

PRELIMINARY FLOOD RISK ASSESSMENT Preliminary Assessment Report



Sefton Metropolitan Borough
Council
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Revision Schedule

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AUTHOR

Name	Organisation and Role
Claire Storer	Associate Director, Capita Symonds
Philip Raynor	Associate Director, Capita Symonds

APPROVALS

Name	Title	Signature	Date

DISTRIBUTION

Name	Organisation and Role
Graham Lymbery	Project Leader - Coastal Defence
Paul Wisse	Senior Officer - Coastal Defence
Claire Bursnoll	Merseyside Flood Risk Management Co-ordinator

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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 produce 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 (ASStWF) 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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Annex

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

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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 (ASStWF), 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 Areas¹. 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.

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 235km² 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 should be consulted in future developments and as part of the development of a local flood risk management strategy.

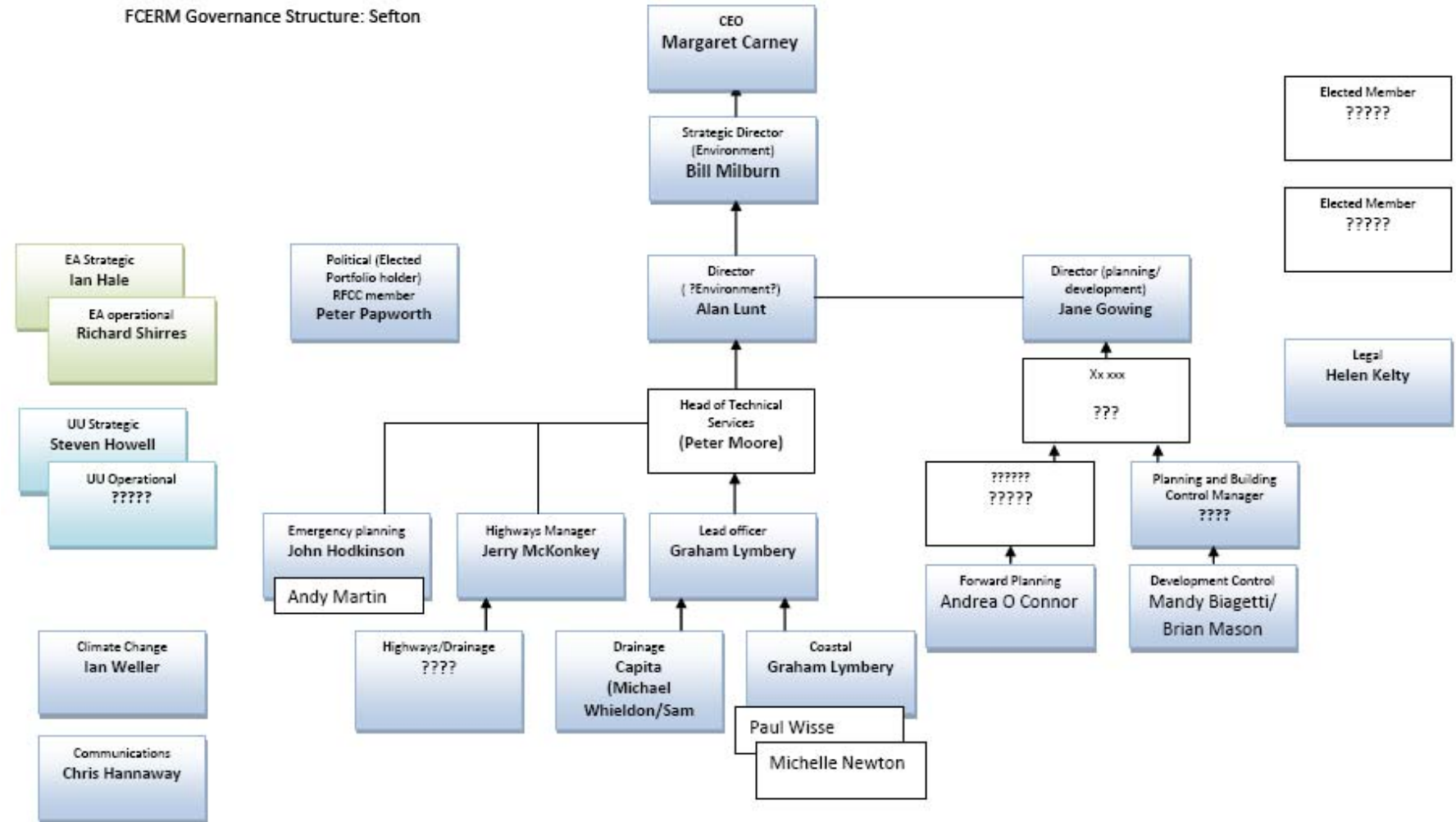


Figure 2-1: Local Flood Risk Management Governance in Sefton

- 2.3.3 Members of the public may also have valuable information to contribute to the PFRA and to 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: <ul style="list-style-type: none"> 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 digitised into GIS where grid reference data is available and these areas 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.
- 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 km² 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 plans². 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 is 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. This is particularly the case for records collated by Sefton MBC and the opportunity

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

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 1km² 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, 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, Blundellsands, 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 concentrated in Crosby, Sefton &	SMBC	Yes (local)

Date	Main source of flooding	Description	Data Source	Significant harmful consequences?
		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 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	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 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
	Unknown	Historical records of surface	Sefton MBC	Locally significant

Main source of flooding	Probability	Description	Data Source	Significant consequences?
		water flooding		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 (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-3 (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 Area³ 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 Plan⁴ 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 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.

