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Sunderland City Council Level 1 Strategic Flood Risk Assessment

Final Report

June 2018

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Sunderland
City Council

Sunderland City Council
Jack Crawford House
Commercial Road
Sunderland
SR2 8QR

JBA Project Manager

Howard Keeble
 JBA Consulting
 Bank Quay House
 Sankey Street
 Warrington
 WA1 1NN

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Contract

This report describes work commissioned by Paul Armin, on behalf of Sunderland City Council, by a letter dated 27 September 2016. Sunderland City Council's representative for the contract was Paul Armin. Mike Williamson, Charlotte Lloyd-Randall, Tasmin Fletcher of JBA Consulting carried out this work.

The Level 1 SFRA was subsequently updated in May 2018 following Sunderland City Council adaptation of development site boundaries to avoid areas of flood risk. The report, screening spreadsheet and mapping have been updated to reflect these changes and are based on background mapping used in the original SFRA. The SFRA report also includes amend text and update web links.

Prepared by Michael Williamson BSc MSc EADA FRGS CGeog
 Chartered Senior Analyst

..... Charlotte Lloyd-Randall BSc
 Technical Assistant

..... Tasmin Fletcher BSc
 Technical Assistant

Reviewed by Howard Keeble MPhil BEng BSc CEng CEnv CSci
 CWEM MICE MCIWEM MCMI
 Technical Director

Purpose

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JBA Consulting has no liability regarding the use of this report except to Sunderland City Council.

Acknowledgements

JBA would like to thank all Sunderland City Council, Environment Agency and Northumbrian Water staff for their time and commitment to providing data and discussing the issues identified during the course of this study.

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Executive Summary

This Level 1 Strategic Flood Risk Assessment (SFRA) updates the previous Level 1 assessment published in 2010 using up-to-date flood risk information together with the most current flood risk and planning policy available from the National Planning Policy Framework¹ (NPPF) and Flood Risk and Coastal Change Planning Practice Guidance² (FRCC-PPG). Sunderland City Council (SCC) requires this update to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary. This will help to inform and to provide the evidence base for the Sunderland City Local Plan.

Sunderland City Council provided their latest potential sites data and information. An assessment of flood risk to all sites is provided to assist SCC in their decision-making process for sites to take forward as part of their Local Plan.

The aims and objectives of this SFRA update are:

- To form part of the evidence base and inform the Sustainability Appraisal (Incorporating the Strategic Environmental Assessment) for the council's Local Plan.
- To reflect current national policy documentation including the NPPF and its accompanying Flood Risk and Coastal Change Planning Practice Guidance to enable SCC to meet its obligations as defined by the NPPF.
- To supplement current policy guidelines and to provide a straightforward risk based approach to development management in the area.
- To make recommendations on the suitability of potential development sites based on flood risk for SCC's Local Plan.
- To understand current flood risk from all sources and any historic and future flood risk information to enable investigation and identification of the extent and severity of flood risk throughout the city. This assessment will enable SCC to steer development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To consider a precautionary approach to climate change.
- To provide guidance for developers and planning officers on planning requirements.
- To pay particular attention to surface water flood risk, using the Environment Agency's (EA's) third generation Risk of Flooding From Surface Water (RoFSW).
- To provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn to for initial advice and guidance.
- To develop a report that forms the basis of an informed development management process that also provides guidance on the potential risk of flooding associated with future planning applications and the basis for site-specific Flood Risk Assessments (FRAs) where necessary.
- To provide a suite of interactive GeoPDF flood risk maps illustrating the interaction between flood risk and potential development sites.
- To identify land required for current and future flood management that should be safeguarded as set out in the NPPF.

1 <http://planningguidance.planningportal.gov.uk/blog/policy/>

2 <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

One potential development site is shown to be at varying risk from fluvial flooding (Table 1-1). This table summarises the results of the Development Site Screening spreadsheet in Appendix B.

Error! Reference source not found. summarises the number of sites at risk from each flood zone as per the Environment Agency's Flood Map for Planning.

Potential Development Site	Number of sites within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
SHLAA 2108	165	0	0	0
Residential	12	0	0	0
Key Employment Areas	21	0	0	0
Primary Employment Areas	18	0	0	0
Port (one site)	1	1	1	0
Total	217	1	1	0

Development viability assessments for all potential sites are summarised through a number of strategic recommendations and the Development Sites Assessment spreadsheet in Appendix B. The strategic recommendations broadly entail the following:

- Strategic Recommendation A - consider withdrawing the site based on significant level of fluvial or surface water flood risk and site vulnerability;
- Strategic Recommendation B - Exception Test required if site passes Sequential Test;
- Strategic Recommendation C - consider site layout and design around the identified flood risk if site passes Sequential Test, as part of a detailed FRA or drainage strategy;
- Strategic Recommendation D - site-specific FRA required; and
- Strategic Recommendation E - site permitted on flood risk grounds due to little perceived risk, subject to consultation with the LPA / LLFA.

Out of the 217 sites provided for assessment by SCC, all but 1 have been removed from Flood Zones 2, 3a and 3b. The port site remains within Flood Zones 1, 2 and 3. No sites are recommended for withdrawal. In addition no sites are recommended for withdrawal based on significant surface water flood risk.

Included along with this report as part of the SFRA are:

- Detailed interactive GeoPDF maps showing all available flood risk information together with the potential development sites - Appendix A;
- Development Site Assessment spreadsheet detailing the risk to each site with recommendations on development - Appendix B;
- A note on the delineation of the functional floodplain following discussion and agreement between SCC and the EA - Appendix C; and
- Sunderland City Council Supporting Drainage Information Chart for Planning Applications - Appendix D.

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Abbreviations

ABD.....	Areas Benefitting from Defences
ACD	Area of Critical Drainage
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AStGWF.....	Areas Susceptible to Groundwater Flooding
CC.....	Climate change
CCA	Civil Contingencies Act
CDA	Critical Drainage Area
CFMP.....	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
CSO	Combined Sewer Overflow
DCLG	Department for Communities and Local Government
DPD	Development Plan Documents
DTM	Digital Terrain Model
EA	Environment Agency
FAA.....	Flood Alert Area
FCA.....	Flood Consequence Assessment
FCDPAG	Flood and Coastal Defence Project Appraisal Guidance
FCERM	Flood and Coastal Erosion Risk Management Network
FDGiA.....	Flood Defence Grant in Aid
FEH.....	Flood Estimation Handbook
FRA.....	Flood Risk Assessment
FRCC-PPG	Flood Risk and Coastal Change Planning Practice Guidance
FRM	Flood Risk Management
FRMP.....	Flood Risk Management Plan
FRMS.....	Flood Risk Management Strategy
FRR.....	Flood Risk Regulations
FSA	Flood Storage Area
FWA.....	Flood Warning Area
FWMA.....	Flood and Water Management Act
GI	Green Infrastructure
GIS.....	Geographical Information Systems
HFM	Historic Flood Map
IDB.....	Internal Drainage Board
LA.....	Local Authority
LDF	Local Development Framework
LFRMS.....	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
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MAFRP	Multi-Agency Flood Response Plan
NGO	Non-Governmental Organisation
NPPF	National Planning Policy Framework
NWL	Northumbrian Water Limited
PCPA	Planning and Compulsory Purchase Act
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RBMP	River Basin Management Plan
RMA	Risk Management Authority
RoFRS	Risk of Flooding from Rivers and the Sea Map
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SCC	Sunderland City Council
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SMP	Shoreline Management Plan
SoP	Standard of Protection
SPD	Supplementary Planning Documents
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UDP	Unitary Development Plan
uFMfSW	updated Flood Map for Surface Water
UKCIP02	UK Climate Projections 2002
UKCP09	UK Climate Projections 2009
WFD	Water Framework Directive

1 Introduction

Sunderland City Council (SCC) is a Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA). The LPA require a Level 1 Strategic Flood Risk Assessment (SFRA) to develop the evidence base for its Local Plan and to update the Sustainability Appraisal (SA). The LLFA, is responsible for managing flood risk from ordinary watercourses, surface water and groundwater whilst also being a statutory consultee on all major planning applications submitted to the LPA. SCC requires this updated Level 1 SFRA to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary using most up-to-date information and guidance. This will help to inform and provide the evidence base for the Council's new Local Plan.

1.1 Sunderland Level 1 SFRA

SCC commissioned JBA Consulting by letter dated 27 September 2016 to undertake an update of the existing Level 1 Strategic Flood Risk Assessment completed in June 2010. SCC is in the process of preparing its new Local Plan which will take forward a new spatial strategy for the area and will include the allocation of sites and detailed policies to guide development. As such, the Local Plan will play a direct role in delivering the regeneration and growth objectives which will be informed by this Level 1 SFRA update. The new Local Plan will consist of a Core Strategy and a separate Site Allocations Plan and will replace the Unitary Development Plan (UDP), originally adopted in 1998 and updated in 2007.

This update has been carried out in accordance with the Government's latest development planning guidance including the National Planning Policy Framework³ (NPPF) and flood risk and planning guidance called the Flood Risk and Coastal Change Planning Practice Guidance⁴ (FRCC-PPG). The latest guidance is available online via:

<http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change>

This SFRA assesses the spatial distribution of flood risk across the local authority area and provides the discussion and guidance required to put this information into practice when taking account of flood risk in development plans and the level of detail required for site specific Flood Risk Assessments (FRAs).

This SFRA makes use of the most up-to-date flood risk datasets (as provided at the start of the commission) to assess the extent of risk, at a strategic level, to potential development allocation sites identified by SCC. Included within the SFRA are this report together with appendices containing SFRA maps showing the potential sites overlaid with the latest, readily available, gathered flood risk information and a Development Site Assessment spreadsheet indicating the level of flood risk to each site following a strategic assessment of risk. This information will allow SCC to identify the strategic development options that may be applicable to each site and to inform on the need for the application of the Sequential Test.

1.2 Aims and Objectives:

The objectives of this Level 1 SFRA update are:

- To understand flood risk from all sources and to investigate and identify the extent and severity of flood risk throughout the area. This assessment will enable SCC to steer development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To form part of the evidence base and inform the Sustainability Appraisal (Incorporating the Strategic Environmental Assessment) for the council's new Local Plan.
- To make recommendations on the suitability of potential development sites based on flood risk for SCC's Local Plan.

³ <http://planningguidance.communities.gov.uk/blog/policy/>

⁴ <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

- To provide guidance for developers and planning officers dealing with applications as well as for the LLFA to fulfil its role including consultation on planning applications for the approval of Sustainable Drainage Systems (SuDS) schemes.
- To pay particular attention to surface water flood risk, using the EA's third generation updated Flood Map for Surface Water (uFMfSW) now known as Risk of Flooding Surface Water (RoFSW).
- To enable SCC to meet its obligations under the NPPF.
- To supplement current policy guidelines and to provide a straightforward risk based approach to development management.
- To provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn to for initial advice and guidance.
- To develop a report that forms the basis of an informed development management process that also provides guidance on the potential risk of flooding associated with future planning applications and the basis for site-specific Flood Risk Assessments (FRAs) where necessary.
- To identify land required for current and future flood management that should be safeguarded as set out in the NPPF.
- To advise on the site-specific applicability of SuDS for managing surface water runoff.
- To assist SCC in identifying specific locations where further and more detailed flood risk data and assessment work may be required as part of a Level 2 SFRA or sequential test, prior to the allocation of specific developments.

This report begins by outlining the connections between the planning framework and flood risk policy thus discussing legislation, planning policy, flood risk management policy and the roles and responsibilities of key stakeholders. All available sources of flood risk within the local authority area are then examined before an assessment of flood risk to the potential development sites. Conclusions and recommendations are cited at the end of the report.

1.3 SFRA Future Proofing

This SFRA has been developed using the most up-to-date data and information available at the time of commission.. The SFRA has been future-proofed as far as possible though the reader should always confirm specific requirements with SCC and that the latest information is being used as the basis for development and flood risk are being made. The Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG), alongside the NPPF, is referred to throughout this SFRA, being the current primary development and flood risk guidance information available at the time of the finalisation of this SFRA.

The EA would usually recommend updating an SFRA every three to four years, unless there is a significant flood affecting the area, in which case an immediate review should be undertaken.

This SFRA uses the EA's Flood Map for Planning version issued in November 2016 to assess fluvial and tidal risk to potential development sites. The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since November 2016 , via the following link:

<https://flood-map-for-planning.service.gov.uk/>

2 Study Area

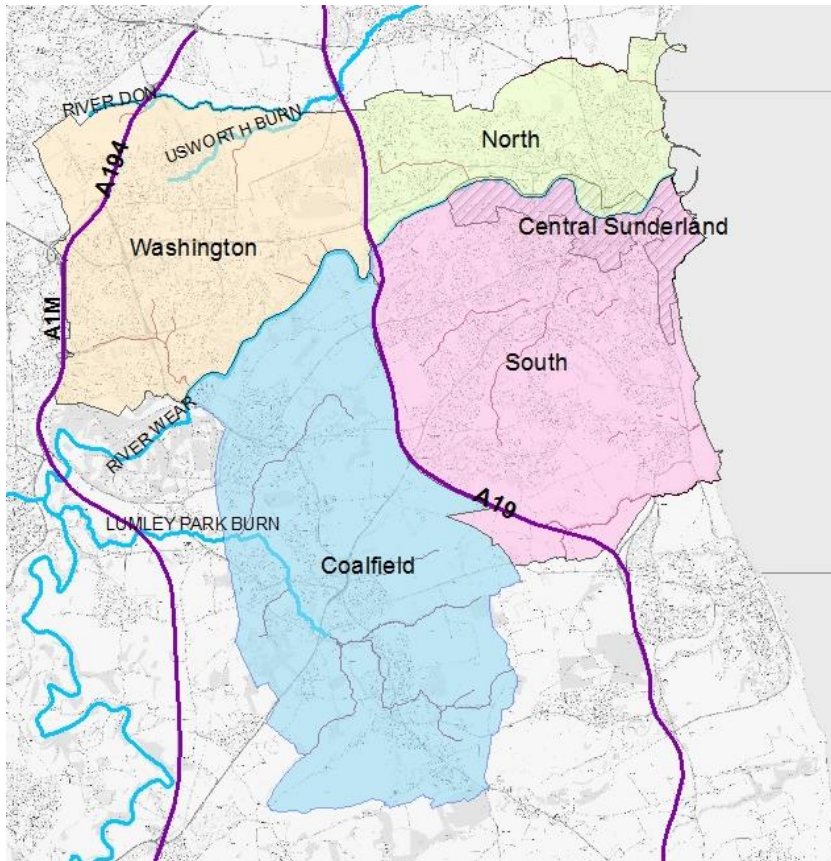
According to the 2011 census population estimates⁵, 275,506 people live in Sunderland. The area covers approximately 13,746 hectares of land and includes the City of Sunderland, where more than half of its population live, as well as the towns of Washington, Hetton-le-Hole and Houghton-le-Spring. The city has approximately 10km of coastline and also includes several parks and country parks. Historically, heavy industries such as coal mining and shipbuilding

⁵ <http://www.ons.gov.uk/ons/guide-method/census/2011/index.html>
SCC Level 1 SFRA

were dominant, but in more recent times new industries have replaced them, most notably the location of the Nissan car plant in Washington.

There are five main sub-areas within the city; North Sunderland, South Sunderland, Washington, Coalfield and Central Sunderland, which includes the city centre, illustrated Figure 2-1.

