flooding (AStSWF) - Less	Probability refers to the probability of the rainfall event. This identifies areas which are 'less susceptible' to surface water flooding. For more information refer to "What are Areas Susceptible to Surface Water Flooding" Environment Agency December 2010.	200	Surface runoff		Medium
	2	• Topography is derived from LIDAR (in larger urban areas, on 1, 2 and 3m grids; original accuracy ± 0.15m) and Geoperspective data (original accuracy ± 1.5m), processed to remove buildings and vegetation, then degraded to a composite 5m DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; no allowance made for manmade drainage. The DTM may miss flow paths below bridges. • Areas that may flood are defined by dynamically routing a 6.5 hour duration storm with 1 in 200 chance of occurring in any year, over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 is used throughout, to allow broad scale effects of buildings and other obstructions to be approximated. • No allowance made for drainage, pumping or other works constructed for the purpose of flood risk management. • The 'intermediate susceptibility' layer shows where modelled flooding is 0.3-1.0m deep; you must not interpret this as depth of flooding, rather as indicative of susceptibility to flooding because of modelling uncertainties.	Liverpool and Sefton	SJ3662097780		Areas Susceptible to Surface Water Flooding (AStSWF) - Intermediate	Probability refers to the probability of the rainfall event. This identifies areas with 'intermediate susceptibility' to surface water flooding.	200	Surface runoff		Medium

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences	Comments
Mandatory Pick from drop-down	**Mandatory** Pick from drop-down	**Mandatory** Pick from drop-down	Optional Number between 1-10,000,000	Optional Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Number between 1-10,000,000	Optional Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Max 250 characters	Optional Max 1,000 characters
Pick a mechanism from; 'Natural exceedance' (of capacity), 'Defence exceedance' (floodwater overtopping defences), 'Failure' (of natural or artificial defences or infrastructure, or of pumping), 'Blockage or restriction' (natural or artificial blockage or restriction of a conveyance channel or system), or 'No data'.	Pick a characteristic from; 'Flash flood' (rises and falls quite rapidly with little or no advance warning), 'Natural flood' (due to significant precipitation, at a slower rate than a flash flood), 'Snow melt flood' (due to rapid snow melt), 'Debris flow' (conveying a high degree of debris), or 'No data'. Most UK floods are 'Natural floods'.	Would there be any significant consequences to human health if the future flood were to occur?	Record the number of residential properties where the building structure would be affected either internally or externally if the flood were to occur.	Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from; 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.	If there would be other Significant consequences to human health, describe them including information such as the number of critical services flooded.	Would there be any significant economic consequences if the future flood were to occur?	Record the number of non-residential properties where the building structure would be affected either internally or externally if the flood were to occur.	Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from; 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.	If there would be other Significant economic consequences, describe them including information such as the area of agricultural land flooded, length of roads and rail flooded.	Would there be any significant consequences to the environment if the future flood were to occur?	If there would be Significant consequences to the environment, describe them including information such as national and international designated sites flooded, and pollution sources flooded.	Would there be any significant consequences to cultural heritage if the future flood were to occur?	If there would be Significant consequences to cultural heritage, describe them including information such as the number and type of heritage assets flooded.	Any additional comments about the future flood record.
Natural exceedance	Natural flood	Yes	12000	Detailed GIS		No				No		No		
Natural exceedance	Natural flood	Yes	85,100	Simple GIS		Yes	13,500	Simple GIS	A5036 (Road to International Port) 3km	Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone (2) St Georges Hall, grade I listed building of national significance (3) Moated Site Maghull (4) Sefton Old Hall (5) Wayside Cross Ince Blundell (6) Registered Parks and Gardens-Sefton: Botanic Gardens, Hesketh Park, Ince Blundell and Derby Park - Liverpool:Princes Park, Toxteth Park	
Natural exceedance	Natural flood	Yes	26,500	Simple GIS		Yes	4,200	Simple GIS	A5036 (Road to International Port) 3km	Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone (2) St Georges Hall, grade I listed building of national significance (3) Sefton Old Hall (4) Registered Parks and Gardens -Sefton: Botanic Gardens, Hesketh Park, Ince Blundell and Derby Park - Liverpool:Princes Park, Toxteth Park	

Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional Max 250 characters	Optional Number with two decimal places The total area of the land flooded, in km^2	Optional Pick from drop-down Pick a broad level of confidence in the modelled flood outline from; 'High' (good match to past flood extents - about 80% confident that outline is correct), 'Medium' (reasonable match - about 50% confident that outline is correct), 'Low' (poor match, sparse data - about 20% confident that outline is correct) or 'Unknown'.	Optional 'yyyy' or 'yyyy-mm' or 'yyyy-mm-dd'	Optional Max 250 characters Type of software used to create future flood information.	Optional Max 250 characters Type of hydrology method used to create future flood information.	Optional Max 250 characters Lineage is how and what the data is made from. Has this data been created by using data owned or derived from data owned by 3rd party (external) organisations? If yes please give details.	Optional Pick from drop-down Has the information been classified under the Government's Protective Marking Scheme? Include protective marking time limit where known. Note: If "Approved for Access" then report "Unmarked".	Optional Max 50 characters For use where organisations apply the Government's Protective Marking Scheme.	Auto-populated Max 42 characters This field will autopopulate using the LLFA name provided on the "Instructions" tab, and the Flood ID. It is an EU-wide unique identifier and will be used to report the flood information. Format: UK<ONS Code><P or F><LLFA Flood ID>. "ONS Code" is a unique reference for each LLFA. "P or F" indicates if the event is past or future. "LLFA Flood ID" is a sequential number beginning with 0001.
Epping Forest District Council		Medium-Low	2008-08	2D-TuFlow	FEH (Revised Rainfall Runoff)	Ordnance Survey AddressPoint; CEH 1:50k River Centreline; NextMap DTM.	Unmarked	Private	UKE10000012F0001
JBA Consulting (distributed by Environment Agency under licence)		Low	2009-07	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 6.5 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile.		Protect	Commercial	UKE08000012F0001
JBA Consulting (distributed by Environment Agency under licence)		Low	2009-07	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 6.5 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile.		Protect	Commercial	UKE08000012F0002