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.

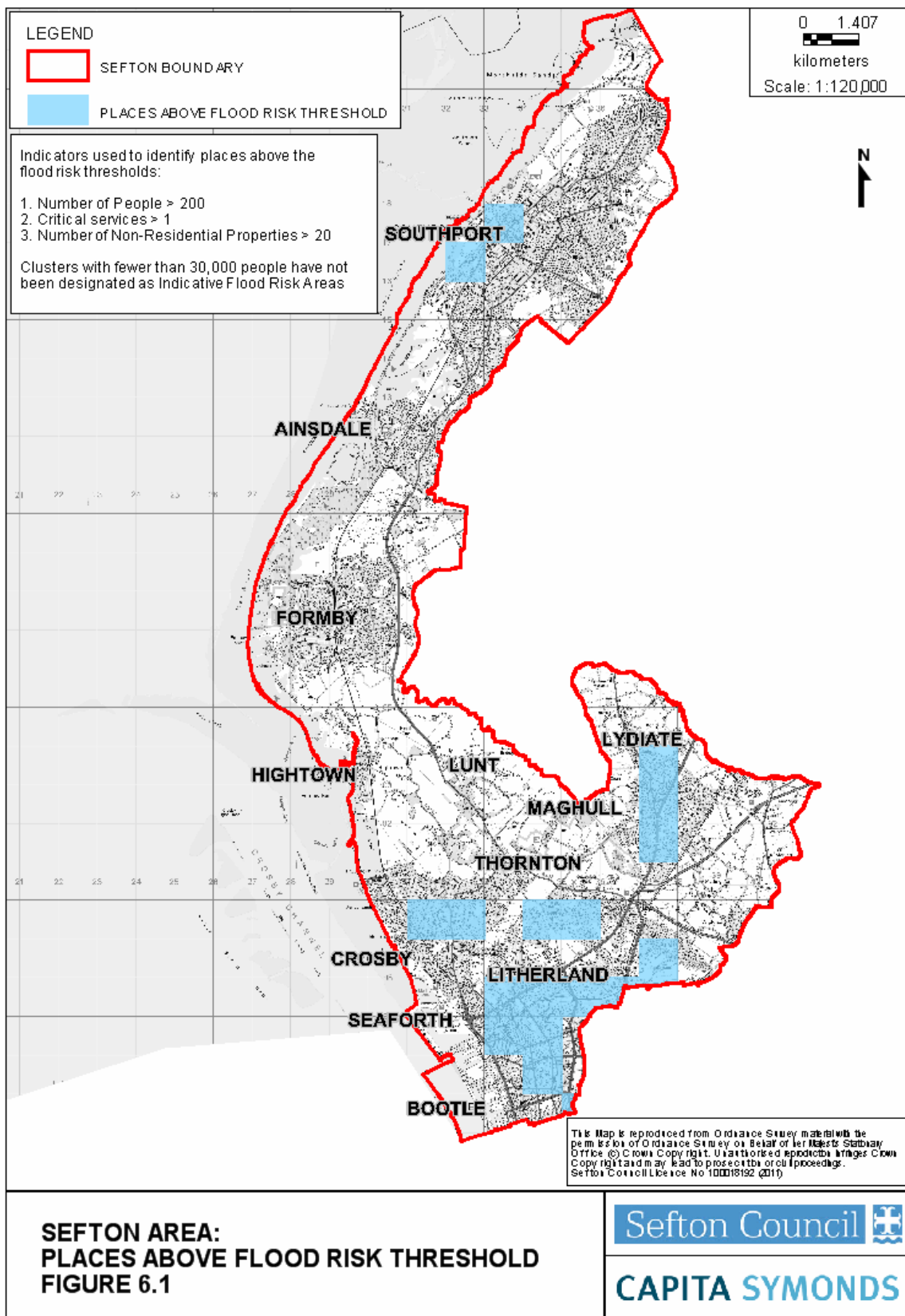


Figure 6-1: Sefton Areas Above Flood Risk Threshold

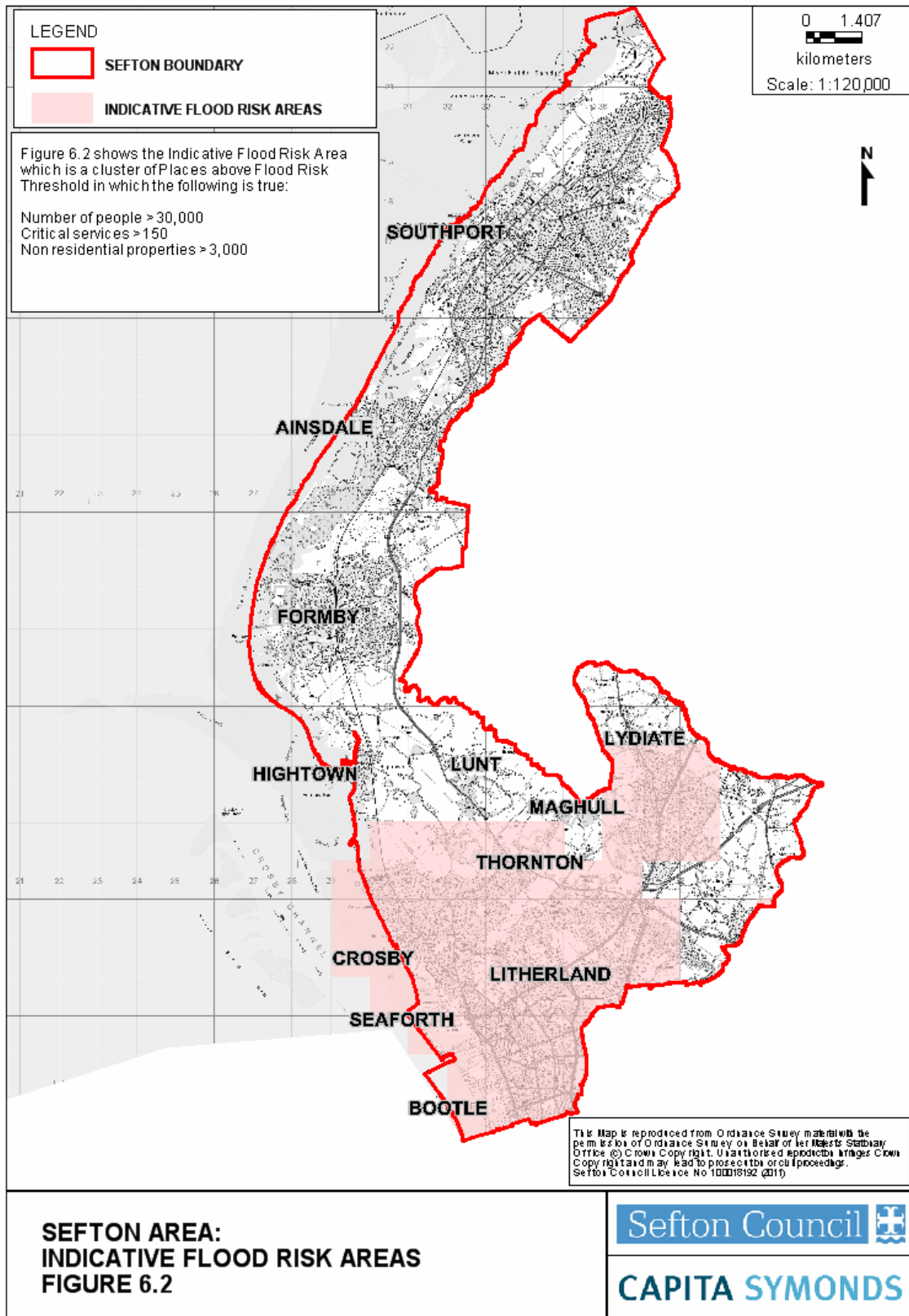


Figure 6-2: Liverpool Indicative Flood Risk Area with New Flood Risk Areas identified by Sefton MBC.

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 than 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, a number of data gaps have been identified 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

Figure A-1 Sefton MBC Surface Water Flooding Records

Figure A-2 Sewer Flooding Records

Figure A-3 Environment Agency Historical Flood Records (whole Borough)

Figure A-3.1 Environment Agency Historical Flood Records (Detailed)