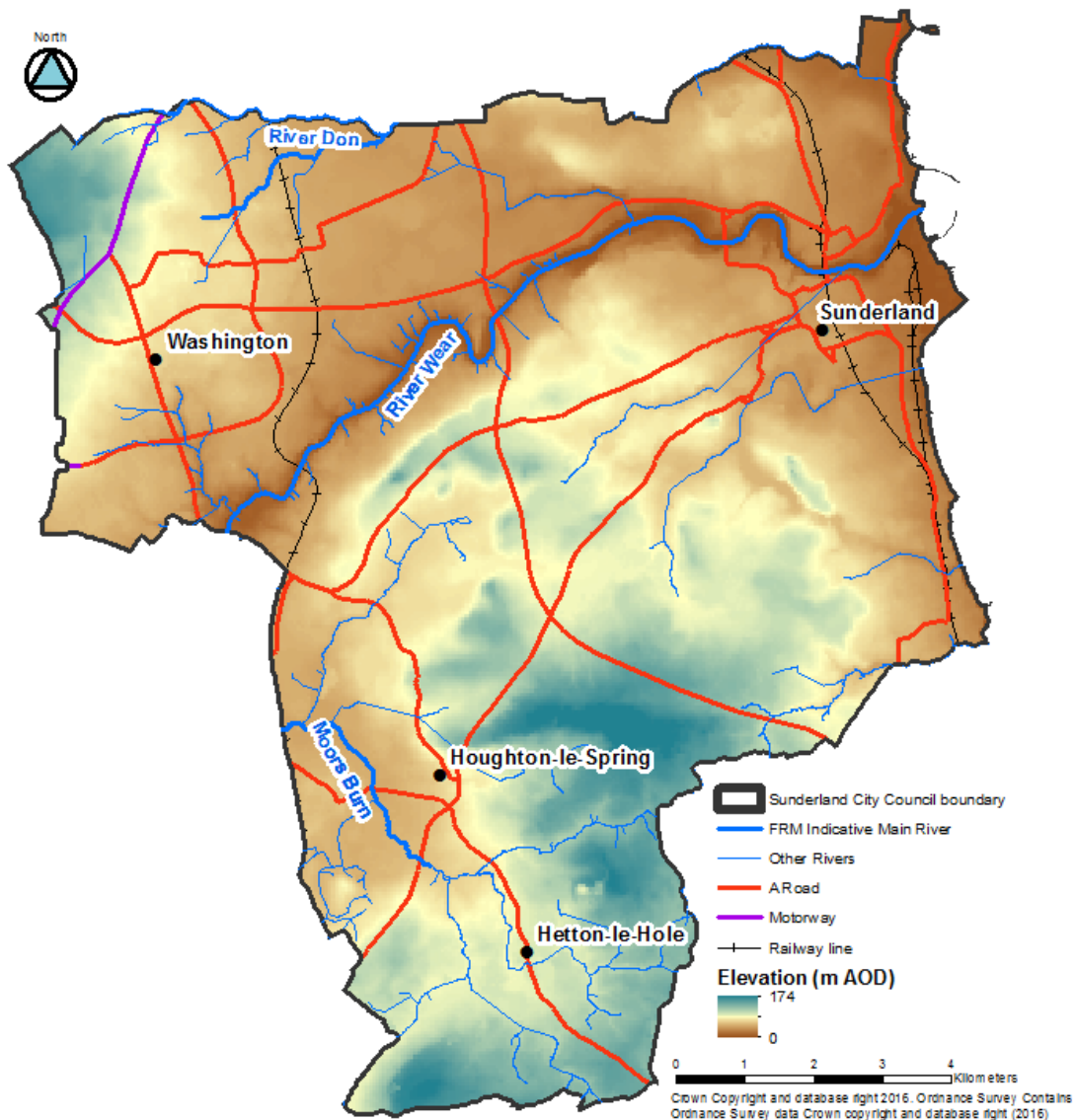
Figure 2-1 the main sub areas, within Sunderland



As illustrated by Figure 2-2 the Main Rivers in the city are the River Wear, which flows north-eastwards to the sea at Sunderland, the River Don which flows along the northern council boundary and the Lumley Park/Hetton Burn, which is a westward draining tributary of the Wear. The Wear is tidally influenced as far as Chester-le-Street weir, upstream of the City of Sunderland. There is risk of flooding in places such as Fatfield when extreme rainfall coincides with high tides. There are several ordinary watercourses, including the Herrington Burn which drains into the Lumley Park Burn, the Usworth Burn which joins the River Don. Ordinary watercourses are any watercourses that are not designated Main River. These watercourses can vary in size considerably and can include rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 2014) and passages, through which water flows. Some of these ordinary watercourses are not hydrologically connected to the Wear or Tyne catchments, such as the Hendon Burn which drains eastwards.

The topography of the area is characterised by the River Wear valley in the north and east of the city. To the south is an area of higher ground, from which rivers drain eastwards into the sea and westwards in the Lumley Park Burn. To the west, the bedrock geology predominantly consists of Pennine Middle Coal Measures - mudstone, siltstone and sandstone and the east of dolomitised limestone and dolomite. The bedrock is predominantly overlain by superficial deposits of till and lacustrine sediments.

Figure 2-2: SFRA study area



2.1.1 River Wear

The River Wear drains the North Pennine Moors between Killhope Law and Burnhope Seat. There are many streams in this area that eventually come together to form the start of the River Wear at Wearhead in County Durham. Two other major rivers also begin within 20 miles of this small area of uplands. These are the River Tees to the south and the River Tyne to the north.

2.1.2 River Don

The Don catchment covers an area of 48.9 km² in South Tyneside, Gateshead and Sunderland. The river forms part of the border between Sunderland and South Tyneside before flowing north-westerly towards Boldon. At this point, the river cuts back and flows north towards its confluence with the River Tyne at Jarrow.

The major tributaries to the Don include the Bede's Burn, Monkton Burn, Calfclose Burn and Usworth Burn. Flooding along the River Don in Gateshead is constrained to a small stretch of rural land placing no properties at risk.

2.1.3 Ordinary Watercourse Flooding

Sunderland contains around 26.5km of inland designated main rivers and another 37km of Ordinary Watercourses. Ordinary Watercourses are those that are not designated as Main River

and therefore come under the control of Sunderland City Council, who have Permissive Power to carry out works should this be deemed necessary. These Ordinary Watercourses will usually be a tributary to a main river (River Wear, Don, Lumley Park and Usworth Burn); however, those which are situated along the eastern side of Sunderland, will not be hydraulically connected to a main river and flow directly into the North Sea.

2.1.4 Hydrological Linkages

The Watercourses within Sunderland originate outside the Council's administrative boundary. Although it is likely that small land use changes within Sunderland will only have localised impact on river flows.

Figure 2-2 illustrates fluvial hydraulic linkages within the North East. Sunderland is mainly a Receiving & Contributing City. Upstream land use changes in the County Durham and Northumberland authority areas could influence fluvial flood risk along the watercourses. The main potential adverse impacts that future development may have on downstream areas are twofold:

- **Reduction in upstream floodplain storage capacity**
- **Reduction in rainfall infiltration and increased runoff**

These issues highlight the need for the North East Councils and the Environment Agency to work together through flood risk management, particularly where actions could exacerbate flooding in downstream communities (e.g. in the upper/middle reaches of the North and South Wear have important impacts on Sunderland).

The need for consistent regional development policies controlling runoff or development in floodplains within contributing areas is therefore crucial as this would have wider benefits for Tyne and Wear authorities as well as the City of Sunderland. This should be carried out by the successful implementation of the Sequential Test. Appropriate flood risk management policies will also be needed in the Local Plan.

Figure 2-3: North East hydrological linkages



Red = Receiving District, Orange = Receiving & Contributing District,
Green = Contributing District (pre 2009 district boundaries)

3 Understanding Flood Risk

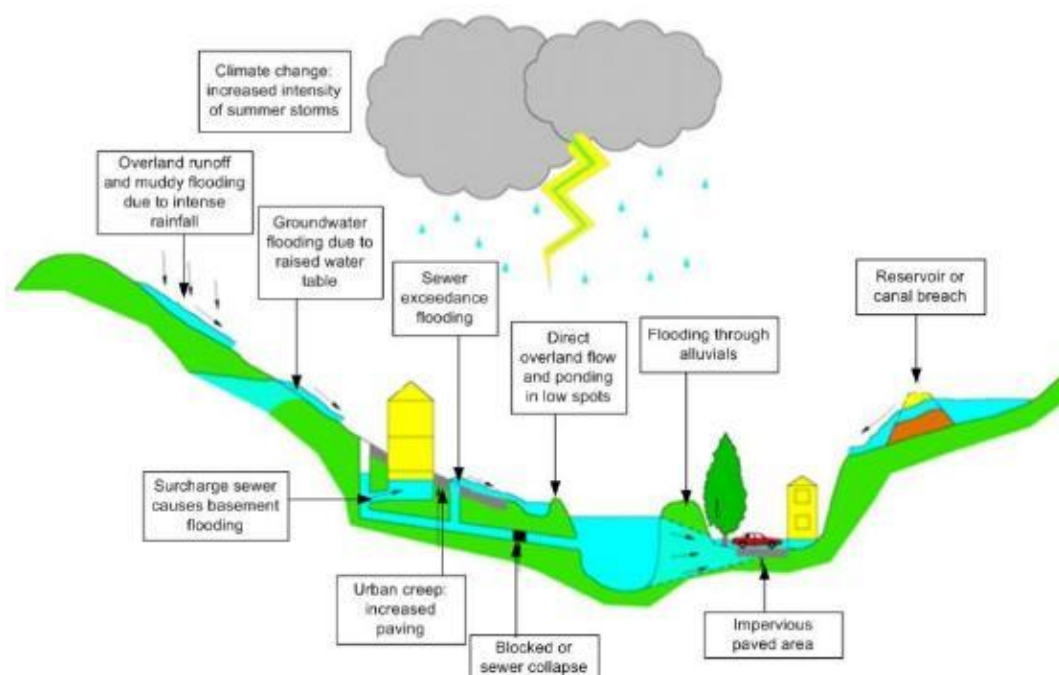
3.1 Sources of Flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways. Major sources of flooding (also see Figure 3-1) include:

- **Fluvial** (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- **Tidal** - sea; estuary; overtopping of defences; breaching of defences; other flows (e.g. fluvial surface water) that could pond due to tide locking; wave action.
- **Surface water** - surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc.)
- **Groundwater** - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- **Infrastructure failure** - reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

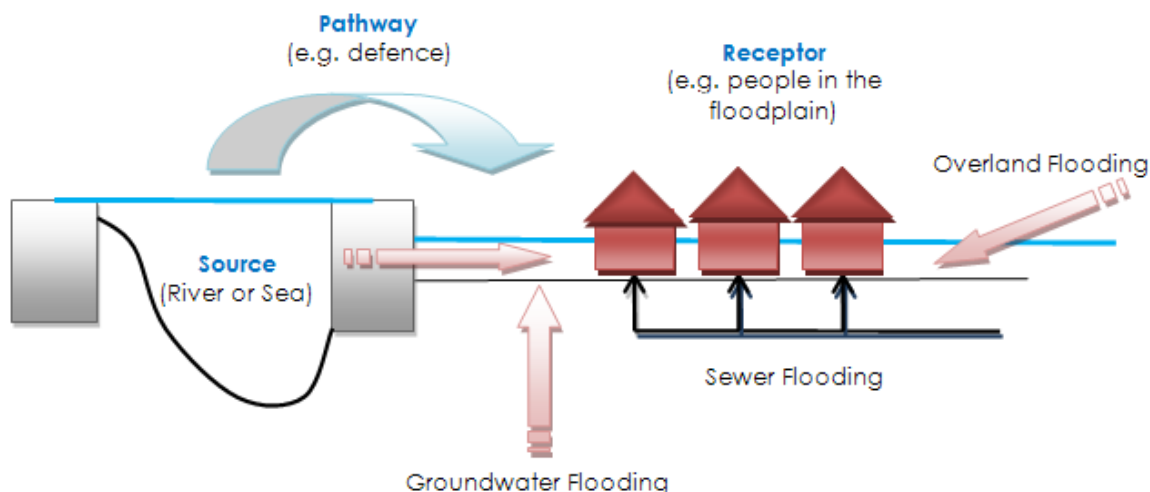
Figure 3-1: Flooding from all sources



3.2 Likelihood and Consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 3-2 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

Figure 3-2: Source-Pathway-Receptor Model



The principal sources are rainfall or higher than normal sea levels, the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets and the receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a consistent manner.

3.2.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years. Table 3-1 provides an example of the flood probabilities used to describe the fluvial and tidal flood zones as defined in the FRCC-PPG and as used by the EA in their Flood Map for Planning (Rivers and Sea).

Note that the flood zones shown on the Flood Map for Planning do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. The Flood Map for Planning can be accessed via:

<https://flood-map-for-planning.service.gov.uk/>

Table 3-1: NPPF Flood Zones⁶

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example:

- A 1% flood has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage
- And a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime

3.2.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

3.3 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

3.3.1 Actual Risk

This is the risk 'as is' taking into account any flood defences that are in place for extreme flood events (typically these provide a minimum Standard of Protection (SoP)). Hence, if a settlement lies behind a fluvial flood defence that provides a 1 in 100-year SoP then the actual risk of flooding from the river in a 1 in 100-year event is generally low. However, the residual risk may be high in that the impact of flood defence failure would likely have a major impact.

Actual risk describes the primary, or prime, risk from a known and understood source managed to a known SoP. However, it is important to recognise that risk comes from many different sources and that the SoP provided will vary within a river catchment. Hence, the actual risk of flooding from the river may be low to a settlement behind the defence but moderate from surface water, which may pond behind the defence in low spots and is unable to discharge into the river during high water levels.

⁶ Table 1, Flood Zones, Paragraph 065 of the Flood Risk and Coastal Change Planning Practice Guidance
SCC Level 1 SFRA

3.3.2 Residual Risk

Defended sites, located behind EA, SCC and private organisation flood defences remain at residual risk as there is a risk of overtopping or defence breach during significant flood events. Whilst the potential risk of failure may be reduced, consideration of inundation and the impact on development needs to be taken into account.

Paragraph 041 of the FRCC-PPG defines residual risk as:

"...those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- *The failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;*
- *failure of a reservoir, or;*
- *a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.*

Areas behind flood defences are at particular risk from rapid onset of fast-flowing and deep water flooding, with little or no warning if defences are overtopped or breached."

Even when flood defences are in place, there is always a likelihood that these could be overtopped in an extreme event or that they could fail or breach. Where there is a consequence to that occurrence, this risk is known as residual risk. Defence failure can lead to rapid inundation of fast flowing and deep floodwaters, with significant consequences to people, property and the local environment behind the defence. Whilst the actual risk of flooding to a settlement that lies behind a fluvial flood defence that provides a 1 in 100 SoP may be low, there will always be a residual risk from flooding if these defences overtopped or failed that must be taken into account. Because of this, it is never appropriate to use the term "flood free".

Developers must be able to demonstrate that development will be safe to satisfy the second part of the Exception Test (see Section 6.9.1). To that end, Paragraph 042 of the FRCC-PPG states:

"Where residual risk is relatively uniform, such as within a large area protected by embanked flood defences, the Strategic Flood Risk Assessment should indicate the nature and severity of the risk remaining, and provide guidance for residual risk issues to be covered in site-specific flood risk assessments. Where necessary, local planning authorities should use information on identified residual risk to state in Local Plan policies their preferred mitigation strategy in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications".