3	• Topography is derived from LIDAR (in larger urban areas, on 1, 2 and 3m grids; original accuracy ± 0.15m) and Geoperspective data (original accuracy ± 1.5m), processed to remove buildings and vegetation, then degraded to a composite 5m DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; no allowance made for manmade drainage. The DTM may miss flow paths below bridges. • Areas that may flood are defined by dynamically routing a 6.5 hour duration storm with 1 in 200 chance of occurring in any year, over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 is used throughout, to allow broad scale effects of buildings and other obstructions to be approximated. • No allowance made for drainage, pumping or other works constructed for the purpose of flood risk management. • The 'more susceptible' layer shows where modelled flooding is >1.0m deep; you must not interpret this as depth of flooding, rather as indicative of susceptibility to flooding because of modelling uncertainties.	Liverpool and Sefton	SJ3662097780	Areas Susceptible to Surface Water Flooding (AStSWF) - More	Probability refers to the probability of the rainfall event. This identifies areas which are 'more susceptible' to surface water flooding.	200	Surface runoff	Medium
4	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 30 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management. • The '>0.1m' layer shows where modelled flooding is greater than 0.1m deep.	Liverpool and Sefton	SJ3662097780	Flood Map for Surface Water (FMfSW) - 1 in 30	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.1m depth.	30	Surface runoff	Medium
5	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 30 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management. • The '>0.3m' layer shows where modelled flooding is greater than 0.3m deep.	Liverpool and Sefton	SJ3662097780	Flood Map for Surface Water (FMfSW) - 1 in 30 deep	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	30	Surface runoff	Medium
6	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 200 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management. • The '>0.1m' layer shows where modelled flooding is greater than 0.1m deep.	Liverpool and Sefton	SJ3662097780	Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.1m depth.	200	Surface runoff	Medium

Natural exceedance	Natural flood	No		No		A5036 (Road to International Port) 3km	Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone (2) St Georges Hall, grade I listed building of national significance (3) Registered Parks and Gardens at risk of flooding -Sefton: Botanic Gardens, Hesketh Park, Kings and South Marine Gardens, Ince Blundell and Derby Park - Liverpool: Princes Park, Toxteth Park Cemetary, Newsham Park, Stanley Park
Natural exceedance	Natural flood	No		No			Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone at risk of flooding (2) St Georges Hall, grade I listed building of national significance (3) Registered Parks and Gardens at risk of flooding -Sefton: Botanic Gardens, Hesketh Park, Kings and South Marine Gardens, Ince Blundell and Derby Park - Liverpool:Princes Park, Toxteth Park Cemetary, Newsham Park, Stanley Park
Natural exceedance	Natural flood	No		No		A5036 (Road to International Port) 3km	Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone at risk of flooding (2) St Georges Hall, grade I listed building of national significance (3) Moated Site Maghull (4) Sefton Old Hall (5) Registered Parks and Gardens - Sefton: Botanic Gardens, Ince Blundell and Derby Park - Liverpool:Princes Park, Toxteth Park Cemetary, Newsham
Natural exceedance	Natural flood	Yes	60,300 Simple GIS	Yes	10,000 Simple GIS		Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone at risk of flooding (2) St Georges Hall, grade I listed building of national significance (3) Moated Site Maghull (4) Sefton Old Hall (5) Cunscough Hall (6) St Katherine's Chapel (6) Registered Parks and Gardens at risk of flooding - Sefton: Botanic Gardens, Hesketh Park, Kings and South Marine Gardens, Ince Blundell and Derby Park -Liverpool: Princes Park, Toxteth Park Cemetary,

JBA Consulting (distributed by Environment Agency under licence)	Low	2009-07	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 6.5 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile.		Protect	Commercial	UKE08000012F0003
Environment Agency	Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:30 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.	Rainfall Hyetograph, EA 2m Composite DTM, OSMM Topography	Unmarked		UKE08000012F0004
Environment Agency	Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:30 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.	Rainfall Hyetograph, EA 2m Composite DTM, OSMM Topography	Unmarked		UKE08000012F0005
Environment Agency	Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.	Rainfall Hyetograph, EA 2m Composite DTM, OSMM Topography	Unmarked		UKE08000012F0006

7	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 200 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management. • The '>0.3m' layer shows where modelled flooding is greater than 0.3m deep.	Liverpool and Sefton	SJ3662097780	Flood Map for Surface Water (FMfSW) - 1 in 200 deep	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.		200 Surface runoff		Medium
8	• Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid • This data has used the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map, which was developed on a 50m grid from: • NEXTMap 5m grid DTM. • National Groundwater Level data on a 50m grid • BGS 1:50 000 geological mapping, with classifications of permeability • It covers consolidated aquifers (chalk, limestone, sandstone etc.) and superficial deposits. • Flood plains are not explicitly identified; the mapping identifies where groundwater is likely to emerge, and not where the water is subsequently likely to flow or pond. • No allowance is made for engineering works, or for groundwater rebound or abstraction to prevent groundwater rebound. • Shows the proportion of each 1km grid square which is susceptible to groundwater emergence, using four area categories.	Liverpool and Sefton	SJ3662097780	Areas Susceptible to Groundwater Flooding (AStGWF)	Does not describe a probability, but shows places where groundwater emergence more likely to occur.	Unknown	Groundwater		Medium
9	• Modelling developed from combination of national (2004) and local (generally 1998-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Liverpool and Sefton	SJ3662097780	Flood Map (for rivers and sea) - flood zone 3	Fluvial 1 in 100, tidal 1 in 200		100 Main rivers	Sea, ordinary watercourses	Medium
10	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Liverpool and Sefton	SJ3662097780	Flood Map (for rivers and sea) - flood zone 2	Extreme flood outline is 1 in 1000, and includes some historic where judged that this gives an indication of areas at risk of future flooding.		1000 Main rivers	Sea, ordinary watercourses	Medium