Table A-1 Significant local flood events

LEGEND



SEFTON BOUNDARY



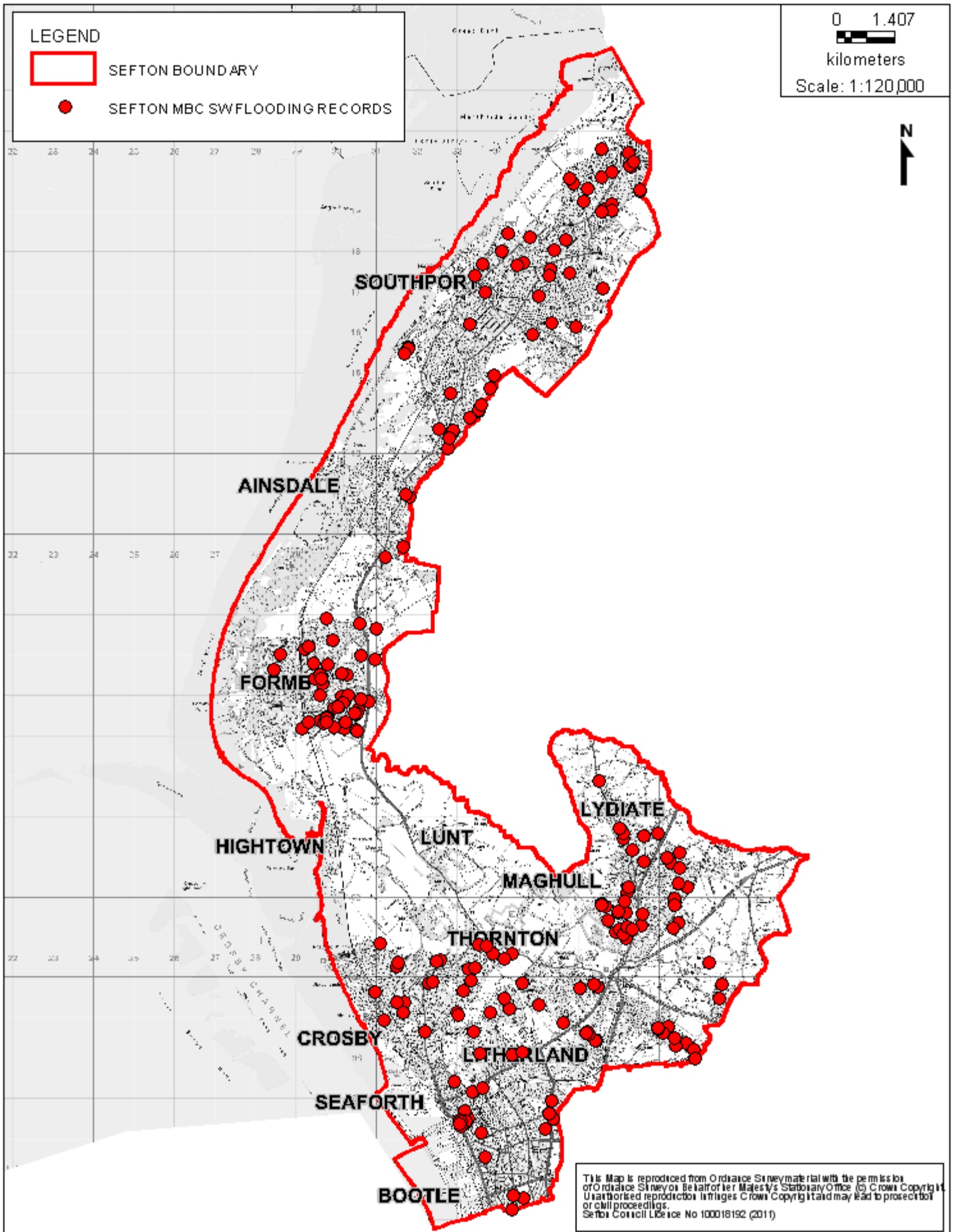
SEFTON MBC SW FLOODING RECORDS

0 1.407



kilometers

Scale: 1:120,000