4 The Planning Framework and Flood Risk Policy

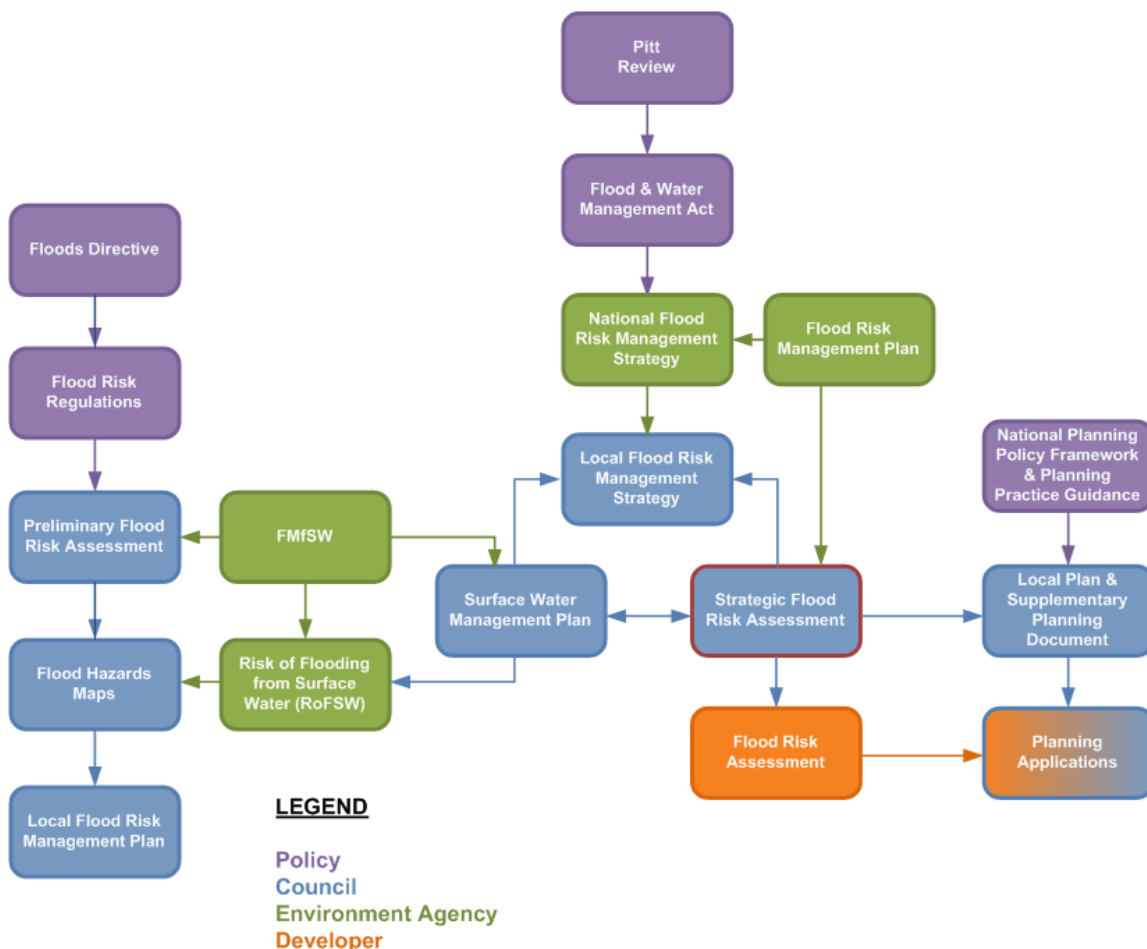
4.1 Introduction

The main purpose of this section of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of SCC's responsibilities and duty in respect to managing local flood risk including but not exclusive to the delivery of the requirements of the Flood Risk Regulations (FRR) 2009 and the Flood and Water Management Act (FWMA) 2010.

Figure 4-1 illustrates the links between legislation, national policy, statutory documents and assessment of flood risk. The figure shows that whilst the key pieces of legislation and policy are separate, they are closely related and their implementation should aim to provide a comprehensive and planned approach to asset record keeping and improving flood risk management within communities.

It is intended that the non-statutory SWMPs and SFRA can provide much of the base data required to support the delivery of the council's statutory flood risk management tasks as well supporting local authorities in developing capacity, effective working arrangements and informing Local Flood Risk Management Strategies (LFRMS) and Local Plans, which in turn help deliver flood risk management infrastructure and sustainable new development at a local level. This SFRA should be used to support SCC's Local Plan and to help inform planning decisions.

Figure 4-1: Key documents and strategic planning links with flood risk



4.2 Legislation

4.2.1 EU Floods Directive & the Flood Risk Regulations

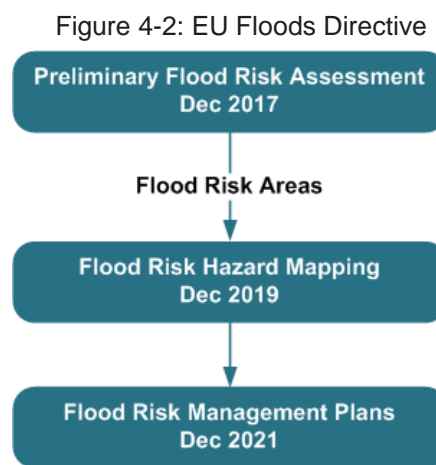
The European Floods Directive (2007) sets out the EU's approach to managing flood risk and aims to improve the management of the risk that floods pose to human health, the environment, cultural heritage and economic activity. The Directive was translated into English law by the Flood Risk Regulations (FRR) 2009 which require Lead Local Flood Authorities (LLFAs) and the EA to produce Flood Risk Management Plans (FRMPs).

The Directive puts in place a six-year cycle of producing Preliminary Flood Risk Assessments (PFRAs) with the aim of identifying significant Flood Risk Areas, prepare flood hazard and risk maps and prepare Flood Risk Management Plans (FRMPs). The first six-year cycle was completed in December 2015 and the second six year cycle is currently underway.

PFRAs should cover the entire area for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). Where significant Flood Risk Areas are identified using a national approach (and locally reviewed), the LLFA is then required to undertake flood risk hazard mapping and to produce Flood Risk Management Plans as illustrated in Figure 4-2.

The FRMP would need to consider objectives for flood risk management (reducing the likelihood and consequences of flooding) and measures to achieve those objectives.

The EA has implemented one of the exceptions for creating PFRAs, etc. for Main Rivers and coastal flooding, as they already have mapping (i.e. EA Flood Map for Planning (Rivers and Sea), Risk of Flooding from Rivers and Sea Map) and plans (i.e. CFMPs, SMPs) in place to deal with this. The EA has therefore focused their efforts on assisting LLFAs through this process.



4.2.2 Sunderland City Council Preliminary Flood Risk Assessment 2011

The SCC PFRA was published in 2011, as required by the FRR, and helped to determine whether there was a significant risk in the City, based on local flooding (surface water, groundwater and ordinary watercourses) and, if so, to identify the parts of the City affected by these risks. As explained previously, the PFRA process is cyclical and the process has already started and is due to be finished by 28th June 2017, this report should be based on the more detailed third generation Risk of Flooding from Surface Water (RoFSW) from the EA.

The PFRA found that there was insufficient evidence to identify past flood events that could be considered to have had 'significant harmful consequences'. The analysis of surface water, using the EA's Risk of Flooding from Surface Water (RoFSW), revealed that up to 29,128 properties could be at risk during a rainfall event with 0.5% annual exceedance probability (AEP). Using the EA's 1 km grid square assessment, two clusters were identified; the Washington and Sunderland clusters of 3400 and 8100 people respectively. However, neither cluster exceeded the threshold of 30,000 required for them to be identified as Flood Risk Areas. SCC was therefore not required to produce flood hazard maps, flood risk maps and flood risk management plans for that area.

4.2.3 Northumbria River Basin District Flood Risk Management Plan, 2016

Flood Risk Management Plans are designed to set out the risk of flooding from rivers, sea, surface water, groundwater and reservoirs and to detail how risk management authorities will work with communities to manage flood risk up to 2021 for this cycle. Both the River Basin Management Plan (Section 4.2.3.1) and FRMP have been developed by the EA in tandem to ensure that flood defence schemes can provide wider environmental benefits during the same six-year cycle. Both flood risk management and river basin planning form an important part of a collaborative and integrated approach to catchment planning for water. Each EU member country must produce FRMPs as set out in the EU Floods Directive 2007.

The Sunderland authority area is within the Wear Management catchment, and is within the Northumbria River Basin District which covers 9,029 km² and four catchments containing 2.78 million people. There are almost 13,000 people at high risk of surface water flooding (more than a 1 in 30 chance of being flooded in any year) and over 6,000 people are at high risk of flooding from rivers and sea with a high 1 in 30 chance of being flooded in any one year, within the Northumbria RBD. Figure 4-3 is an extract from the Northumbria RBD FRMP showing all the catchments within the RBD.

Figure 4-3 is an extract from the Northumbria RBD FRMP showing all the catchments within the RBD.

Figure 4-3: Overview of Northumbria RBD catchments



River Wear catchment

More than 620,000 people live within the CFMP area, the majority of residents live within the urban areas in the east of the catchment. The main source of flooding in the catchment is from the rivers, there are no known groundwater flooding problems. Given the large urban areas in the east of the catchment there are some instances of surface water flooding where intense rainfall can exceed the capacity of the urban drainage systems. The River Wear has a long and

varied flood history with reports as early as 1316 with regular floods recorded from the 1700s onwards in the Durham area. Due to the differences in the catchments between the main River Wear and the tributary river catchment, wide scale floods are rare and flooding generally occurs on either the Wear, or the tributaries, but rarely on both at the same time.

Figure 4-4, extracted from the Northumbria RBD FRMP, provides an overview of the River Wear catchment.

Figure 4-4: River Wear catchment



Various measures to help manage flood risk in the Wear catchment. Those that may apply to Sunderland include:

Prevention of risk:

- Developing a register of structures or features which are likely to have a significant effect on flood risk
- Seeking opportunities within the catchment for habitat creation opportunities and opportunities to improve floodplain connectivity.

Preparation for risk:

- Considering the vulnerability of key infrastructure such as roads, schools and community buildings

Protection from risk:

- Providing more natural flood storage within the catchment to reduce peak flows downstream
- Preparing suitable measures to ensure services and assets are resilient and are able to remain open or be open rapidly during and after flood events

Producing working with natural processes opportunity maps to show where such natural management measures could assist in reducing flood risk. Also maps showing how the catchment can both adapt and become more resilient to the impacts of climate change.

4.2.4 Flood & Water Management Act

The FWMA was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

4.2.5 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP). The SCC area is covered by the Northumbria River Basin Management Plan, managed by the EA and published in 2015. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The Northumbria RBMP, 2015, includes examples such as the Living Waterways project, whereby failing urban waterbodies have been targeted to reduce flood risk whilst also improving water quality, restoring habitats and reducing diffuse pollution.

The EA is responsible for monitoring and reporting on the objectives of the WFD on behalf of Government. They work with Government, Ofwat, local government, non-governmental organisations (NGOs) and a wide range of other stakeholders including local businesses, water companies, industry and farmers to manage water⁷.

The second management cycle of the WFD⁸ has already begun and the second river basin management plans were completed in 2015, building upon the first set of RBMPs completed in 2009.

The main responsibility for SCC is to work with the EA to develop links between river basin management planning and the development of Local Authority plans, policies and assessments. In particular, the programme of actions (measures) within the RBMP highlights the need for:

- Water Cycle Studies to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan implementation,
- Considering the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, including LDDs and Sustainable Community Strategies, and
- Promoting the wide scale use of SuDS in new development.

4.2.6 Northumbria River Basin District River Basin Management Plan

The Northumbria River Basin District RBMP, managed by the EA, has been updated since the first cycle in 2009. The latest version was published in December 2015. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The Northumbria RBMP includes such examples whereby land management techniques have been designed to reduce flood risk whilst also reducing sediment loss and improving water quality. The plan includes an assessment of river basin characteristics, a review of the impact on human activity, statuses of water bodies, and an economic analysis of water use and progress since the first plan in 2009.

⁷ <https://www.gov.uk/government/policies/improving-water-quality/supporting-pages/planning-for-better-water>

⁸ http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm

4.3 Planning Policy

4.3.1 Housing and Planning Act, 2016

The Act provides the statutory framework to build more homes that people can afford, expand home ownership, and improve housing management. The Act places a duty on local authorities to promote the development of starter homes, custom and self-build homes. The Act simplifies and speeds up the neighbourhood planning process to support communities that seek to meet local housing and other development needs through neighbourhood planning. In addition, the Act seeks to ensure that every area has a Local Plan, and gives the Secretary of State further powers to intervene if Local Plans are not effectively delivered.

The Secretary of State must also carry out a review of planning legislation, government planning policy and local planning policies, concerning sustainable drainage in relation to the development of land in England.

4.3.2 National Planning Policy Framework

The NPPF was published in March 2012, and is based on core principles of sustainability. It forms the national policy framework in England and is accompanied by a number of Planning Practice Guidance notes. It must be taken into account in the preparation of Local Plans and is a material consideration in planning decisions. Section 10 Paragraph 100 of the NPPF states that Local Plans...

“...should be supported by a Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by applying the Sequential Test, if necessary applying the Exception Test, safeguarding land from development that is required for current and future flood management, using opportunities offered by new development to reduce the causes and impacts of flooding and where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long term, seeking opportunities to facilitate the relocation of development including housing to more sustainable locations”.

The Sequential Test must be performed when considering the placement of future development and for planning application proposals. The Sequential Test is used to direct all new development to locations at the lowest probability of flooding. It states that development should not be permitted or allocated if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding.

The Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG) sits alongside the NPPF and sets out detailed guidance on how this policy should be implemented.

4.3.3 Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG)

On 6 March 2014, the Department for Communities and Local Government (DCLG) launched their planning practice guidance, including guidance for flood risk and coastal change, which replaces the previous Technical Guidance. This new guidance is available as a web-based resource⁹, which is accessible to all and is regularly updated. Whilst the NPPF concentrates on high level national policy, the FRCC-PPG is more detailed. The practice guidance advises on how planning can take account of the risks associated with flooding and coastal change in plan making and the development management process. This is in respect of Local Plans, SFRAs, the sequential and exception tests, permitted development, site-specific flood risk, Neighbourhood Planning, flood resilience and resistance techniques and the vulnerability of development to make development safe from flooding.

⁹ <https://www.gov.uk/guidance/flood-risk-and-coastal-change>
SCC Level 1 SFRA

4.3.4 Localism Act

The Localism Act was given Royal Assent in November 2011 with the purpose of shifting power from Central Government back to local councils, communities and individuals. The Government abolished Regional Spatial Strategies, providing the opportunity for councils to re-examine the local evidence base and establish their own local development requirements for employment, housing and other land uses through the plan making process.

Additionally, this act places a duty to cooperate on local authorities, including statutory bodies and other groups, in relation to the planning of sustainable development. This duty to cooperate requires local authorities to:

“...engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter.” (Provision 110).

This act, together with the Neighbourhood Planning (General) Regulations 2012, also provides new rights to allow Parish or Town Councils to deliver additional development through neighbourhood planning (Neighbourhood Plans). This means local people can help decide where new homes and businesses should go and what they should look like. Local planning authorities can provide technical advice and support as neighbourhoods draw up their proposals. Neighbourhood Plans have a number of conditions and requirements as set out in the NPPF. Also refer to Paragraph 061-064 of the FRCC-PPG for information on neighbourhood planning and flood risk.

4.3.5 Local Plan

A Local Plan¹⁰ is a statutory document prepared in consultation with the local community. It is designed to promote and deliver sustainable development. Local Plans have to set out a clear vision, be kept up to date and to set out a framework for future development of the local area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure as well as safeguarding the environment and adapting to climate change and securing good design.

Local plans set the context for guiding decisions and development proposals and along with the NPPF, set out a strategic framework for the long-term use of land and buildings, thus providing a framework for local decision making and the reconciliation of competing development and conservation interests.

The NPPF states that Local Plans should be supported by a SFRA and should take account of advice provided by the EA and other flood risk management bodies. The SFRA should be used to ensure that when allocating land or determining planning applications, development is located in areas at lowest risk of flooding. Policies to manage, mitigate and design appropriately for flood risk should be written into the Local Plan, informed by both the SFRA and Sustainability Appraisal.

4.3.6 Sunderland Local Plan

Sunderland City Council is in the process of preparing a new Local Plan for the City. The Local Plan will comprise of three key documents; a Core Strategy and Development Management Plan, which will set out the overarching spatial strategy for development within the city over the plan period from 2015-2033, as well as containing more specific detailed Development Management policies; a separate Allocations and Designations Plan which will make the site specific allocations necessary to deliver the Core Strategy, and; an International Advanced Manufacturing Park (IAMP) Area Action Plan, which was prepared jointly with South Tyneside to enable the delivery of a new International Advanced Manufacturing Park on land to the north of the existing Nissan car manufacturing plant. This IAMP Area Action Plan was adopted in November 2017.

The Core Strategy and Development Management Plan sets the strategic planning framework for the city and includes housing allocation sites currently in the Green Belt.