Natural exceedance	Natural flood	No	11,500 Simple GIS	No	2,000 Simple GIS		No		Yes	(1)World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone at risk of flooding (2) St Georges Hall, grade I listed building of national significance (3) Moated Site Maghull (4) Sefton Old Hall (5) Cunscough Hall (6) St Katherine's Chapel Lydiate (7) Registered Parks and Gardens at risk of flooding -Sefton: Botanic Gardens, Hesketh Park, Ince Blundell and Derby Park -Liverpool: Princes Park, Toxteth Park Cemetary, Newsham Park, Stanley Park. EA mapping show 17		
Natural exceedance	Natural flood	No		Yes		(i)Mersey Tunnels are affected by Groundwater- one rail tunnel and two road tunnels. (ii)Large areas of prime agricultural ground in Sefton.	No		Yes	Mersey Tunnels Grade II listed.	Data developed specifically for PFRA, and is unlikely to be suitable for any other purposes.
Natural exceedance	Natural flood	No		No		Large areas of prime agricultural ground in Sefton.	Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	Registered Parks and Gardens- Botanic Gardens & Kings and South Marine Gardens	Data updated quarterly. To understand the likelihood of future flooding, taking account of defences, refer to Areas Benefitting from Defences and National Flood Risk Assessment (NaFRA) data. Marked 'Protect' for complete national dataset only.
Natural exceedance	Natural flood	No		No		Large areas of prime agricultural ground in Sefton.	Yes	RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	(1) Moated Site Maghull & Registered Parks and Gardens- Botanic Gardens & Kings and South Marine Gardens	Data updated quarterly. To understand the likelihood of future flooding, taking account of defences, refer to National Flood Risk Assessment (NaFRA) data. Marked 'Protect' for complete national dataset only.

Environment Agency	Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.	Rainfall Hyetograph, EA 2m Composite DTM, OSMM Topography	Unmarked		UKE08000012F0007
Environment Agency	Low	2010-11	ArcGIS	Uses data which is developed from published BGS groundwater level contours, groundwater levels in BGS WellMaster database and some river levels. No probability is associated with this data.	British Geological Society (BGS) DiGMapGB-50 [Susceptibility to Groundwater Flooding].	Unmarked		UKE08000012F0008
Environment Agency	Medium	2010-11	Varies but mainly JFLOW, ISIS, HEC-RAS, TUFLOW for fluvial, and HYDROF for tidal.	National methodology described in "National Generalised Modelling for Flood Zones - Fluvial & Tidal Modelling Methods - Methodology, Strengths and Limitations". A national dataset (for England and Wales) of fluvial flood peak estimates was derived from the Flood Estimation Handbook (FEH) to generate a 1 in 100 chance fluvial flood. Local fluvial modelling uses FEH methods. Peak tidal water levels from either Dixon & Tawn (DT3) or local data sets to derive 1 in 200 chance tide levels including surge from POL CSX model.	NextMap SAR DTMe, UKHO Admiralty Charts, 1:50K CEH River Centre Line, CEH FEH Q(T) Grids, POL CSX Peak Extreme Water Levels, POL CS3 Astronomical Tides, UKHO Admiralty Tide Time-Series Calibration Locations, OS 1:10 Boundary Line MHW	Protect	Commercial	UKE08000012F0009
Environment Agency	Medium	2010-11	Varies but mainly JFLOW, ISIS, HEC-RAS, TUFLOW for fluvial, and HYDROF for tidal.	National methodology described in "National Generalised Modelling for Flood Zones - Fluvial & Tidal Modelling Methods - Methodology, Strengths and Limitations". A national dataset (for England and Wales) of fluvial flood peak estimates was derived from the Flood Estimation Handbook (FEH) to generate a 1 in 1000 chance fluvial flood. Local fluvial modelling uses FEH methods. Peak tidal water levels from either Dixon & Tawn (DT3) or local data sets to derive 1 in 1000 chance tide levels including surge from POL CSX model.	NextMap SAR DTMe, UKHO Admiralty Charts, 1:50K CEH River Centre Line, CEH FEH Q(T) Grids, POL CSX Peak Extreme Water Levels, POL CS3 Astronomical Tides, UKHO Admiralty Tide Time-Series Calibration Locations, OS 1:10 Boundary Line MHW, Historic	Protect	Commercial	UKE08000012F0010

ANNEX 3: Records of Flood Risk Areas and their rationale (preliminary assessment report spreadsheet)