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

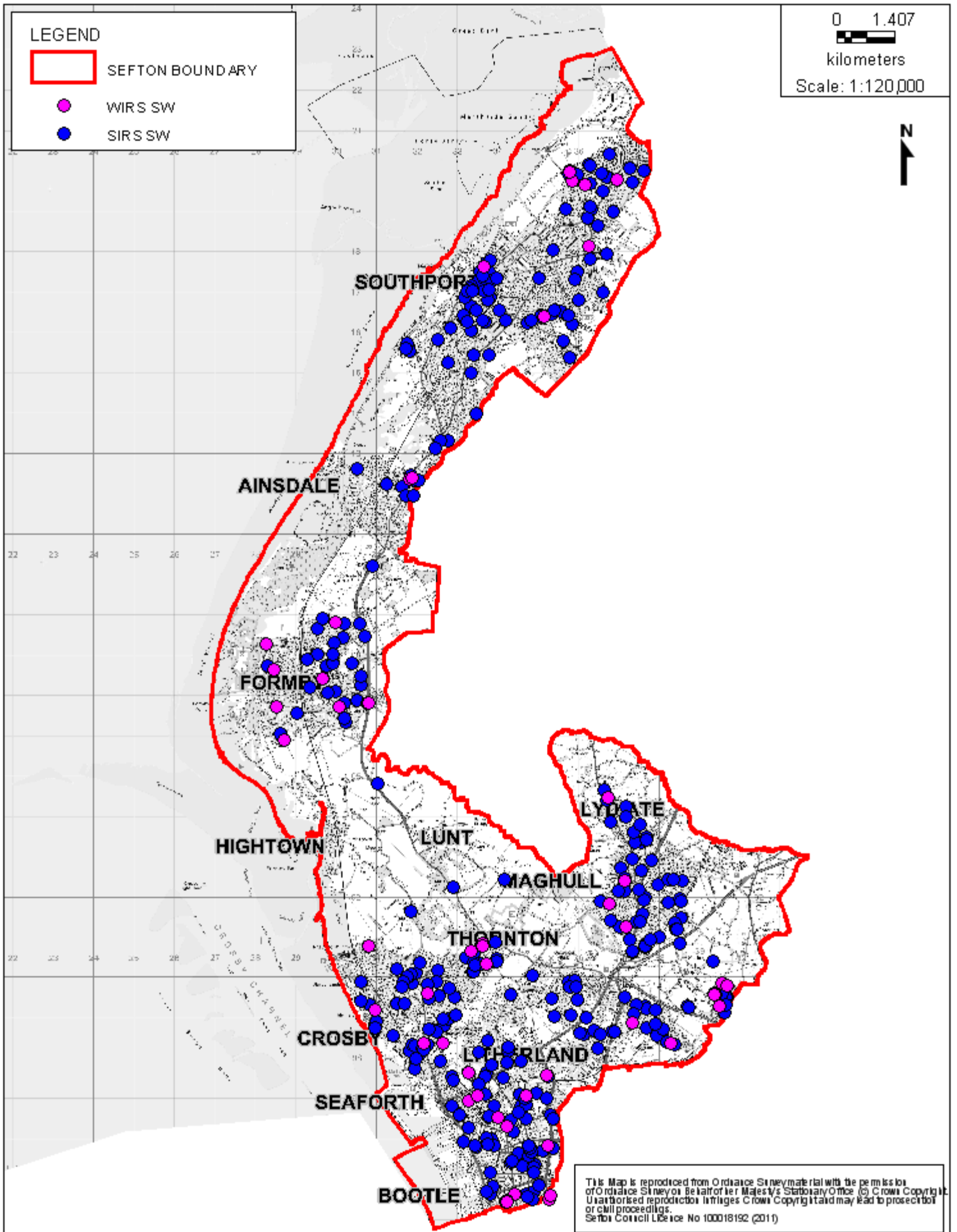
Sefton Council

CAPITA SYMONDS

LEGEND

- SEFTON BOUNDARY
- WIRS SW
- SIRS SW

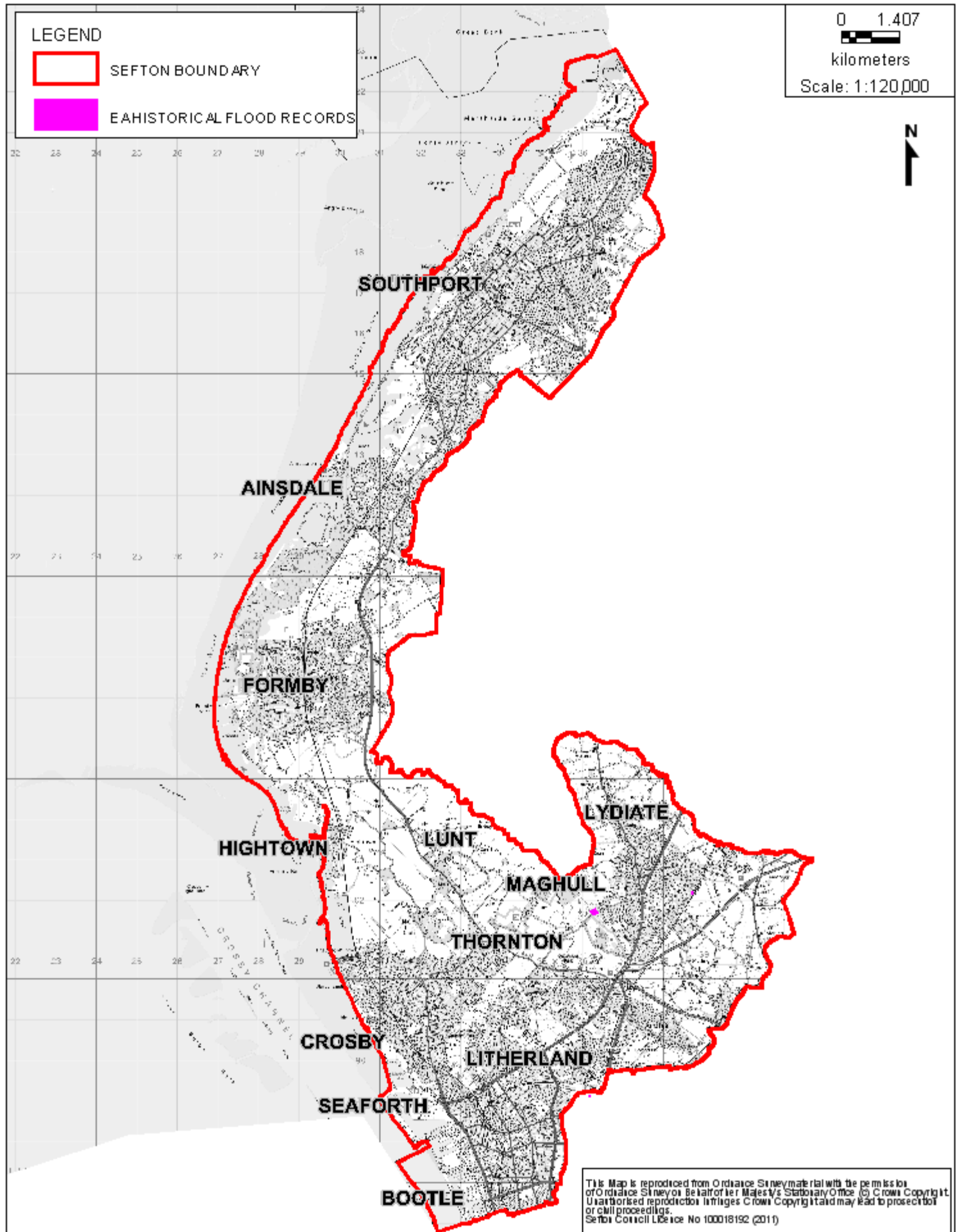
0 1.407
kilometers