¹⁰ Town and Country Planning, England. The Town and Country Planning (Local Planning) (England) Regulations 2012
SCC Level 1 SFRA

4.3.7 Sustainability Appraisal

The Sustainability Appraisal (SA) is a key component of the Local Plan evidence base, ensuring that sustainability issues are addressed during the preparation of local plans. The SA is a technical document which has to meet the requirements of the Strategic Environmental Assessment Directive 2001/42/EC which assesses and reports on a plan's potential impact on the environment, economy, and society. The SA carries out an assessment of the draft policies at various stages throughout the preparation of the Local Plan, and does this by testing the potential impacts, and consideration of alternatives are tested against the plan's objectives and policies. This ensures that the potential impacts from the plan on the aim of achieving sustainable development are considered, in terms of the impacts, and that adequate mitigation and monitoring mechanisms are implemented.

In October 2015 consultation was undertaken on a SA Scoping Report with Natural England, English Heritage, the EA and a number of other key organisations. A SA of Growth Options was produced in March 2016, taking into account the comments received at the Scoping Stage¹¹. This report started the process of developing and refining alternative growth options and also assessing the effects of these options and discussing potential mitigation measures. A full SA report has been produced to support preparation of the revised Core Strategy and Development Management Plan. The SA has been updated to reflect the Publication Draft of the Plan.

The SA Growth Options report states the following sustainability objective in relation to flood risk:

'To Reduce the risk of flooding and coastal erosion to people and property, taking into account the effects of climate change'.

This SFRA will assist SCC in achieving this objective.

4.4 Flood Risk Management Policy

4.4.1 Core Strategy and Development Management Policies

The current Publication draft Core Strategy and Development Management Plan, referred to in Section 4.3.5, sets out a number of draft policies which include consideration of flood risk. The following policies specifically address flood risk and water management issues.

4.4.2 Flood Risk and Coastal Management

To reduce flood risk and ensure appropriate coastal management, development:

- should follow the sequential approach to determining the suitability of land for development, directing new development to areas at the lowest risk of flooding and where necessary applying the exception test, as outlined in national planning policy;
- will be required to demonstrate, where necessary, through an appropriate Flood Risk Assessment (FRA) that development will not increase flood risk on site or elsewhere, and if possible reduce the risk of flooding;
- will be required to include or contribute to flood mitigation, compensation and/or protection measures, where necessary, to manage flood risk associated with or caused by the development;
- should comply with the Water Framework Directive by contributing to the Northumbria River Basin Management Plan;
- will maintain linear coastal flood defences north from Hendon Sea Wall to Seaburn, and managed coastal retreat on the Heritage Coast and north of Seaburn;
- which would adversely affect the quantity of surface or groundwater flow or ability to abstract water must demonstrate that no significant adverse impact would occur, or mitigation can be put in place to minimise this impact; and
- of additional river flood defences must demonstrate that the proposal represents the most sustainable response to a particular threat.

¹¹https://www.sunderland.gov.uk/media/19876/Draft-Core-Strategy-and-Development-Plan/pdf/Draft_Core_Strategy_and_Development_Plan.pdf

4.4.3 Water Management

Development must consider the effect on flood risk, on-site and off-site, commensurate with the scale and impact. Development must:

- be accompanied by a Flood Risk Assessment (where appropriate), to demonstrate that the development, including the access, will be safe, without increasing or exacerbating flood risk elsewhere and where possible will reduce flood risk overall;
- demonstrate that they pass the Sequential Test and if necessary the Exceptions Test in flood Zones 2 and 3;
- discharge at greenfield runoff rates for the 1 in 1 and 1 in 100 flood events plus the relevant climate change allowance for greenfield and brownfield sites in accordance with the latest Local Flood Risk Management Strategy;
- incorporate a Sustainable Drainage System (SuDS) to manage surface water drainage. Where SuDS are provided, arrangements must be put in place for their whole life management and maintenance;
- separate, minimise and control surface water runoff by discharging in the following order:
 - to an infiltration or soak away system;
 - to a watercourse (open or closed);
 - to a surface water sewer; then
 - to a combined sewer.
- However, if sites are within 250m of a tidal estuary or the sea, surface water can be discharged directly);
- ensure adequate protection where sites may be susceptible to over land flood flows (as shown in the Strategic Flood Risk Assessment) or lie within a Surface Water Risk Area (as shown on the Environment Agency flood maps);
- incorporate allowance for climate change in accordance with the latest Environment Agency Guidance;
- make developer contributions, where needed, to ensure that the drainage infrastructure can cope with the capacity needed to support proposed new development;
- demonstrate control of the quality of surface water runoff during construction and for the lifetime of the development. For all developments the management of water should be an intrinsic part of the overall development; and
- not have a detrimental impact on the city's water resources, including the Magnesian Limestone Aquifer and its ground source protection zones. Development along the River Wear and coast should take account of the Northumbria River Basin Management Plan, to deliver continuing improvements in water quality.

4.4.4 Sunderland City Council Level 1 SFRA (June 2010)

The 2010 Level 1 SFRA was commissioned by SCC to undertake a review and update of the existing SFRA. The study analysed current and future flooding issues in order to support LPA assessment of specific development allocation sites.

The assessment identified Critical Drainage Areas (CDAs) at Barnes Burn, Hendon Burn, Houghton/Hetton, Herrington, Seaburn/Roker and Washington Central. These areas were determined by combining Northumbria Water drainage areas with a high risk of surface water flooding and those which have a high risk from other flood sources. The report also made a number of key recommendations which are still current within this update, including:

- SCC should avoid allocating any developments in flood risk areas and should carry out the Sequential Test;
- FRAs are required for developments sites with areas greater than 0.5 ha that are within Critical Drainage Areas;
- Any mitigation or SuDS techniques adopted in Washington should be considered strategically;

4.4.5 Flood Risk Management Plans

Flood risk management plans (FRMPs) explain the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs with each FRMP covering a specific river basin district. FRMPs set out how risk management authorities, including the EA and LLFAs, will work with communities to manage flood risk over the current period 2015 - 2021. Each EU member country must produce FRMPs as set out in the EU Floods Directive 2007.

The Northumbria FRMP¹² is within the Northumbria River Basin District which covers approximately 9,000 square kilometres from the Scottish border to just south of Guisborough and from the Pennines to the North Sea. SCC was not required to produce a FRMP for its own area following the PFRA process whereby significant flood risk areas were not identified.

The area covered by SCC lies primarily within the River Wear catchment, however a small section of the City lies within the catchment of the River Don, a tributary of the River Tyne. Therefore, both the Wear Catchment Flood Management Plan (CFMP)¹³ and the Tyne CFMP¹⁴ policies are relevant in this study.

The CFMPs contain useful information about how the catchments work, previous flooding and the sensitivity of the river systems to increased rainfall. The EA may draw on the evidence and previous proposals set out in the CFMPs to help develop the FRMP.

4.4.6 National and Local Flood Risk Management Strategies

As presented in Figure 4-1 in Section 4.1, the FWMA establishes how flood risk will be managed within the framework of National Strategies for England and Local Strategies for each LLFA area.

The National Strategy for England has been developed by the EA with the support and guidance of Defra. It sets out principles for how flood risk should be managed and provides strategic information about different types of flood risk and which organisations are responsible for their effective management. The Act requires risk management authorities (local authorities, sewerage companies and highways authorities) to work together and act consistently with the National Strategy in carrying out their flood and coastal erosion risk management functions effectively, efficiently and in collaboration with communities, business and infrastructure operators to deliver more effective flood risk management.

LLFAs have responsibility for developing a Local Flood Risk Management Strategy (LFRMS) for their area covering local sources of flooding (see Table). The local strategy produced must be consistent with the National Strategy. The local strategy should set out the framework for local flood risk management functions and activities and should raise awareness of local organisations with responsibilities for flood risk management in the area. The strategy should also facilitate partnership arrangements to ensure co-ordination between local organisations and an assessment of flood risk and plans and actions for managing risk, as set out under section 9 of the FWMA.

The following link provides links to guidance for RMAs and local authorities on various subjects of flood risk management, including tools to support LLFAs in developing their LFRMS:

<https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities>

12
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/507123/LIT_10200_NORTHUMBRIA_FRMP_SUMMARY_DOCUMENT.pdf

13
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289186/River_Wear_Catchment_Flood_Management_Plan.pdf

13
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289171/River_Tyne_Catchment_Flood_Management_Plan.pdf

4.5 Sunderland City Council Local Flood Risk Management Strategy

A LFRMS was produced in April 2016. The Strategy sets out how SCC will manage risk from all types of flooding such as surface water runoff, groundwater and ordinary watercourses for which the City Council has a responsibility as LLFA, and other types of flooding where local agents can play a supporting role to lead agencies.

The LFRMS has eight key objectives set for each of the social, economic and environmental indicators.

Social objectives:

- Reduce the risk to people by understanding the current and future flood risk so that measures can be targeted at those most at risk
- Minimise the impact of local flooding on communities
- Manage the impact of new development on flood risk to communities and the environment
- Reduce the flood risk to critical services and infrastructure

Economic objectives:

- Reduce the risk to the economy by understanding current and future flood risk so that measures can be targeted in the most cost beneficial way
- Ensure investment in FCERM does not hinder but promotes economic growth in a sustainable way

Environmental objectives:

- Promote schemes that have multiple environmental benefits
- Reduce the impact of flood risk on the environment and cultural heritage

Planning objectives:

- Allowing space for surface water flood flows (and SuDS) during development planning
- Increase sustainable development and effective planning of flood risk infrastructure along with consideration of flood risk management in core planning principles to meet existing challenges and future needs.

The Strategy will be implemented through an Action Plan, which will involve working with other RMAs across Sunderland. Community involvement is also an important aspect. The Strategy is currently in the consultation phase, after which a final Strategy will be adopted.

4.5.1 River Don Partnership, Don Integrated Catchment Project, June 2016

River Don Partnership launched January 2016 as a sub-partnership of the Tyne Catchment Partnership, to represent partner interests and steer delivery of the Don Integrated Catchment Project.

The partnership was born out of the Tyne Catchment Partnership which recognised the need for improvements under the Water Framework Directive, the prioritisation of the catchment for internal drainage studies by NIDP and the plans for large scale developments in the upper Don catchment. In January 2016, funding provided by Northumbrian Water (NW) to Durham Wildlife Trust (DWT) to initiate a project on the Don to improve river water quality, allowed the formation of the River Don Partnership, led by DWT working closely with the Local Nature Partnership (LNP).

In April, the EA set up a meeting to discuss potential additions to the flood risk Medium Term Plan (MTP), at which partners discussed the various interests and opportunities, and the potential for taking a more strategic approach to drainage for the Don which could tackle integrated flood risk whilst also incorporating multiple environmental benefits.

The objectives of the Partnership are to deliver a catchment approach to resolving issues and planning improvements; to maximise benefits; to mitigate development pressures; to combine and share knowledge, resources and skillsets; and to integrate and align multiple funding opportunities.

In terms of flood risk, the River Don Catchment Vision includes:

- Gathering the information required to assess the contribution to flood risk of river, surface water and sewer flows.
- Allowance for the attenuation of water in the wider landscape through natural flood management and the creation of floodplain habitat.
- Removal or modification of culverts where these act as a constraint to flows, thereby reducing the flood risk to properties and infrastructure.
- Identification of opportunities to implement surface water management through well designed SuDS that provide multifunctional benefits within new developments.
- Improving the resilience of the catchment to the predicted effects of climate change, increasing the capacity of the river to manage the impacts of high flows.

4.5.2 River Don Integrated Catchment Study, 2017

This study is in progress at the time of writing and is funded by the local levy fund. Its focus is on identifying issues and opportunities to improve flood management, water quality, ecology, supporting growth and mitigation for climate change.

4.5.3 River Tyne to Flamborough Head Shoreline Management Plan 2

The River Tyne to Flamborough Head Shoreline Management Plan (SMP) was adopted by SCC in 2007 and provides a broad-scale assessment of the management issues along this stretch of coastline. Management areas MA06, MA07 and MA08 fall within the SCC area. The plan includes the major refurbishment works and reconstruction of the linear defences over the southern extent of the Council's area, as well as making monitoring recommendations, which have now been completed.

4.5.4 International Advanced Manufacturing Park Flood Risk and Water Management Report 2016

This report forms part of the evidence base for the Area Action Plan (AAP) for the International Advanced Manufacturing Park (IAMP), to be located on greenfield land to the north of the existing Nissan car manufacturing plant in Washington. Because of the proximity to the council boundary, the development is a partnership between Sunderland and South Tyneside Councils. The IAMP is a 150ha development and is designated as a Nationally Significant Infrastructure Project, due for completion by 2027.

The report identifies the main flood risk to the development as being from the River Don, with key areas at North Moor Farm and Hylton Bridge which are likely to be flooded in the 5% AEP event. There is deemed to be some risk from surface water flooding due to the impermeable nature of superficial deposits, as well as localised risk from overflowing drains and land-drain culvert blockages.

Key water management issues to be addressed during the development of the IAMP include:

- Managing flood risk from large paved areas
- Controlling runoff from new built development
- The ability to be able to Cross the River Don clear of predicted flood levels
- Managing water quality of development runoff

The scheme also offers potential to improve the river channel and to create wetland/water habitats. At the time of writing, a site-specific FRA is being undertaken by the scheme promoter.

4.5.5 Surface Water Management Plans

In June 2007, widespread extreme flooding was experienced in the UK. The Government review of the 2007 flooding, chaired by Sir Michael Pitt recommended that...

"...Local Surface Water Management Plans (SWMPs) ... coordinated by local authorities, should provide the basis for managing all local flood risk."

The Government's guidance document¹⁵ 2011 for SWMPs defines a SWMP as:

- *A framework through which key local partners with responsibility for surface water and drainage in their area, work together to understand the causes of surface water flooding and agree the most cost-effective way of managing surface water flood risk.*
- *A tool to facilitate sustainable surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences.*
- *A plan for the management of urban water quality through the removal of surface water from combined systems and the promotion of SuDS.*

As a demonstration of its commitment to SWMPs as a structured way forward in managing local flood risk, Defra announced an initiative to provide funding for the highest flood risk authorities to produce SWMPs. *No high risk locations were identified in the Sunderland City as part of this process.*

4.5.6 Flood Risk Partnerships and Partnership Plans

SCC has been involved in the development of a number of partnerships designed to provide collaboration between public agencies, businesses and the community. Partnerships and plans that affect the City (see Section 0 on Emergency Planning for more information) include:

- The Flood and Coastal Erosion Risk Management Group - set up to plan and deliver the requirements of the FWMA with representatives from departments including Emergency Planning, Finance, Planning Strategy, Planning Development Control, Highways and Transportation.
- Tyne and Wear Strategic Flood Risk Management Group – this group is made up from the five Tyne and Wear Councils. The Group meets quarterly to discuss related planning and flood risk issues.
- Northumbrian Water – SCC has quarterly operational liaison meetings with NW to discuss local flooding and planning issues.
- North East Coastal Group (NECG) – this group of coastal representatives meet with the EA to discuss local issues and identify how the RFCC can assist with the issues raised.
- Key businesses – SCC has ongoing relations with major land owners, employers and organisations including Sunderland Port.
- Northumbria Local Resilience Forum (NLRF)
- Northumbria Regional Flood and Coastal Committee
- Northumbria Integrated Drainage Partnership (NIDP) - LLFA, EA and NWG meet quarterly to discuss issues.

4.5.7 Green Infrastructure Assessments

Open space, or Green Infrastructure (GI), should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities and should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

Open space can provide many social, economic and environmental benefits close to where people live and work including:

- Places for outdoor relaxation and play;
- Space and habitat for wildlife with access to nature for people;
- Environmental education;
- Local food production - in allotments, gardens and through agriculture;
- Improved health and well-being – lowering stress levels and providing opportunities for exercise;
- Climate change adaptation - for example flood alleviation and cooling urban heat islands.

¹⁵ Surface Water Management Plan Technical Guidance - <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>

The NPPF explains that open space can perform many functions, including flood risk mitigation, and that Local Plans should account for increased flood risk, resulting from climate change, through the planning of Green Infrastructure. GI can have an important role to play in reducing the likelihood of flooding by providing space for flood storage, reducing runoff and increasing infiltration, whilst also providing other benefits as stated above.

Alongside GI should be the implementation of SuDS, specifically within potential development sites, where possible. The suitability of GI and SuDS can be informed by this SFRA through utilisation of open space for water in the areas of greatest flood risk, which would be key to helping deliver sustainable development. Examples include:

- Restoration of the natural character of floodplains;
- Keeping and preserving of areas of existing natural floodplain;
- Introduction of new areas and enhancing existing areas of greenspace whilst incorporating sustainable drainage within new development;
- Reduction of downstream flood risk.