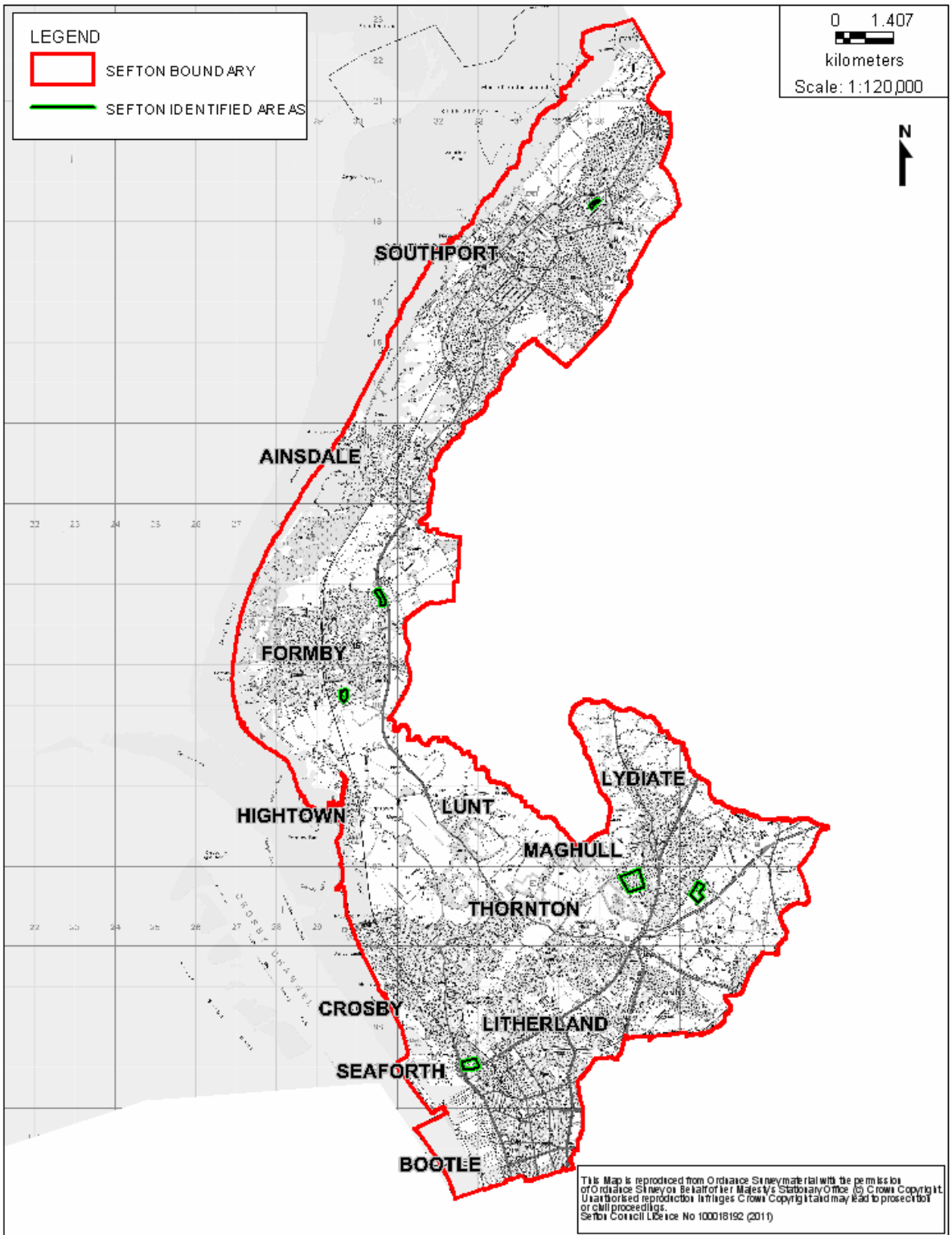
Field:	**Flood Risk Area ID**	**Name of Flood Risk Area**	**National Grid Reference**	**Main source of flooding**	Additional source(s) of flooding	Confidence in main source of flooding	**Main mechanism of flooding**	**Main characteristic of flooding**	**Significant consequences to human health**	Human health consequences - residential properties	Property count method	Other human health consequences	**Significant economic consequences**	Number of non-residential properties flooded
Mandatory / optional:	**Mandatory**	**Mandatory**	**Mandatory**	**Mandatory**	Optional	Optional	**Mandatory**	**Mandatory**	**Mandatory**	Optional	Optional	Optional	**Mandatory**	Optional
Format:	Unique number between 1-9999	Max 250 characters	12 characters: 2 letters, 10 numbers	Pick from drop-down	Max 250 characters, same source terms	Pick from drop-down	Pick from drop-down	Pick from drop-down	Pick from drop-down	Number between 1-10,000,000	Pick from drop-down	Max 250 characters	Pick from drop-down	Number between 1-10,000,000
Notes:	A sequential number starting at 1 and incrementing by 1 for each record.	Name of the locality associated with the Flood Risk Area; a town, city, or county.	National Grid Reference of the centroid (centre point, falls within polygon) of the Flood Risk Area.	Pick the source from which there is a significant flood risk. Refer to the PFRA guidance for definitions of sources.	If there is also significant flood risk generated by another source (other than the Main source of flooding), report the source(s) here, using the same source terms.	Pick a broad level of confidence in the Main source of flooding from; 'High' (compelling evidence of source - about 80% confident that source is correct), 'Medium' (some evidence of source but not compelling - about 50% confident that source is correct) 'Low' (source assumed - about 20% confident that source is correct) or 'Unknown'.	Pick a mechanism from; 'Natural exceedance' (of capacity), 'Defence exceedance' (floodwater overtopping defences), 'Failure' (of natural or artificial defences or infrastructure, or of pumping), 'Blockage or restriction' (natural or artificial blockage or restriction of a conveyance channel or system), or 'No data'.	Pick a characteristic from; 'Flash flood' (rises and falls quite rapidly with little or no advance warning), 'Natural flood' (due to significant precipitation, at a slower rate than a flash flood), 'Snow melt flood' (due to rapid snow melt), 'Debris flow' (conveying a high degree of debris), or 'No data'. Most UK floods are 'Natural floods'.	Has the Flood Risk Area been identified as a result of significant consequences to human health?	Record the number of residential properties where the building structure would be affected either internally or externally by the flood.	Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from; 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.	If the Flood Risk Area has been identified as a result of other Significant consequences to human health, describe them (such as information about the number of critical services flooded).	Has the Flood Risk Area been identified as a result of significant economic consequences?	Record the number of non-residential properties where the building structure would be affected either internally or externally by the flood.
Example:	1	London	SX1234512345	Surface runoff	NA	High	Natural exceedance	Natural flood	Yes	50000	Detailed GIS		No	
Records begin here:	1	Liverpool and Sefton	SJ3662097780	Surface runoff	Ordinary watercourses, groundwater	High-Medium	Natural exceedance	Natural flood	Yes	22,220	Simple GIS	263 critical services	Yes	3,356