Scale: 1:120,000



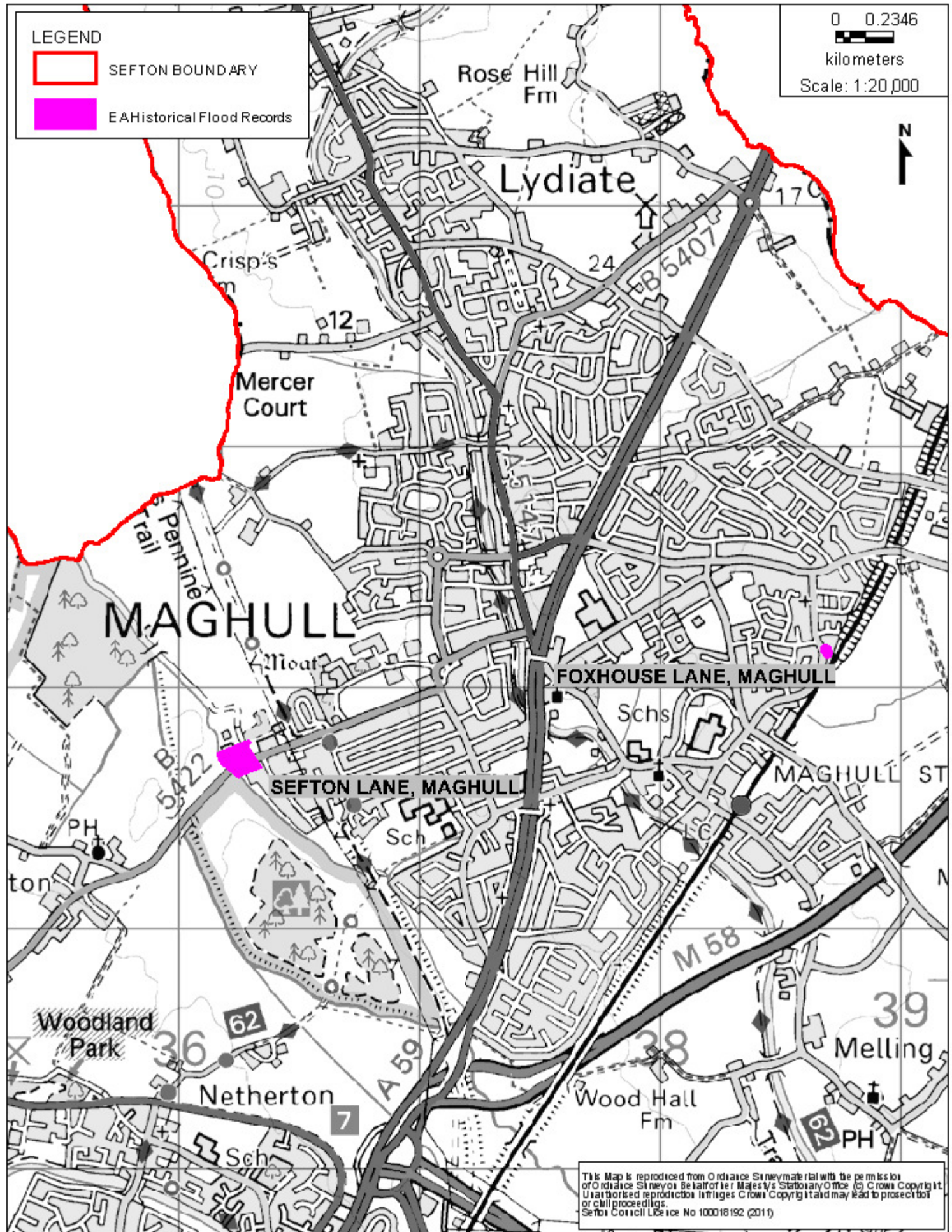
**SEFTON AREA:
SEFTON MBC SEWER FLOODING RECORDS
FIGURE A-2**

Sefton Council

CAPITA SYMONDS



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