The Town and Country Planning Association together with The Wildlife Trusts produced a guidance document for Green Infrastructure. The guidance states that local plans should identify funding sources for GI and provision should be made for GI to be adequately funded as part of a development's core infrastructure. For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. LPAs may include capital for the purchase, design, planning and maintenance of GI within the Community Infrastructure Levy (CIL) programme.

4.5.8 Sunderland Green Infrastructure Strategy Framework 2011

The GI Strategy Framework is an integral part of the process towards developing a GI Strategy, which will support the final Core Strategy as part of the Local Plan. The Framework identifies the main GI issues in Sunderland and suggests a number of provisional principles on which to base the GI Strategy. The ultimate aim of this SPD will be to establish a vision for GI in Sunderland and to provide guidance on policy and successful integration of a GI network in the city. The council are currently updating this GI strategy.

4.5.9 Sunderland Greenspace Audit and Report 2012

Published in July 2013, this audit is based on what is stated in the NPPF in that planning policies should be based on robust and up-to-date assessments of the needs for open space. The audit does not discuss the availability of greenspace for flood risk management, though several of the greenspace typologies that are listed could potentially be used for the temporary storage of flood water. A site-specific investigation would be required. The Greenspace Audit is presently being updated in 2017. This report, together with the emerging Green Infrastructure Strategy, can identify sites that can support flood risk and water management initiatives across the city.

4.5.10 Natural Flood Management and Working with Natural Processes

Natural Flood Management (NFM) or Working with Natural Processes (WwNP) is a type of flood risk management used to protect, restore and renaturalise the function of catchments and rivers to reduce flood and coastal erosion risk. WwNP has the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible and to increase the lifespan of existing flood defences. NFM and WwNP are used interchangeably in the UK though the term WwNP used throughout this report.

A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). WwNP involves taking action to manage flood and coastal erosion risk by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts. Techniques and measures, that may be applicable, include:

- Peatland and moorland restoration in upland catchments
- Re-meandering streams
- Targeted woodland planting

- Reconnection and restoration of functional floodplains
- Restoration of rivers and removal of redundant structures
- Installation or retainment of large woody material in river channels
- Improvements in management of soil and land use
- Creation of rural and urban SuDS

Both the European Commission and UK Government are actively encouraging the implementation of WwNP measures within catchments and coastal areas in order to assist in the delivery of the requirements of various EC Directives relating to broader environmental protection and national policies. It is fully expected that the sustained interest in WwNP implementation across the UK will continue in the post-Brexit era as a fundamental component of the flood risk management tool kit.

4.5.11 Mapping the potential for WwNP

JBA Consulting has been working with the EA and Lancaster Environment Centre (LEC) to update national maps of Potential for Working with Natural Processes. LEC has developed a new spatial model of slowly permeable soils to identify areas where shrub or tree-planting could increase hydrological losses and slow the flow based on British Geological Survey (BGS) 1:50k maps, who have also agreed to an open government license for the maps. The new national maps for England make use of different mapping datasets and highlight potential areas for tree-planting (for three different types of planting), runoff attenuation storage, gully blocking, and floodplain reconnection. The maps can be used to signpost areas of potential, and do not take into account issues such as land-ownership and drainage infrastructure, but they may well help start the conversation and give indicative estimates of, for example, additional distributed storage in upstream catchments.

Interactive mapping showing the potential for WwNP is available for all river basin districts, via:

<http://wwnp.jbahosting.com/>

These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps, however it is a useful tool to help start dialogue with key partners. The maps are provided as spatial data for use in GIS and also interactive GeoPDF format, supported by a user guide and a detailed technical guide.

4.5.12 Limitations

The effectiveness of WwNP measures is site-specific and depends on many factors, including the location and scale at which they are used. It may not always be possible to guarantee that these measures alone will deliver a specified standard of defence. Consequently, flood risk management measures should be chosen from a number of options ranging from traditional forms of engineering through to more natural systems. The research gaps that need to be addressed to move WwNP into the mainstream are identified in the evidence directory.

4.6 Roles and Responsibilities

The responsibilities for the Risk Management Authorities (RMA) under the Flood and Water Management Act and the Flood Risk Regulations are summarised below.

4.6.1 EA as a RMA

- Has a strategic overview role for all forms of flooding;
- Has the power to request information from any partner in connection with its risk management functions;
- Must exercise its flood or coastal erosion risk management functions in a manner consistent with the National Strategy and Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA;
- Must help advise on sustainable development.

4.6.2 SCC LPA as a RMA

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA;
- Has a duty to be subject to scrutiny from the LLFA;
- Has a duty to cooperate and share information with other RMAs;

4.6.3 SCC LLFA as a RMA

- Must develop, maintain, apply and monitor a strategy for local flood risk management. This must be consulted on with all RMAs, the public and all other partners with an interest in local flood risk, and must comply with the National Strategy;
- Is required to coordinate and share information on local flood risk management between relevant authorities and partners;
- Is empowered to request information from others when it is needed in relation to its flood risk management functions;
- Must investigate significant flooding incidents in its area where it considers it necessary or appropriate;
- Has a duty to establish and maintain a record of structures within its area that it considers to have a significant impact on local flood risk;
- Is empowered to designate structures and features that affect flooding;
- Has powers to undertake works to manage flood risk from surface runoff, groundwater and ordinary watercourses;
- Must exercise its flood and coastal erosion risk management functions in a manner consistent with the National Strategy and the Local Strategy;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a Local Strategy) to other RMAs;
- Must aim to contribute to sustainable development;
- Should consider flooding issues that require collaboration with neighbouring LLFAs and other RMAs.

4.6.4 Northumbrian Water as a RMA

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the relevant LLFA;
- Has a duty to be subject to scrutiny from LLFAs;
- Has a duty to cooperate and share information with other RMAs;
- Is responsible for managing the risks of flooding from water and foul or combined sewer systems providing drainage from buildings and yards.

4.6.5 Highways Authority (SCC) and Highways England as RMAs

- Have a duty to act consistently with the National Strategy and Local Strategies;
- Have responsibility for ensuring effective drainage of local roads in so far as ensuring drains and gullies are maintained;
- Must be consulted on Local Strategies, if affected by the Strategy, by the LLFA;
- Have a duty to be subject to scrutiny from LLFAs.

4.6.6 The Local Community

- Must be consulted on Local Strategies by the LLFA;
- Has a key role in ensuring local strategies are capable of being successfully delivered within the community. They should actively participate in this process and be engaged by the LLFA.

4.6.7 Riparian Owners

A riparian owner is someone who owns land or property alongside a river or other watercourses. A watercourse is any natural or artificial channel through which water flows including flow through a culvert, ditch, drain, cut, dyke, sluice or private sewer.

Riparian owners have statutory responsibilities, including:

- Maintaining watercourses;
- Allowing the flow of water to pass without obstruction;
- Controlling invasive alien species

Further guidance for riverside property owners can be found in the EA's helpful booklet 'Living on the Edge'¹⁶.

4.6.8 Developers

- Have a vital role in ensuring effective local flood risk management by avoiding development in areas at risk of flooding. Local Strategies should form a key element of local planning guidance.

Table 4-1 provides an overview of the key LLFA responsibilities under the FWMA.

Table 4-1: Key LLFA Duties under the FWMA

FWMA Responsibility	Description of duties and powers	SCC LLFA Status
Local Strategy for Flood Risk Management	A LLFA has a duty to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different LA areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	Produced March 2016 (see Section 4.5)
Duty to contribute to sustainable development	The LLFA has a duty to contribute towards the achievement of sustainable development.	Ongoing
Duty to comply with national strategy	The LLFA has a duty to comply with national flood and coastal risk management strategy principles and objectives in respects of its flood risk management functions.	Ongoing
Investigating Flood Incidents	The LLFA, on becoming aware of a flood in its area, has (to the extent it considers necessary and appropriate) to investigate and record details of "locally significant" flood events within their area. This duty includes identifying the relevant risk management authorities and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	Ongoing
Asset Register	A LLFA has a duty to maintain a register of structures or features, which it considers to have a significant 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.	Ongoing
Duty to co-operate and Powers to Request Information	The LLFA must co-operate with other relevant authorities in the exercise of their flood and coastal erosion management functions.	Ongoing
Ordinary Watercourse	A LLFA has a duty to deal with enquiries and determine watercourse consents where the altering, removing or	Ongoing

¹⁶ <https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities>
SCC Level 1 SFRA

FWMA Responsibility	Description of duties and powers	SCC LLFA Status
Consents	replacing of certain flood risk management structures or features that affect flow on ordinary watercourses is required. It also has provisions or powers relating to the enforcement of unconsented works.	
Works Powers	The Act provides a LLFA with powers to undertake works to manage flood risk from surface runoff, groundwater and on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Ongoing
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Ongoing
Emergency Planning	A LLFA is required to play a lead role in emergency planning and recovery after a flood event.	Northumbria Local Resilience Forum (Section 6.11.1)
Community Involvement	A LLFA should engage local communities in local flood risk management issues. This could include the training of community volunteers, the development of local flood action groups and the preparation of community flood plans, and general awareness raising around roles and responsibilities plans.	Various ongoing (Section 6.11.1)
Planning Requirements for SuDS	Sustainable Drainage Systems (SuDS) are to become a planning requirement for major planning applications of 10 or more residential units or equivalent commercial development schemes with sustainable drainage. The LLFA is now a statutory planning consultee and it will be between the LPA and the LLFA to determine the acceptability of these proposed sustainable drainage schemes subject to exemptions and thresholds. Approval must be given before the developer can commence construction. Planning authorities should use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of any SuDS over the lifetime of the development.	Follow LASOO Guidance And LFRMs ¹⁷
Latest changes to FWMA legislation ¹⁸		

17 Non-Statutory Technical Standards for Sustainable Drainage, Practice Guidance, Local Authority SuDS Officer Organisation,

18 <http://www.legislation.gov.uk/ukpga/2010/29>

5 Flood Risk within Sunderland City

5.1 Flood Risk Datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within the City. The information contained is the best available at the time of publication and is intended to provide SCC with an overview of risk. Where further detail is available, then the source of information is provided. Table 5-1 provides a summary of the key datasets used in this SFRA according to the source of flooding.

Table 5-1: Flood source and key datasets

Flood Source	Datasets / Studies
Fluvial	EA Flood Map for Planning (Rivers and Sea) (November 2016 version)
	EA Risk of Flooding from Rivers and Sea map (October 2016 version)
	Latest available EA Flood Risk Mapping Studies
	EA Historic Flood Map
	LLFA historic flood incident register
	River Tyne & River Wear Catchment Flood Management Plans
Pluvial (surface water runoff)	EA Risk of Flooding from Surface Water (RoFSW)
	Critical Drainage Areas (from 2010 SFRA)
	Sunderland Preliminary Flood Risk Assessment
Sewer	Northumbrian Water historic flooding
	Northumbrian Water Drainage Area Zones
Groundwater	EA Areas Susceptible to Groundwater Flooding (ASTGWF)
Reservoir	EA Reservoir Flood Maps (available online)
All sources	Sunderland Local Flood Risk Management Strategy
	Tyne and Wear Fire & Rescue Service historic flood incident data
	Northumbria River Basin Management Plan
	Northumbria Flood Risk Management Plan
	Sunderland Level 1 SFRA 2010
Flood risk management infrastructure	EA flood defence data
	LLFA FRM asset register

5.2 Fluvial Flooding

Fluvial flooding is associated with the exceedance of channel capacity during higher flows or as a result of blockage. The process of flooding from watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain; and infiltration and rate of runoff associated with urban and rural catchments.

From the EA's Flood Map for Planning, the majority of fluvial flood risk comes from the River Wear, the River Don/Usworth Burn and the Lumley Park/Hetton Burn. There is also flood risk from ordinary watercourses on the coastal plain, namely the Hendon Burn and Burdon Dene/Cherry Knowles Dene/Ryhope Dene watercourse. The areas at risk include urban land at Fatfield and Farringdon, as well as rural locations.

The SFRA Maps in Appendix A present the EA's Flood Map for Planning which shows the fluvial and tidal coverage of flood zones 2 and 3 across the City.

5.2.1 EA Flood Map for Planning (Rivers and Sea)

The EA's Flood Map for Planning is the main dataset used by planners for predicting the location and extent of fluvial (from Main River) and tidal flooding. This is supported by the CFMPs and FRMPs along with a number of detailed hydraulic river modelling reports which provide further detail on flooding mechanisms. The Flood Map for Planning provides flood extents for the 1 in

100 AEP fluvial event (Flood Zone 3), the 1 in 200 AEP tidal event (also Flood Zone 3) and the 1 in 1000 AEP fluvial and tidal flood events (Flood Zone 2). Flood zones were originally prepared by the EA using a methodology based on the national digital terrain model (NextMap), derived river flows from the Flood Estimation Handbook (FEH) and two dimensional flood routing. Since their initial release, the EA has regularly updated their flood zones with detailed hydraulic model outputs as part of their national flood risk mapping programme.

The EA Flood Map for Planning is precautionary in that it does not take account of flood defence infrastructure (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represents a worst-case scenario of flooding. The flood zones do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change. As directed by the FRCC-PPG, this SFRA subdivides Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (functional floodplain - see Section 5.2.2).

The EA also provides a 'Risk of Flooding from Rivers and Sea Map'. This map shows the EA's assessment of the likelihood of flooding from rivers and the sea, at any location, and is based on the presence and effect of all flood defences, predicted flood levels and ground levels. This dataset is not used in the assessment of flood risk for planning applications but is a useful source of information to show the presence and effects of flood risk management infrastructure. This dataset is further discussed in Section 5.2.3.

This SFRA uses the EA's Flood Map for Planning version issued in November 2016 to assess fluvial and tidal risk to potential development sites, as per the NPPF and the accompanying FRCC-PPG (see Section 6.5.1 for this assessment). The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since November 2016:

<https://flood-map-for-planning.service.gov.uk/>

5.2.2 Functional Floodplain (Flood Zone 3b)

The functional floodplain forms a very important planning tool in making space for flood waters when flooding occurs. Development should be directed away from these areas.

Table 1, Paragraph 065 of the FRCC-PPG defines Flood Zone 3b as:

"...land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency."

Paragraph 015 of the FRCC-PPG explains that

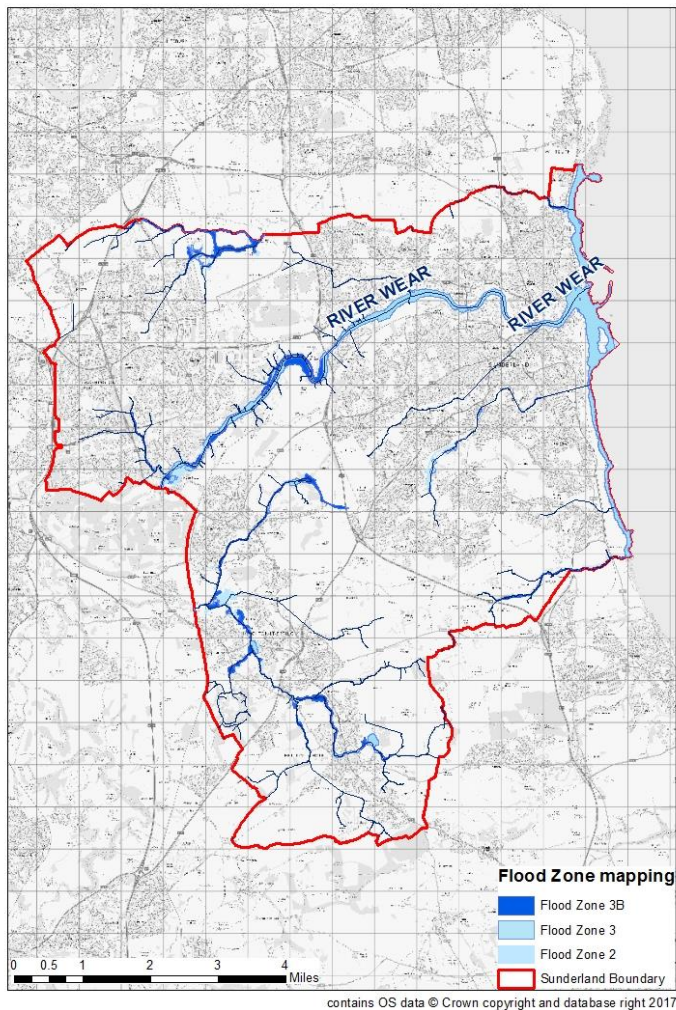
"...the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point to help identify the functional floodplain."