Property count method	Other economic consequences	**Significant consequences to the environment**	Environment consequences	**Significant consequences to cultural heritage**	Cultural heritage consequences	**Origin of Flood Risk Area**	**Amended Flood Risk Area rationale**	**New Flood Risk Area rationale**	**Rationale detail**	European Flood Risk Area Code
Optional Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	Optional Max 250 characters	**Mandatory** Pick from drop-down	**Mandatory** Pick from drop-down	**Mandatory** Pick from drop-down	**Mandatory** Max 1,000 characters	Auto-populated Max 42 characters
Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from; 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.	If the Flood Risk Area has been identified as a result of other Significant economic consequences, describe them (such as information about the area of agricultural land flooded, length of roads and rail flooded).	Has the Flood Risk Area been identified as a result of significant consequences to the environment?	If the Flood Risk Area has been identified as a result of Significant consequences to the environment, describe them (such as information about national and international designated sites flooded, and pollution sources flooded).	Has the Flood Risk Area been identified as a result of significant consequences to cultural heritage?	If the Flood Risk Area has been identified as a result of Significant consequences to cultural heritage, describe them (such as information about the number and type of heritage assets flooded).	Pick the origin from either; 'Indicative' Flood Risk Area, 'Amended' Flood Risk Area (in which case Amended Flood Risk Area rationale is mandatory), or 'New' Flood Risk Area (in which case New Flood Risk Area rationale is mandatory).	Pick the main rationale from either; 'Geography', 'Past floods', or 'Future floods'. Then provide further detail in Rationale detail. This is not mandatory if the Flood Risk Area was an indicative Flood Risk Area and has not been amended, or is a new Flood Risk Area.	Pick the main rationale from either 'Past floods', or 'Future floods'. Then provide further detail in Rationale detail. This is not mandatory if the Flood Risk Area was an indicative Flood Risk Area.	Summarise the rationale for amending an indicative Flood Risk Area, or identifying a new Flood Risk Area. Refer to Defra & WAG guidance to LLFAs on "Selecting and reviewing Flood Risk Areas for local sources of flooding". If the Flood Risk Area was an indicative Flood Risk Area and has not been amended, record "indicative Flood Risk Area".	This field will autopopulate using the LLFA name provided on the "Instructions" tab, and the Flood Risk Area ID. It is an EU-wide unique identifier and will be used to report the Flood Risk Area information. Format: UK<ONS Code><A><LLFA Flood ID>. "ONS Code" is a unique reference for each LLFA. "A" indicates it is a Flood Risk Area. "LLFA Flood ID" is a sequential number beginning with 0001.
		No		No		Indicative	NA	NA	indicative Flood Risk Area	UKE10000012A0001
Simple GIS	(i)18km2 aqricultural land. (ii)A5036 (port road) 3km (iii) Mersey Tunnels-two road and one rail tunnel	Yes	SAC- Sefton Coast, SSSI - Sefton Coast, RAMSAR - Ribble & Alt Estuaries, SPA - Ribble & Alt Estuaries	Yes	World Heritage Site, Liverpool Maritime Mercantile City, Core Area and Buffer Zone. St Georges Hall, grade I listed building of national significance. Registered Parks and Gardens at risk of flooding -Sefton: Churchtown Botanic Gardens, Ince Blundell Gardens, Derby Park and South Marines Gardens- Liverpool:Princes Park, Toxteth Park Cemetary, Newsham Park, Stanley Park EA mapping show 17 listed buildings at risk of flooding.	Amended	Future floods	NA	Indicative Flood Risk Area from Areas Susceptible to Surface Water Flooding (AStSWF), amended to detach Knowsley and verified with additional known past flood information and future flood information from both Liverpool and Sefton Surface Water Management Plans.The number of residential properties 22,220 affected in the Liverpool and Sefton Flood Risk Area equates to 51,995 people using the 2.34 multiplier.	UKE08000012A0001

Appendix B Future Floods

Figure B-1 Areas Susceptible to Surface Water Flooding (Less, Intermediate and More Susceptible)

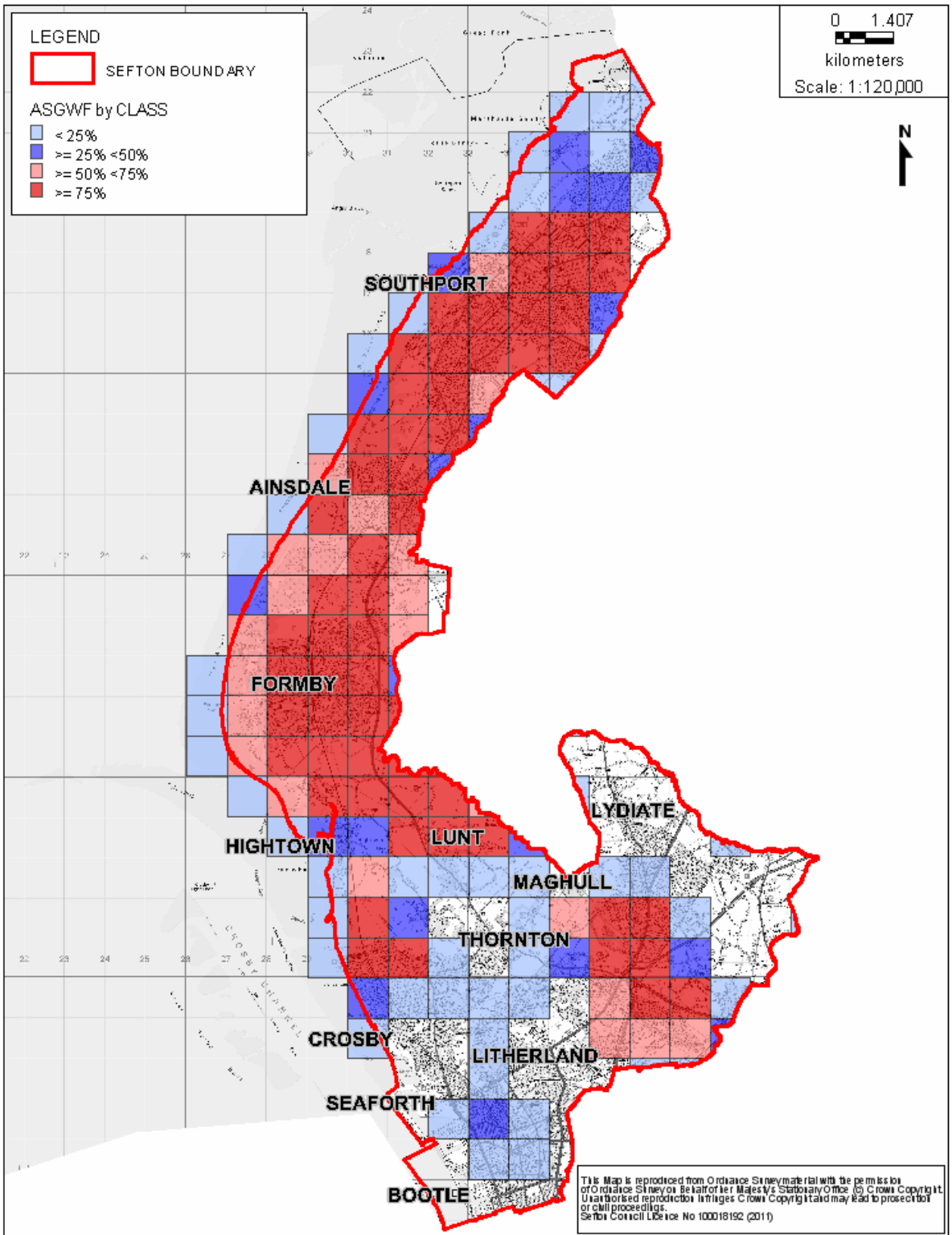
Figure B-2 Areas Susceptible to Groundwater Flooding