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

Appendix B Future Floods

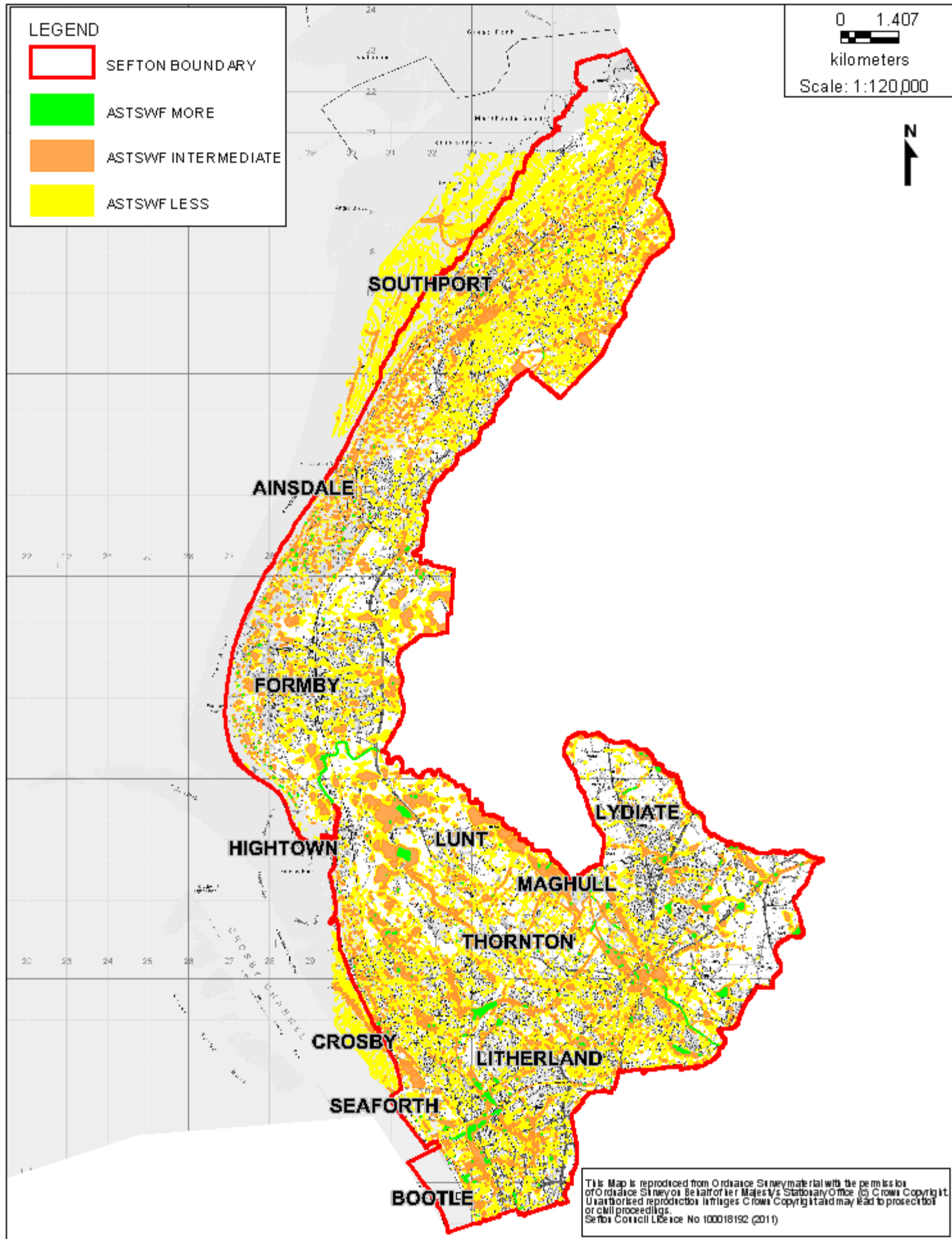
Figure B-1 Areas Susceptible to Surface Water Flooding (Less, Intermediate and More Susceptible)