The area identified as functional floodplain should take into account the presence and effect of all flood risk management infrastructure including defences. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often."

The functional floodplain forms a very important planning tool in making space for flood waters

A technical note is provided in Appendix C which explains the methodology used in creating the functional floodplain outline. The outline is also displayed on the SFRA Maps in Appendix A. The functional floodplain outline was assessed and agreed upon by the LPA, the LLFA and the EA, based on their local knowledge. Any site-specific FRAs should further assess areas of functional floodplain through detailed investigation and assessment of the actual risk and extent of any possible functional floodplain. Figure 5-1 illustrates the flood Zone 3b (functional floodplain outline).

Figure 5-1: Functional Floodplain outline



5.2.3 EA Risk of Flooding from Rivers and the Sea Map

This Risk of Flooding from Rivers and Sea map (RoFRS) shows the likelihood of flooding from rivers and the sea based on the presence and effect of all flood defences, predicted flood levels and ground levels and is shown on the Appendix A maps. The RoFRS map splits the likelihood of flooding into four risk categories:

- High – greater than or equal to 1 in 30 (3.3%) chance in any given year
- Medium – less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year
- Low – less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
- Very Low – less than 1 in 1,000 (0.1%) chance in any given year

The RoFRS map is included on the SFRA Maps to act as a supplementary piece of information to assist the LPA in the decision-making process for site allocation.

This dataset is not suitable for use with any planning application nor should it be used for the sequential testing of site allocations. The EA's Flood Map for Planning should be used for all planning purposes, as per the FRCC-PPG.

5.3 Surface Water Flooding

Surface water flood risk should be afforded equal standing in importance and consideration as fluvial flood risk, given the increase in rainfall intensities due to climate change and the increase in impermeable land use due to development.

Surface water flooding, in the context of this SFRA, includes:

- **Surface water runoff (also known as pluvial flooding); and**
- **Sewer flooding**

There are certain locations, generally within urban areas, where the probability and consequence of pluvial and sewer flooding are more prominent due to the complex hydraulic interactions that exist in the urban environment. Urban watercourse connectivity, sewer capacity, and the location and condition of highway gullies all have a major role to play in surface water flood risk.

It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site-specific and detailed investigations.

Paragraph 013 of the FRCC-PPG states that SFRA's should address surface water flooding issues by identifying areas of surface water flooding and areas where there may be drainage issues that can cause surface water flooding. The RoFRS map along with the LFRMS should assist with this and various mitigative measures, i.e. SuDS, safe flow paths should be identified

5.3.1 Pluvial Flooding

Pluvial flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. In these instances, the volume of water from rural land can exceed infiltration rates in a short amount of time, resulting in the flow of water over land. Within urban areas, this intensity can be too great for the urban drainage network resulting in excess water flowing along roads, through properties and ponding in natural depressions. Areas at risk of pluvial flooding can, therefore, lie outside of the fluvial flood zones.

Pluvial flooding within urban areas across the country will typically be associated with events greater than the 1 in 30 year design standard of new sewer systems. Some older sewer and highway drainage networks will have a lower capacity than what is required to mitigate for the 1 in 30 year event. There is also a residual risk associated with these networks due to possible network failures, blockages or collapses.

5.3.2 Risk of Flooding from Surface Water (RoFSW)

The Risk of Flooding from Surface Water (RoFSW), formally referred to as the updated Flood Map for Surface Water (uFMfSW) is the third generation national surface water flood map, produced by the EA, aimed at helping to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW, used in this SFRA to assess risk from surface water, has proved extremely useful in supplementing the EA Flood Map for Planning by identifying areas in Flood Zone 1, which may have critical drainage problems.

The RoFSW includes surface water flood outlines, depths, velocities and hazards for the following events:

- 1 in 30 AEP event (high risk)
- 1 in 100 AEP event (medium risk)
- 1 in 1000 AEP event (low risk)

The RoFSW is much more refined than the second generation map in that:

- More detailed hydrological modelling has been carried out using several design rainfall events rather than one for the second generation,
- A higher resolution Digital Terrain Model (DTM) has been used – 2 m, compared to 5 m for the second generation,
- Manual edits of DTM to improve flow routes at over 91,000 locations compared to 40,000 for the second generation,

- DTM edited to better represent road network as a possible flow pathway, this was not done for the second generation,
- Manning's n roughness (used to represent the resistance of a surface to flood flows in channels and floodplains) values varied using MasterMap Topography layer compared to blanket values for urban and rural land use applied in the second generation surface water flood map.
- The National Modelling and Mapping Method Statement, May 2013 details the methodology applied in producing the map. The RoFSW is displayed on the SFRA Maps.

5.3.3 Sewer Flooding

Combined sewers spread extensively across urban areas serving residential homes, business and highways, conveying waste and surface water to treatment works. Combined Sewer Overflows (CSOs), provide an EA consented overflow release from the drainage system into local watercourses or large surface water systems during times of high flows. Some areas may also be served by separate waste and surface water sewers which convey waste water to treatment works and surface water into local watercourses.

Flooding from the sewer network mainly occurs when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. Pinch points and failures within the drainage network may also restrict flows. Water then begins to back up through the sewers and surcharge through manholes, potentially flooding highways and properties. It must be noted that sewer flooding in 'dry weather' resulting from blockage, collapse or pumping station mechanical failure (for example), is the sole concern of the drainage undertaker.

Northumbrian Water is the water company responsible for the management of the majority of the City's drainage network.

Additionally, Northumbrian Water has recently invested £8 million to upgrade the sewer network in Sunderland. It is a one-year scheme which has begun in September 2016, that involves reducing the amount of surface water that enters the sewer network and this will free up the capacity within pipes. The main areas in which the new sewers will improve the performance and resilience of the sewer network are in the Roker, Seaburn, Cleadon and St Peters areas¹⁹.

5.3.4 Locally Agreed Surface Water Information

EA guidance on using surface water flood risk information recommends that the LLFA, should:

"...review, discuss, agree and record, with the Environment Agency, Water Companies, Internal Drainage Boards and other interested parties, what surface water flood data best represents their local conditions. This will then be known as locally agreed surface water information".

For the purposes of the PFRA, SCC used the Flood Map for Surface Water (FMfSW) dataset to define surface water flood information in the region. This dataset uses a more detailed digital terrain model than the first generation Areas Susceptible to Surface Water Flooding (ASStWF), therefore providing a more accurate representation of the terrain and overland flow routes.

5.3.5 Areas with Critical Drainage Problems and Critical Drainage Areas

The Town and Country Planning (Development Management Procedure) (England) Order 2010 defines a Critical Drainage Area (CDA) as:

"...an area within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency".

EA guidance on carrying out Flood Risk Assessments²⁰ states that a FRA should be carried out for sites in Flood Zone 1 that are...

"...in an area with critical drainage problems as notified by the Environment Agency."

¹⁹ <https://northumbrianwater.blob.core.windows.net/projects/1/Custombooklet.pdf>

²⁰ <https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>

CDAs were devised in the 2010 SFRA by combining high risk NW drainage areas and those which have a high risk of flooding from other sources. Contributing natural catchments were also identified for those CDAs as the source or surface water flooding may originate outside of the drainage area but still contribute to the overall risk. Natural catchments were derived from the Flood Estimation Handbook (FEH) CD-ROM. Table 5-2 lists the CDAs delineated through the 2010 SFRA.

Table 5-2: 2010 Critical Drainage Areas

NW Drainage Area	Comments
Barnes Burn & Hendon Burn	Due to the urban nature of both watercourses flooding can arise directly from the burns themselves, the contributing urban surface water drainage system or surface water runoff. Whilst the drainage area itself does not have any DG5 or DG10 records and there is currently no major development proposed in the area, it has been classified as a CDA purely on the fact that significant future work is required to understand the level of current and future risk to the community.
Houghton & Hetton	There is a high risk of both fluvial flooding along Lumley Park Burn and surface water flooding. Fluvial flood extents are mainly concentrated on greenfield land however any removal of the functional floodplain will increase risk downstream at Chester-le-Street which is known to have a high risk of flooding. Critical surface water flow paths and large areas of pooling show there is a high risk of surface water flooding. Again, any increase in surface water runoff from new development will increase risk downstream.
Herrington	There is medium fluvial and high risk surface water flooding; however, this is currently located on greenfield land. DG5 and DG10 records also show there is a history of sewer flooding. Any large scale development in this area could significantly increase surface runoff and flood risk downstream at Chester-le-Street.
Seaburn & Roker	There is a low risk of fluvial and tidal flooding in this area, however DG5 and DG10 records show there is a history of sewer flooding. This could be related to the surface water risk in the area. Tidal locking could also be an issue for surface water drainage. As this area is located at the downstream extent of the catchment, any development could potentially improve the current surface water issues to the surrounding community through storage or reducing conveyance.
Washington Central	There is a low risk of fluvial flooding in this area and flood extents are mainly concentrated along open space surrounding the small watercourses. There are however critical surface water flow paths and large areas of surface water flooding. DG5 and DG10 records also show there is a history of sewer flooding. Tidal locking of those watercourses and surface water drainage discharging in to the River Wear could also be an issue. Any development in this area could improve the current drainage and surface water issues through storage or reducing conveyance.

Within the CDAs, it is thought that any increase in surface water runoff rates and/or volume from new development will increase risk to areas downstream or to the surrounding community. The 2010 SFRA recommended that a detailed FRA or Drainage Impact Assessment (DIA) would be expected for developments equal to or greater than 0.5 ha in size, regardless of which Flood Zone the development is within. A FRA should demonstrate that the development will not adversely affect existing flooding conditions within the CDAs by increasing the rate of surface runoff and should define and address the constraints that will govern the design of the drainage system and layout of the development site. Developers should look to reduce or control runoff to Greenfield rates or better, if feasible.

The use of appropriate mitigation measures should be investigated. Ideally, SCC should work closely with the EA, NW and individual developers to ensure surface water runoff is controlled as near to the source as possible which will include the application of SuDS. See Section 6.10 for more information on SuDS.

5.4 Groundwater flooding

Groundwater flooding is caused by the emergence of water from beneath the ground, either at point or diffuse locations. The occurrence of groundwater flooding is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall, high in-bank river levels, artificial structures, groundwater rebound and mine water rebound. Properties with basements or cellars or properties that are located within areas deemed to be susceptible to groundwater flooding are at particular risk. Development within areas that are susceptible to groundwater flooding will generally not be suited to SuDS; however, this is dependent on detailed site investigation and risk assessment at the FRA stage.

Taken from the 2010 SFRA, according to the Wear CFMP, groundwater flooding in the Wear catchment is not known to be a major problem, due to the low permeability of the bedrock geology. The low permeability of the bedrock may lead to sub-surface flows rapidly entering the river network or surface water flooding will occur when soils are saturated, as water cannot drain through the rock below. There have also been no major flooding problems reported in the catchment.

Groundwater flood risk should however be considered on a site by site basis in development planning.

The EA has produced a guidance document which may be used by developers and homeowners to help reduce the impacts caused to property by groundwater flooding:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911b_ugi-e-e.pdf

5.5 Canal and Reservoir Flood Risk

5.5.1 Canals

There are no canalised watercourses within the Sunderland, therefore there is no significant risk identified.

5.5.2 Reservoirs

A reservoir can usually be described as an artificial lake where water is stored for use. Some reservoirs supply water for household and industrial use, others serve other purposes, for example, as fishing lakes or leisure facilities. Like canals, the risk of flooding associated with reservoirs is residual and is associated with failure of reservoir outfalls or breaching. This risk is reduced through regular maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

The EA is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be regularly inspected and supervised by reservoir panel engineers. LAs are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared.

According to the 2010 SFRA, the EA Register of Reservoirs, there are no 'large raised reservoirs' directly located within the boundaries of Sunderland or surrounding local authorities. Whilst large reservoirs provide the obvious source of residual risk (breaching/overtopping) from artificial sources, there could potentially be a number of smaller water bodies within the area. Smaller water bodies have potential ownership issues resulting in a lack of regularly inspected and poor embankment conditions. This will increase the residual risk of breaching or overtopping associated with them.

There are a number of smaller water bodies within Sunderland such as Swan Industrial Estate reservoir in Washington, Joe's Pond in Houghton-le-Hole, Lyon Lake and Blossom Pond in

Hetton-le-Hole and the lakes surrounding the sports complex at Farrington however it is believed that they pose little risk of flooding to the surrounding areas.

5.5.3 Reservoir Flood Maps

The EA has produced reservoir flood maps (RFM) for all large reservoirs that they regulated under the Reservoirs Act 1975 (reservoirs that hold over 25,000 cubic meters of water). The FWMA updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m³ to 10,000m³. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to.

The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds, including information about the depth and speed of the flood waters. In September 2016, the EA produced a RFM guide ' Explanatory Note on Reservoir Flood Maps for Local Resilience Forums – Version 5²¹', which provides information on how the maps were produced and what they contain.

The RFM outlines are not included on the SFRA Maps in Appendix A due to data sensitivity, however they can be viewed online at:

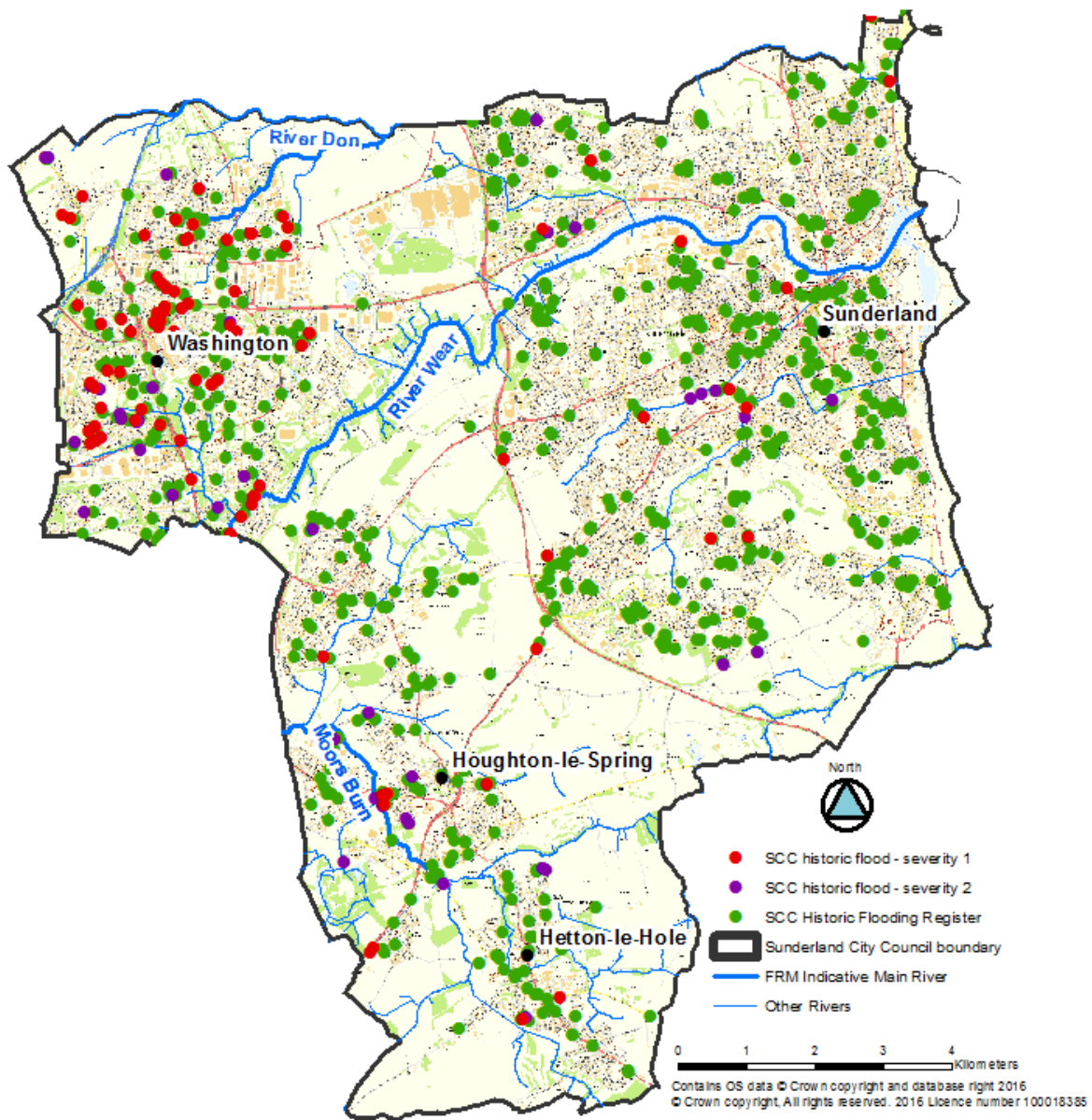
https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater#Reservoirs_3-ROFR

5.6 Historical Flooding

SCC provided its historic flood incident register, required under the FWMA, which includes 1,092 flood incidents of multiple sources having occurred across the city since 1999. This includes flooding of property, gardens to property, highways and footpaths. Over 900 of these incidents have been mapped, however as many of these incidents are at the property level and considered as sensitive information, they have not been included on the detailed large scale SFRA maps. They are however shown at the smaller scale of the whole authority in Figure 5-2 below.