SEFTON AREA:
LOCAL FLOOD RISK AREAS
FIGURE C-1

Sefton Council

CAPITA SYMONDS



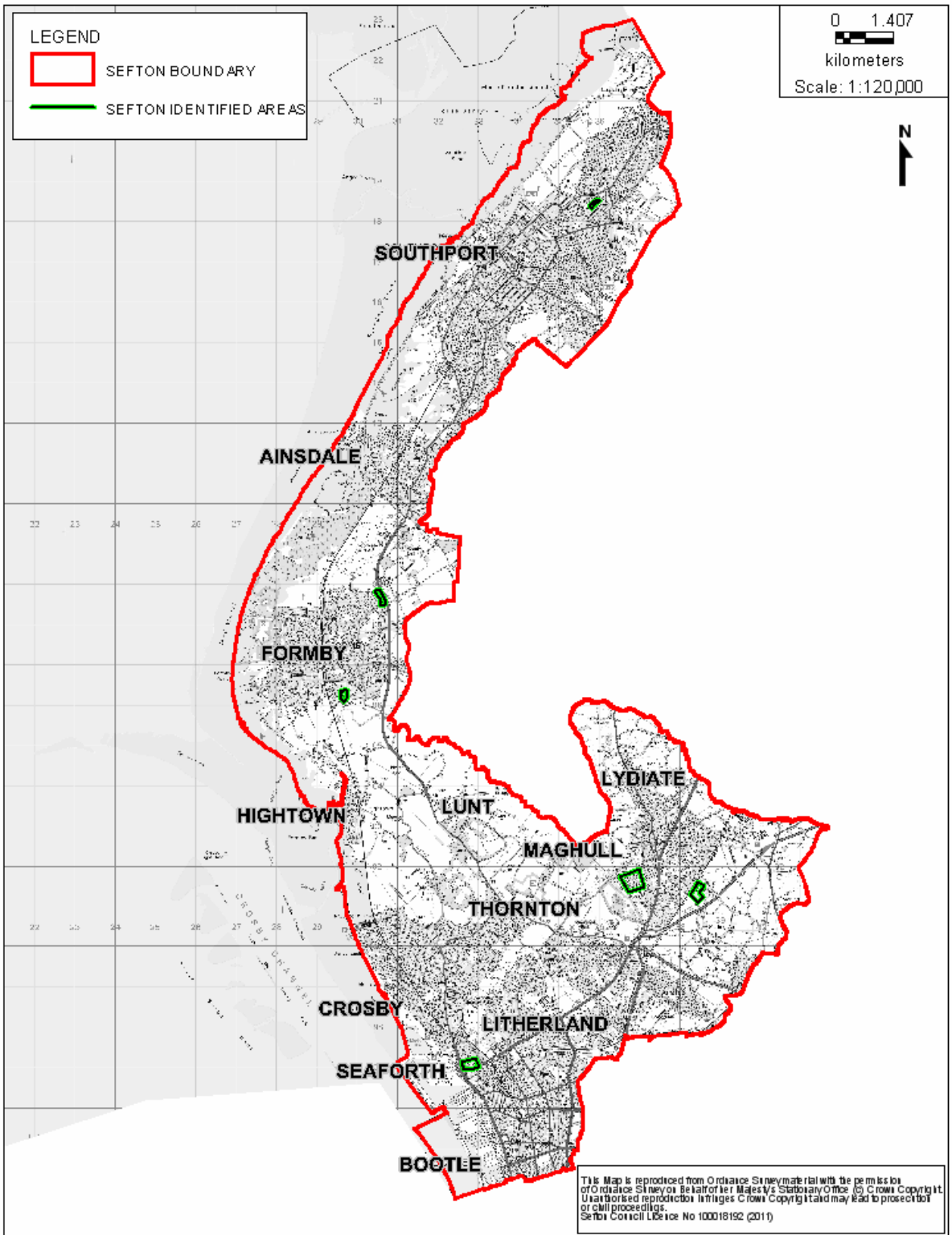
SEFTON AREA:
ASGWF
FIGURE B-2

Sefton Council

CAPITA SYMONDS

Appendix C Flood Risk Areas

Figure C-1 Agreed Indicative Flood Risk Areas



SEFTON AREA:
LOCAL FLOOD RISK AREAS
FIGURE C-1

Sefton Council

CAPITA SYMONDS

Appendix D Review Checklist

Notes for Completing PFRA Review Checklist

	General Notes for Users
a	This review checklist has been prepared by the Environment Agency as Annex 3 of the Preliminary Flood Risk Assessment (PFRA) guidance. The checklist is intended to help Lead Local Flood Authorities (LLFAs) review their PFRAs and any Flood Risk Areas. It should be used in conjunction with the Environment Agency's PFRA guidance, and Defra/WAG's guidance on selecting and reviewing Flood Risk Areas for local sources of
b	The same review checklist will be used by the Environment Agency for review of PFRAs and Flood Risk Areas
c	The worksheet titled PFRA Review Coversheet is a summary sheet, which should be completed by LLFAs before submitting to the Environment
d	The worksheet titled Review Checklist has been developed using the 10 steps contained in the PFRA Guidance (Table 1, page 9).
e	In the Review Checklist there is a column for LLFA completion which is coloured pale blue, one for Environment Agency local office staff (yellow), and one for the national Review Panel (green).
f	Boxes which are greyed out do not need to be completed.
g	Supporting notes are provided in Column C of the Review Checklist to help LLFAs and the Environment Agency respond to the questions.
h	Some of the questions have drop-down responses to select from, and others are for free-text comments. The notes for completion in column C identify the type of response required.
i	Additional columns or questions should not be added to the spreadsheet.

LLFAs should complete the pale blue sections with the relevant information, and send to their Environment Agency Local Area Contact along with the Preliminary Assessment Report and Annexes. Yellow and green boxes on this coversheet are for Environment Agency completion

Preliminary Flood Risk Assessment Review	
LLFA Name	Sefton Metropolitan Borough Council
If collaboration, list other LLFAs	Liverpool
LLFA Lead contact name	Graham Lymbrey
Email address	Graham.Lymbery@sefton.gov.uk
Contact telephone number	0151-9342960
Date sent to Environment Agency	

Documents submitted		
	LLFA	**EA date received**
Preliminary Assessment Report	Yes	
Annex 1 - Past floods reporting template	Yes	
Annex 2 - Future floods reporting template	Yes	
Annex 3 - Flood Risk Area reporting template	Yes	
Annex 4 - Review checklist	Yes	

Flood Risk Areas	
Was there an indicative Flood Risk Area?	Yes
Is a Flood Risk Area proposed?	Yes

Approvals	
LLFA approval	
Name	
Title	
Date	

For completion by Environment Agency		
Region		
Area		
Lead contact name		
	Review date	**Recommendation**
Environment Agency area		
National review panel		
RFCC/FRMW		
Regional Director Sign-off		