Figure B-2 Areas Susceptible to Groundwater Flooding

LEGEND

-  SEFTON BOUNDARY
-  ASTSWF MORE
-  ASTSWF INTERMEDIATE
-  ASTSWF LESS

0 1.407
kilometers
Scale: 1:120,000







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SEFTON AREA:
AStSWF
FIGURE B-1

LEGEND

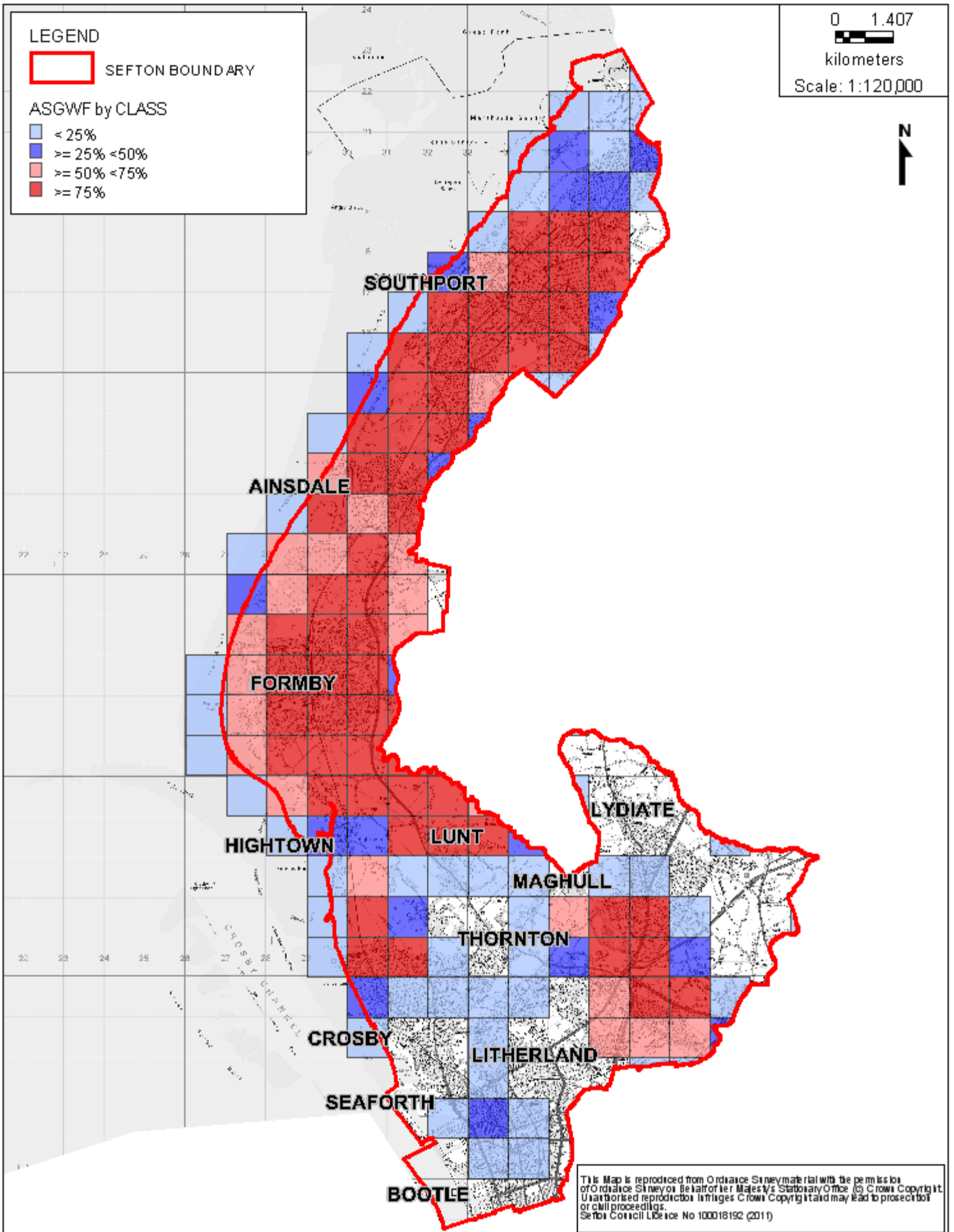
 SEFTON BOUNDARY

ASGWF by CLASS

-  < 25%
-  $\geq 25\%$ < 50%
-  $\geq 50\%$ < 75%
-  $\geq 75\%$

0 1.407

kilometers
Scale: 1:120,000



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SEFTON AREA:
ASGWF
FIGURE B-2

Sefton Council 

CAPITA SYMONDS

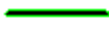
Appendix C Flood Risk Areas

Figure C-1 Agreed Indicative Flood Risk Areas

LEGEND



SEFTON BOUNDARY



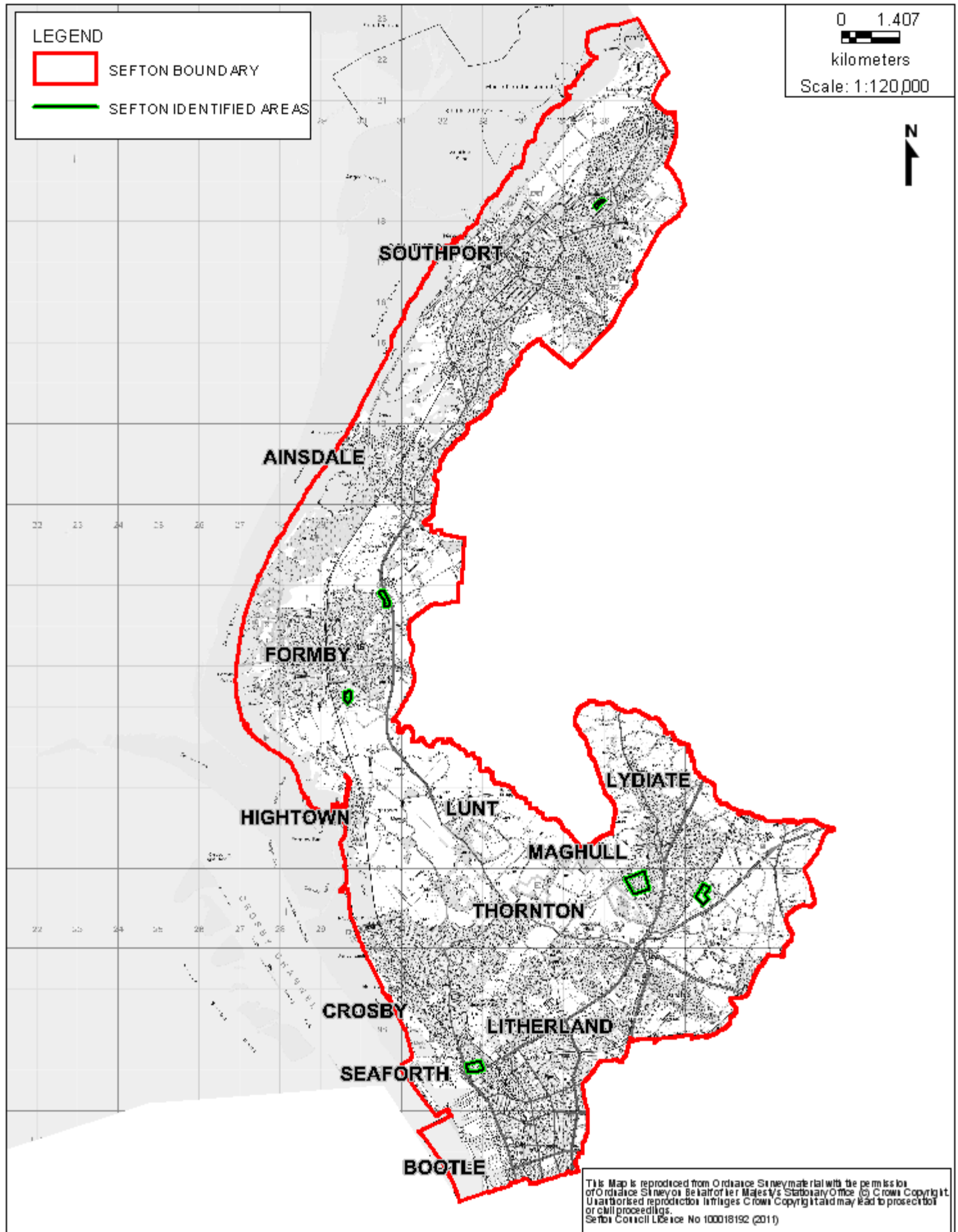
SEFTON IDENTIFIED AREAS

0 1.407



kilometers

Scale: 1:120,000



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**SEFTON AREA:
LOCAL FLOOD RISK AREAS
FIGURE C-1**

Sefton Council

CAPITA SYMONDS

Appendix D Review Checklist

Appendix E GIS Layer of Flood Risk Area(s)