Two further mapped historic flooding datasets provided by SCC include 'Historic Flooding - Severity 1' and 'Historic Flooding - Severity 2'. The Severity 1 incidents are the higher severity floods whereby a property has been flooded internally or a road has been closed due to flooding. The Severity 2 incidents are less severe including ponding to gardens or roads. The majority of historic incidents have occurred in Washington. Again, this information is considered sensitive and has therefore not been included on the SFRA maps but is on Figure 5-2.

Figure 5-2: SCC historic flood incidents



The SCC LFRMS and PFRA also summarise historical flood events that have occurred across the City.

5.6.1 Tyne and Wear Fire and Rescue Service Flood Incident Data

Tyne and Wear Fire and Rescue Service (TWFRS) provided a spatial dataset containing flooding incident locations that TWFRS has attended over a four year period (from 22 August 2016 – 7 July 2012). TWFRS do not plot the extents of any flooding or each and every property affected by flooding during spate conditions, the incident plot is centred on the flooding location. There are also many different types of flooding incidents included, such as leaks in homes, to rivers breaching and subsequent flooding of properties. It was therefore decided not to include this data on the SFRA Maps. Incidentally, there were 48 flood incidents attended to by TWFRS over the four year period, across the City.

5.6.2 Historic Surface Water Flooding

Northumbria Water provided a copy of its existing DG5 Register which is used to record flood incidents at the individual property level attributable to water company controlled sewer networks, whether that be from foul and / or surface water sewers. Due to the sensitivity of this information, this data could not be mapped as part of this SFRA. The Register does however list

a number of properties that have flooded in the past as a result of surface water / sewer system flooding.

5.6.3 EA Historic Flood Map

The Historic Flood Map (HFM) contains outlines of past fluvial, tidal and groundwater flooding though does not contain any information regarding flood source, return period or date of flooding. There is only one small area within the HFM in the City, shown on the SFRA Maps in Appendix A. This is at Fatfield at Penshaw Bridge where the River Wear has caused flooding to South View road.

5.6.4 Historic groundwater flooding

The 2010 SFRA stated that the area north of Washington is known to have a high water table and also has a history of groundwater flooding to property. The area of North Sunderland surrounding the amusement park has also suffered historic groundwater flooding.

5.7 Flood Risk Management

The aim of this section of the SFRA is to identify existing Flood Risk Management (FRM) assets and previous / proposed FRM schemes in the City. The location, condition and design standard of existing assets will have a significant impact on actual flood risk mechanisms. Whilst future schemes in high flood risk areas carry the possibility of reducing the probability of flood events and reducing the overall level of risk. Both existing assets and future schemes will have a further impact on the type, form and location of new development or regeneration.

5.7.1 EA Assets

The EA provide a spatial defences dataset via the Government's Spatial Data Catalogue from which such spatial data can be downloaded for free. The defences dataset shows that there are five major flood embankments located within the City. Each embankment is situated on Main River therefore will be owned and maintained by the EA.

Table 5-3: EA flood embankments

Asset	Flood source	Watercourse	Design standard	Bank	Condition
Flood bank	Fluvial	River Don	10	Left	3 - Fair
Flood bank	Fluvial	River Don	20	Left	4 - Poor, requires further investigation
Flood bank	Fluvial	River Don	5	Right	3 - Fair
Embankment	Fluvial	Rainton Burn / Moors Burn	50	Right	3 - Fair
Flood bank	Fluvial	Moors Burn	20	Left	3 - Fair

As well as the ownership and maintenance of a network of formal defence structures, the EA carries out a number of other flood risk management activities that help to reduce the probability of flooding, whilst also addressing the consequences of flooding. These include:

- Maintaining and improving existing flood defences, structures and Main River.
- Enforcement and maintenance where riparian owners unknowingly carry out work that may be detrimental to flood risk.
- Identifying and promoting new flood alleviation schemes (FAS) where appropriate.
- Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is permitted relative to the scale of flood risk.
- Operation of Flood Line Warnings Direct and warning services for areas within designated Flood Warning Areas (FWA) or Flood Alert Areas (FAA). EA FWAs are shown on the SFRA Maps in Appendix A.

- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are therefore sufficiently prepared in the event of flooding.
- Promoting resilience and resistance measures for existing properties that are currently at flood risk, or may be in the future as a result of climate change.

5.7.2 SCC Assets

The LLFA will own and maintain a number of assets throughout Sunderland which will include culverts, bridge structures, gullies, weirs and trash screens. The majority of these assets will lie along ordinary watercourses within smaller urban areas where watercourses may have been culverted or diverted, or within rural areas. All these assets can have flood risk management functions as well as an effect on flood risk if they become blocked or fail. In the majority of cases responsibility lies with the riparian/land owner.

As part of its FWMA duties, the LLFA has a duty to maintain a register of structures or features, which are considered to have a significant effect on flood risk, including details on ownership and condition as a minimum. The Asset Register should include those features relevant to flood risk management function including feature type, description of principal materials, location, measurements (height, length, width, diameter) and condition grade. The Act places no duty on the LLFA to maintain any third party features, only those for which the authority has responsibility as land/asset owner.

5.7.3 Water Company Assets

The sewerage infrastructure within the City of Sunderland is likely to be based on Victorian sewers from which there is a risk of localised flooding associated with the existing drainage capacity and sewer system. The drainage system may be under capacity and / or subject to blockages resulting in localised flooding of roads and property. Northumbrian Water Ltd is responsible for the management of the urban drainage system. This includes surface water and foul sewerage. There may however be some private surface water sewers in the area as only those connected to the public sewer network transferred to the water companies under the Private Sewer Transfer in 2011. Surface water sewers discharging to watercourses did not transfer and would therefore not be under the ownership of NWL, unless adopted under a Section 104 adoption agreement.

Water company assets include Wastewater Treatment Works, Combined Sewer Overflows, pumping stations, detention tanks, sewer networks and manholes.

5.7.4 Future Flood Risk Management Work Programmes

Based on information provided by the EA, there are a number of ongoing and proposed flood risk management work programmes in the city. In the Flood and Coastal Erosion Risk Management (FCERM) Development Programme, proposed works include Cut Throat Dene Watercourse Flood Alleviation Scheme and Hendon Burn Culvert Capital Maintenance Design & Construction (strengthening culvert) project construction forecast 2017-2019. Additionally, Strategy Frontage 3 (Hendon Foreshore Barrier/ Stonehill wall/ SW breakwater) project construction forecast 2019-2021.

6 Development and Flood Risk

6.1 Introduction

This section of the SFRA provides a strategic assessment of the suitability, relative to flood risk, of the potential development sites provided by SCC to be considered through the Local Plan.

The information and guidance provided in this chapter (supported by the SFRA mapping in Appendix A and the Development Site Assessment Spreadsheet in Appendix B) can be used by SCC to inform their Local Plan, and provide the basis from which to apply the Sequential Approach in the development allocation and development management process.

Modelled climate change outputs are unavailable for this study therefore a cautious approach to assessing future risk to sites at risk has been adopted. It is often the case that modelled 0.1% AEP event outlines are similar to modelled climate change scenarios for the 1% AEP event. Therefore, Flood Zones 2 and 3 of the EA's Flood Map for Planning have been used as a climate change proxy to provide an indication of risk to sites in the future.

For this SFRA therefore, the assumption should be that the current day Flood Zone 2 will become Flood Zone 3a in 100 years' time and the current functional floodplain could become Flood Zone 3a. Predicting future expansion of the functional floodplain is however more difficult as the functional floodplain extent is based on a number of different criteria, as discussed in Section 5.2.2.

This approach to climate change is precautionary though is considered to be the most pragmatic methodology available. This approach is also consistent with other SFRA's and professional modelling experience. As such, for any sites within Flood Zone 2, the possibility of these sites being within Flood Zone 3a within 100 years' time should be considered.

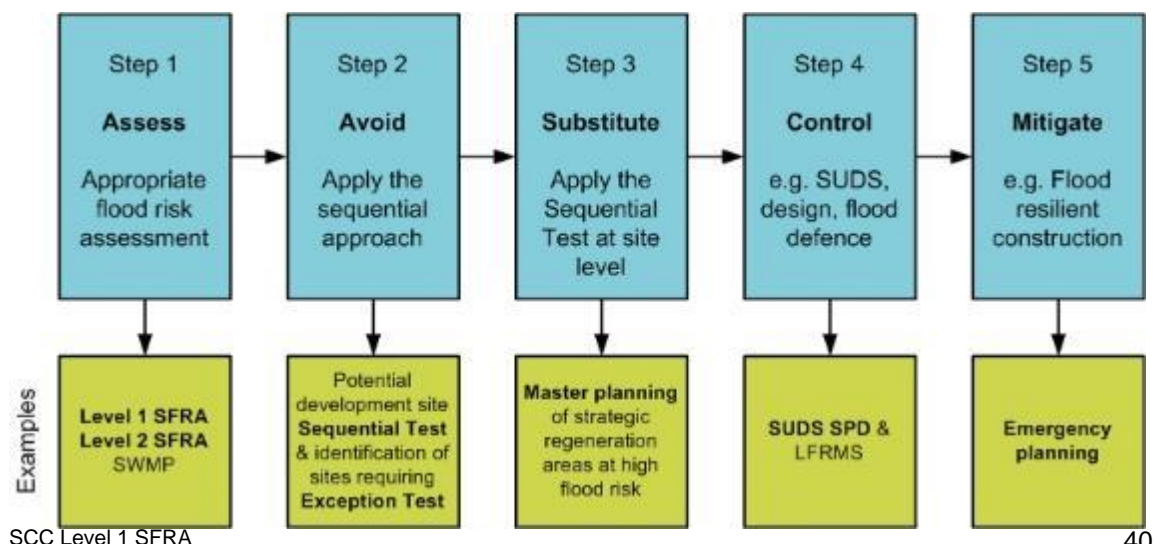
6.2 The Sequential Approach

The FRCC-PPG provides the basis for the Sequential Approach. It is this approach, integrated into all stages of the development planning process, which provides the opportunities to reduce flood risk to people, property, infrastructure and the environment to acceptable levels.

The approach is based around the flood risk management (FRM) hierarchy, in which actions to avoid, substitute, control and mitigate flood risk is central. For example, it is important to assess the level of risk to an appropriate scale during the decision-making process, (starting with this Level 1 SFRA). Once this evidence has been provided, positive planning decisions can be made and effective FRM opportunities identified.

Error! Reference source not found. illustrates the FRM hierarchy with an example of how these may translate into each authorities' management decisions and actions.

Figure 6-1: Flood Risk Management hierarchy



The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system is being carried out i.e. LPAs allocating land in Local Plans or determining planning applications for development. This SFRA does not remove the need for a site-specific Flood Risk Assessment at a development management stage.

The following sections provide a guided discussion on why and how the Sequential Approach should be applied, including the specific requirements for undertaking Sequential and Exception Testing.

6.3 Local Plan Sequential & Exception Test

SCC, as the LPA, should seek to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk and ensuring that all development does not increase risk and where possible can help reduce risk from flooding to existing communities and development.

(Guidance on the application of the Sequential and Exception tests through the development management process is provided at Section 6.9.1 of this report).

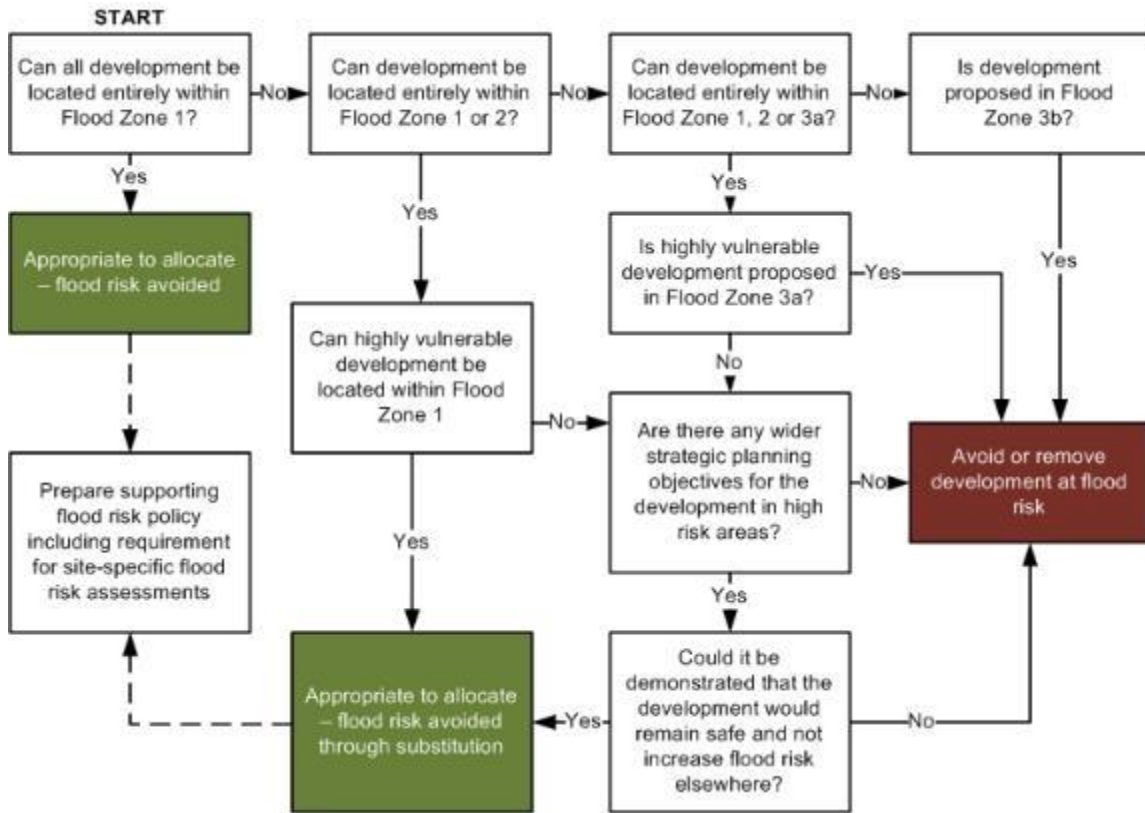
At a strategic level, this should be carried out as part of SCC's Local Plan. This should be done by:

1. Applying the Sequential Test and if the Sequential Test is passed, applying the Exception Test, if required;
2. Safeguarding land from development that is required for current and future flood management;
3. Using opportunities offered by new development to reduce the causes and impacts of flooding and where climate change is expected to increase flood risk so that existing development may not be sustainable in the long term;
4. Seeking opportunities to facilitate the relocation of development including housing to more sustainable locations.