Ministerial referral (if applicable)		

Preliminary Flood Risk Assessment Checklist					
LLFA Name:					
	Checklist questions	**Notes for completion**	**LLFA**	**Environment Agency area review**	**Environment Agency national review**
Step 1	**Set up governance and develop partnerships**				
1.1	Have appropriate governance and partnership arrangements been set up?	Refer to section 2.3 of guidance. Governance and partnership arrangements should be to the satisfaction of the LLFA.	Yes		
1.2	Who in the LLFA reviewed the PFRA and when was it done?	Please state the review and approval process and when approval was gained e.g. Officer, Scrutiny Committee, Cabinet. Refer to Section 5 of the guidance.	TBC		
Step 2	**Determine appropriate data systems**				
2.1	Has a data management system been established and implemented?	See Annex 5 for information about data standards	Yes		
Step 3	**Collate information on past and future floods and their consequences**				
3.1	Has information been requested from all relevant partners?	See Flood Risk Regulations Part 6 Co-operation.	No		
3.2	Are there any gaps in available information? (This could include gaps which could have been filled but weren't, or gaps which couldn't be filled because the information wasn't available)	LLFAs - Are there gaps in certain locations, or for certain events that you are aware of, or for certain sources of flooding (such as groundwater). Respond with Yes/No and provide comments on any missing information. EA Review - Has all available information has been gathered and included?	British Waterways were not consulted. Groundwater level data obtained, however, not reviewed in detail in relation to hostorical events		
Step 4	**Determining locally agreed surface water information**				
4.1	Which dataset (or combination of datasets) has been determined as "locally agreed surface water information"?	LLFAs - Select from drop down. Refer to "Locally agreed surface water information" text box in section 3.5.1 (p.17) of guidance. EA review - Has this been agreed?	Combination of AStSWF and other local information		
4.2	Has the locally agreed surface water information been clearly stated and presented (on a map) in the Preliminary Assessment Report?	LLFAs - Select Yes/No from drop down list. Refer to "locally agreed surface water information" text box in section 3.5.1 (p.17) of guidance.	Yes		
4.3	If available, what is the total property count for locally agreed surface water information in the LLFA?	If known, please enter the total number of properties at risk in the LLFA.	99600		
4.4	If applicable, has the method for counting properties been described in the Preliminary Assessment Report?	Refer to text box on page 17 of guidance	Yes		
4.5	Has available information on local drainage capacity (where used to inform the determination of locally agreed surface water information) been included in the report?	Refer to text box on page 17 of guidance. Information provided on drainage may inform options for any future improvements to the Flood Map for Surface Water.	Yes		

Preliminary Flood Risk Assessment Checklist					
LLFA Name:					
	Checklist questions	**Notes for completion**	**LLFA**	**Environment Agency area review**	**Environment Agency national review**
Step 5	**Complete Preliminary Assessment Report Document**				
5.1	Does the Preliminary Assessment Report cover all the content described in Annex 1 of the Environment Agency's PFRA guidance?	LLFAs - If the Preliminary Assessment Report contains all the content described in Annex 2 of the PFRA guidance, respond with a 'Yes'. If there are some elements missing, please provide a brief explanation. EA Review - Include comments on any missing content.	Yes		
5.2	Has a summary table of flood events been produced?	Refer to section 3.4 and 3.5 of guidance	Yes		
5.3	Has a description of past flood events been included?	Refer to section 3.4 and 3.5 of guidance	Yes		
5.4	Has additional information been included on climate change and long term developments?	Refer to 3.6 of guidance. Standard text has been provided for Preliminary Assessment Reports which meets the minimum requirements of the Flood Risk Regulations. Please respond with Yes or No, and if additional information has been included, please state the information source(s)	Yes		
Step 6	**Record information on past and future floods with significant consequences in spreadsheet**				
6.1	Are records of past flooding with significant harmful consequences recorded on the Preliminary Assessment Report spreadsheet (Annex 1 of Prelminary Assessment Report) ?	LLFAs - past flooding should be recorded on the spreadsheet and included as Annex 1 of the Preliminary Assessment Report. EA review - Are all the mandatory fields complete?	Yes		
6.2	Are there any past floods with significant harmful consequences that have not been recorded? If so, please explain why not.	LLFAs - Respond with Yes or No. If No, provide additional information e.g. anecdotal information on flood, but not enough evidence to include EA review - Do you agree with LLFA response and comments?	No		
6.3	Have any additional records of future flooding (other than the national dataset information which is already completed) been recorded on the future flooding Preliminary Assessment Report spreadsheet (Annex 2 of Preliminary Assessment Report)	LLFAs - future flooding information should be recorded on the spreadsheet and included as Annex 2 of the Preliminary Assessment Report. EA review - Are all mandatory fields complete?	No		
Step 7	**Illustrate information on past and future floods**				
7.1	Have summary maps been produced for past and future floods?	Refer to section 3.4 and 3.5 of guidance	Yes		
Step 8	**Review indicative Flood Risk Areas**				
8.1	Is your LLFA within an indicative Flood Risk Area?	Indicative Flood Risk Areas were provided to LLFAs by the Environment Agency in December 2010.	Yes		
8.2	If the answer to 8.1 is yes, have you reviewed it using the locally agreed surface water information, and relevant local information in the Preliminary Assessment Report?	Refer to section 4 of guidance. LLFAs should identify whether they have reviewed against local information or just used the indicative Flood Risk Area information provided by the Environment Agency.	Yes		

Preliminary Flood Risk Assessment Checklist					
LLFA Name:					
	Checklist questions	**Notes for completion**	**LLFA**	**Environment Agency area review**	**Environment Agency national review**
Step 9	**Identify Flood Risk Areas**				
9.1	Is a Flood Risk Area proposed?	LLFA - select a response from the drop down list and then complete the relevant questions 9.1.1 - 9.1.5. (NB. Indicative Flood Risk Areas can be amended due to Geography, past flooding and/or future flooding.)	Yes - it is exactly the same as the indicative Flood Risk Area (go to question 9.1.1)		
9.1.1	If the proposed Flood Risk Area is exactly the same as the indicative Flood Risk Area, please confirm.	LLFA - please confirm that the boundary of the indicative Flood Risk Area has not been changed and no change has been made to the flood risk indicators. EA review - please confirm	Yes		
9.1.2	If changes have been made to the indicative Flood Risk Area because of geography, please identify what changes have been made.	Use the drop down list to identify the reasons for the change. Options are the same as the table on page 26 of the PFRA guidance. EA review - please confirm evidence supports change			
9.1.3	If changes have been made to the indicative Flood Risk Area because of past / historic flooding, please indicate the changes and the reasons why.	LLFA - identify the scale of the changes made e.g. major/minor increase or decrease in size of Flood Risk Area and the source of information used e.g. records of historic flooding. EA review - confirm scale of the changes made and provide indication of confidence in the evidence provided e.g. anecdotal evidence versus detailed report on flooding event.	Minor changes due to historic flooding		
9.1.4	If changes have been made to the indicative Flood Risk Areas because of future flooding, please indicate the changes and the reasons why.	LLFA - identify the scale of the changes made e.g. major/minor increase or decrease in size of Flood Risk Area and the source of information used e.g. detailed modelling as part of SWMP. EA review - confirm scale of the changes made and indication of confidence in the evidence			
9.1.5	If a new Flood Risk Area is being proposed, does it meet the Defra / WAG thresholds?	Criteria and thresholds are set out in the Defra/WAG guidance on selecting and reviewing Flood Risk Areas for local sources of flooding EA review - identify the evidence provided to support this and indicate degree of confidence in the evidence.			
9.2	Does the proposed Flood Risk Area include flooding from interactions with main river, reservoirs or the sea?	LLFAs should respond with Yes or No. EA Review - Summarise the location and nature of interactions i.e. river or sea.	No		
9.3	Has an indicative Flood Risk Area been deleted?	LLFA - Respond with Yes/No and if an indicative Flood Risk Area has been deleted please provide a short description why. EA - confirm the evidence presented to support this is aligned to 'locally agreed surface water information'	No		
Step 10	**Record information including rationale - ONLY COMPLETE IF ANSWER TO 9.1 IS YES**				
10.1	If proposing Flood Risk Areas, have the mandatory fields in the spreadsheet been completed?	LLFAs - the spreadsheet indicates mandatory columns to be completed. EA Review - Are all mandatory fields complete?	Yes		
10.2	Has a rationale and evidence for amending/adding/deleting Flood Risk Areas been included in the Preliminary Assessment Report?	LLFAs - Refer to Table 5 on page 26 of the PFRA guidance and Annexes A-D of the Defra/WAG Guidance. Rationale should be included in "Identification of Flood Risk Areas" section of Preliminary Assessment Report. EA Review - Confirm that supporting evidence for any amendments/additions/deletions has been provided in the Preliminary Assessment Report and annexes	Yes		

Appendix E GIS Layer of Flood Risk Area(s)