Figure 6-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against the EA's Flood Map for Planning flood zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented and evidence used to support decisions recorded.

Figure 6-2: Local Plan sequential approach to site allocation



This SFRA provides the main evidence required. This process also enables those sites that have passed the Sequential Test, and may require the Exception Test, to be identified.

For the Exception Test to be passed, the NPPF Paragraph 102 states:

- a. *It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
- b. *A site-specific Flood Risk Assessment (FRA) must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both elements of the test will have to be passed for development to be allocated or permitted.

Although actually passing the Exception Test will require the completion of a site-specific FRA, SCC should be able to assess the likelihood of passing the test at the Local Plan level by using the information contained in this SFRA to answer the following questions:

- a. Can development within higher risk areas be avoided or substituted?
- b. Is flood risk associated with possible development sites considered too high; and will this mean that the criteria for Exception Testing are unachievable?
- c. Can risk be sustainably managed through appropriate development techniques (resilience and resistance) and incorporate Sustainable Drainage Systems without compromising the viability of the development?
- d. Can the site, and any residual risks to the site, be safely managed to ensure that its occupiers remain safe during times of flood if developed?

Where it is unlikely that the Exception Test can be passed due to few wider sustainability benefits, the risk of flooding being too great, or the viability of the site being compromised by the level of flood risk management work required, then SCC should consider avoiding the site all together.

Once the process has been completed SCC should then be able to allocate appropriate development sites through the Local Plan as well as prepare flood risk policy including the requirement to prepare site-specific FRAs for all allocated sites that remain at risk of flooding.

6.4 Local Plan Sites Assessment

This assessment has considered sites from 3 different sources: the 2018 Strategic Housing Land Availability Assessment (SHLAA); the 2016 Employment Land Review, and; 2017 Green Belt Site Selection Report. Following an initial review of sites in terms of flood risk SCC adapted development boundaries to avoid Flood Zones 2 and 3. These revised boundaries have been used as the basis of updating this SFRA.

Strategic Housing Land Availability Assessment (SHLAA)

The SHLAA is an evidence base document that will inform the preparation of the council's Local Plan. SCC produced a draft SHLAA for consultation in 2017. LPAs have a requirement under the National Planning Policy Framework (NPPF) to demonstrate a sufficient supply of potential sites suitable for residential development to meet local housing requirements as well as sites for economic development uses.

Sites have been identified from a broad range of sources as suggested in PPG, including previously unidentified sites which have been put forward for consideration, sites promoted through a "call for sites" exercise (carried out in 2014 and 2015), and sites from the council's previous SHLAA in 2013. The Assessment also includes sites previously discounted from the SHLAA which are being reconsidered in light of changed circumstances. The sites are assessed on their suitability for development, availability and the likelihood of development being financially viable. The assessment is used to inform the Local Plan, but it does not make policy decisions on future site allocations. The inclusion of a site in the assessment does not mean it will be developed, or that the LPA would view an application on the site favourably. A final revised SHLAA is due to be published in 2018.

Employment Land Review (ELR)

In order to understand anticipated employment growth within the city over the plan period and identify an appropriate supply of sites, the Council has prepared an Employment Land Review as part of its evidence base. This was published in March 2016 and informs the employment sites included within the SFRA.

Green Belt Site Selection Report

This report has been compiled because there is an identified shortfall in the city's housing land supply. This shortfall needs to be met through Green Belt deletions (all other options have been investigated), in order to ensure that the Council's objectively assessed housing needs are met in full.

A total of 217 sites were identified as being deliverable or having development potential in the period 2015-2033, and have been assessed and subdivided into several proposed uses including:

- SHLAA 2108 - 165 sites
- Residential 12 sites
- Key Employment Areas - 21 sites
- Primary Employment Areas - 18 sites
- Port employment area - 1 site

In order to inform the first part of the Sequential Approach for allocation of development through the Local Plan (illustrated in Figure 6-2), this SFRA has carried out a high level GIS screening exercise which involved overlaying the potential sites against Flood Zones 1, 2, 3a and 3b.

Surface water risk to sites has also been assessed through the EA's updated Flood Map for Surface Water dataset to help identify those sites that may have critical drainage problems. The Development Site Assessment Excel spreadsheet, included in Appendix B, provides a breakdown of each site and the area (ha) and percentage coverage of each flood zone and each surface water flood zone.

Zones 3b, 3a and 2 are considered in isolation. Any area of a site within the higher risk Flood Zones 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any area within Flood Zone 3a is excluded from Flood Zone 2. This allows the sequential assessment of risk at each site by addressing those sites at higher risk first. Table 6-1 provides a count of the number of sites within each Flood Zone.

Table 6-1: Number of potential development sites at risk from Flood Map for Planning flood zones

Potential Development Site	Number of sites within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
SHLAA 2108	165	0	0	0
Residential	12	0	0	0
Key Employment Areas	21	0	0	0
Primary Employment Areas	18	0	0	0
Port (one site)	1	1	1	0
Total	217	1	1	0

SCC should use the Development Site Assessment spreadsheet in Appendix B to identify which sites should be avoided during the Sequential Test. If this is not the case, or where wider strategic objectives require regeneration in areas already at risk of flooding, then SCC should consider the compatibility of vulnerability classifications and Flood Zones (refer to FRCC-PPG) and whether or not the Exception Test will be required before finalising sites. The decision making process on site suitability should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

6.4.1 Sustainability Appraisal and Flood Risk

The Sustainability Appraisal should help to ensure that flood risk is taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in figure 6-2.

By avoiding sites identified in this SFRA as being at significant risk, such as those listed in Section 0, or by considering how changes in site layout can avoid those parts of a site at flood risk, such as any site included within Recommendation C (Section 0), the Council would be demonstrating a sustainable approach to development.

In terms of surface water, the same approach should be followed whereby those sites at highest risk should be avoided or site layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques (see Section 6.10).

Once the Council has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a site-specific FRA, a phased approach to development should be carried out to avoid any cumulative impacts that multiple developments may have on flood risk. For example, for any site where it is required to develop in Flood Zone 3, detailed modelling would be required to ascertain where water displaced by development may flow and to calculate subsequent increases in downstream flood volumes. The modelling should investigate scenarios based on compensatory storage techniques to ensure that downstream or nearby sites are not adversely affected by development on other sites.

Using a phased approach to development, based on modelling results of floodwater storage options, should ensure that any sites at risk of causing flooding to other sites are developed first

in order to ensure flood storage measures are in place before other sites are developed, thus ensuring a sustainable approach to site development. Also, it may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

6.5 Potential Development Sites Review

This section of the report assesses flood risk to potential sites. Section 6.5.1 provides high level broad-brush recommendations for those sites within the flood zones of the Flood Map for Planning. Section **Error! Reference source not found.** reviews the surface water risk to the potential sites by way of the updated Flood Map for Surface Water.

The Level 1 SFRA was subsequently updated in May 2018 following Sunderland City Council adaptation of development site boundaries to avoid areas of flood risk. The report, screening spreadsheet and mapping have been updated to reflect these changes and are based on background mapping (November 2016) used in the original SFRA.

Flood Zones 1, 2 and 3a are sourced from the Environment Agency's (EA) Flood Map for Planning (Rivers and Sea) and Flood Zone 3b (functional floodplain) was delineated as part of this assessment. Surface water risk to potential sites is assessed by way of the EA's Risk of Flooding from Surface Water (RoFSW) map.

The accompanying Development Site Assessment Excel spreadsheet provides a breakdown of each site and the area (in hectares) and percentage coverage of each fluvial/tidal flood zone and each surface water flood zone. Fluvial/tidal Flood Zones 3b, 3a, 2 and 1 are considered in isolation. Any area of a site within the higher risk Flood Zone 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any area within Flood Zone 3a is excluded from Flood Zone 2. This allows for the sequential assessment of risk at each site by addressing those sites at higher risk first.

It is important to note that each individual site will require further investigation, as local circumstances may dictate the outcome of the recommendation. Such local circumstances may include the following:

- Flood depths and hazards will differ locally to each at risk site therefore modelled depth, hazard and velocity data should be assessed for the relevant flood event outlines, including climate change (using the EA's February 2016 allowances), as part of a site-specific FRA.
- Current surface water drainage infrastructure and applicability of SuDS techniques are likely to differ at each site considered to be at risk from surface water flooding. Further investigation would therefore be required for any site at surface water flood risk.
- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finished floor levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been granted.
- It may be possible at some sites to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water.
- Surrounding infrastructure may influence scope for layout redesign/removal of site footprints from risk.
- Current land use. A number of sites included in the assessment are likely to be brownfield, thus the existing development structure could be taken into account as further development may not lead to increased flood risk.
- Existing planning permissions may exist on some sites where the EA may have already passed comment and/or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations/FRAs may already have been carried out at some sites.

Development viability is assessed, based on the flood risk vulnerability classification in Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance²² (FRCC-PPG), and subsequent strategic recommendations were made and are discussed in this report.

The following strategic recommendations may apply to a site, following application of the Sequential Test by the LPA:

²² <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>
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- Strategic Recommendation A - consider withdrawing the site based on significant level of fluvial or surface water flood risk;
- Strategic Recommendation B - Exception Test required if site passes Sequential Test;
- Strategic Recommendation C - consider site layout and design around the identified flood risk if site passes Sequential Test;
- Strategic Recommendation D - site-specific FRA required; and
- Strategic Recommendation E - site permitted on flood risk grounds due to little perceived risk, subject to consultation with the LPA / LLFA.

In this instance the Council have removed development sites from Flood Zone 2 and 3 areas.

The exception to this is the Port of Sunderland. The Council have identified the Port of Sunderland as an employment area. This site may have a range of uses. As 60% of this site is located (out of necessity) in FZ3 a more detailed Level 2 assessment is recommended. This assessment is being prepared separately to this report.

6.5.1 Flood Map for Planning Site Assessment

The following recommendations provide only a guide, based on the flood risk information made available for this Level 1 SFRA. Information regarding local, site specific information is beyond the scope of this SFRA. It is SCC's responsibility to carry out sequential testing of each site using the information provided in this SFRA and more specifically using their local, site specific knowledge and advice from the EA. These sections should be read alongside the Development Site Assessment spreadsheet in Appendix B.

Recommendation A – Consider withdrawal of site

No sites within this SFRA have been identified as required as Strategic Recommendation A.

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

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Recommendation A applies to any site within the functional floodplain where the following criteria is true:

- 10% or greater of the site area is within Flood Zone 3b. The FRCC-PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test. Land allocated for housing falls in to the more vulnerable category and sites for employment; retail; recreation and leisure; and mineral and waste are in the less vulnerable category, though waste management sites for hazardous materials fall with the more vulnerable category. Gypsy and traveller sites fall within the highly vulnerable category. Mixed use sites should be placed into the higher of the relevant classes of flood risk sensitivity. Development should not be permitted for sites within the more vulnerable and less vulnerable categories that fall within Flood Zone 3b. If the developer is able to avoid 3b however, then part of the site could still be delivered.
- The 10% or greater threshold is not included within any policy, it is merely considered that it would likely prove difficult for developers to deliver a site where 10% or more of the site area is considered as undevelopable, based on the NPPF.
- This 10% threshold does not account for local circumstances therefore it may be possible to deliver some of the sites included with Recommendation A upon more detailed investigation, through a Level 2 SFRA or site-specific FRA. It may also be possible to deliver part of some of the larger sites, dependent upon further investigation, where a significant area is not within Flood Zone 3b.

Recommendation B – Exception Test

No sites within this SFRA have been identified as required as Strategic Recommendation B.

Recommendation B applies to sites where it is likely the Exception Test would be required. This does not include any recommendation on the likelihood of a site passing the Exception Test. These sites may need to be examined as part of a more in-depth Level 2 SFRA. The developer / LPA should attempt to avoid the risk area where possible.

The Plan identifies the Port of Sunderland as an employment area. This site may have a range of port-related development uses within Use Classes B1, B2 and B8. As 60% of this site is located (out of necessity) in FZ3 a more detailed Level 2 assessment is recommended to provide more detailed information.

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation B applies to sites where the following criteria is true:

- 10% or greater of any residential site or essential infrastructure site that is within Flood Zone 3a. Water-compatible and less vulnerable uses of land do not require the Exception Test if in Flood Zone 3a.
- 10% or greater of any mixed use site that may entail residential use that is within Flood Zone 3a.
- The 10% threshold is not included within any policy; it is merely considered that it would be very difficult for developers to avoid Flood Zone 3a when 10% or more of the site area is within it. This 10% threshold does not account for local circumstances therefore it may be possible to avoid Flood Zone 3a altogether for some of the sites included with Recommendation B.

All development proposals in Flood Zone 3a must be accompanied by a FRA.

Recommendation C – Consider site layout and design

This recommends a review of site layout and / or design at the development planning stage in order for development to proceed. A Level 2 SFRA may be required or a site-specific FRA would be required to inform on site layout and design.

There are 0 sites recommended for amendment or withdrawal (Recommendation C) based on surface water flooding.

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation C may apply to sites where the following criteria is true:

- <10% of the area of any site type is within Flood Zone 3b.
- <10% of any residential site is within Flood Zone 3a.
- <10% of any mixed-use site entailing residential use is within Flood Zone 3a.
- Employment sites within Flood Zone 3a assuming the site use falls within the less vulnerable or water-compatible category of the flood risk vulnerability classification of the FRCC-PPG.
- <10% of any essential infrastructure site is within Flood Zone 3a.
- 10% or greater of the area of any site is within the high risk (1 in 30 year) or medium risk (1 in 100 year) surface water flood outline

Recommendation D – Development could be allocated subject to FRA

Strategic Recommendation D suggests that development could be permitted, assuming a site-specific FRA shows that the site can be safe, and that the developer / LPA can demonstrate that the site is sequentially preferable. Any site within Flood Zones 2 or 3a or at surface water risk could still be rejected if the conclusions of the FRA decide development is unsafe or inappropriate.

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation D applies to sites where the following criteria is true:

- Any site within Flood Zone 2 that does not have any part of its footprint within Flood Zone 3a, except for highly vulnerable developments (such as gypsy and traveller sites) which would be subject to, and have to pass, the Exception Test.
- Any site 100% within Flood Zone 1 where surface water flood risk is apparent on site and therefore recommended for investigation through a site-specific FRA.
- Any site 100% within Flood Zone 1 that is greater than or equal to 1 hectare in area.

The remaining 215 sites are either recommendation D or E.

According to the FRCC-PPG, all development proposals within Flood Zone 2 or Flood Zone 3a must be accompanied by a site-specific FRA and any sites 100% within Flood Zone 1 that are 1 hectare or greater in area must also be accompanied by a site-specific FRA to determine vulnerability to flooding from other sources as well as fluvial. The FRA should determine the potential of increased flood risk elsewhere as a result of the addition of hard surfaces on-site and the effect of new development on surface water runoff.

The FRCC-PPG (Paragraph 030) states:

A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 5 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability).

The objectives of a site-specific flood risk assessment are to establish:

- *whether a proposed development is likely to be affected by current or future flooding from any source;*
- *whether it will increase flood risk elsewhere;*
- *whether the measures proposed to deal with these effects and risks are appropriate;*
- *the evidence for the local planning authority to apply (if necessary) the Sequential Test, and;*
- *whether the development will be safe and pass the Exception Test, if applicable*

Recommendation E - Should be allocated on flood risk grounds subject to consultation with the LPA / LLFA

Strategic Recommendation E recommends that development should be permitted, based on the flood risk evidence provided within this SFRA. Further investigation may be required by the developer and the LPA / LLFA should be consulted as to whether a FRA may be required based on any further or new information that may not have been included within this SFRA.

Recommendation E applies to any site with its area 100% within Flood Zone 1, less than 1 ha in area and with no perceived surface water flood risk, according to the EA's Risk of Flooding from Surface Water map.

The remaining 215 sites are either recommendation D or E.

6.5.2 Surface Water Risk to Potential Sites

This section assesses surface water risk to each site according to the uFMfSW. The Development Site Assessment spreadsheet in Appendix B isolates each of the surface water outlines so that any area of a site within the higher risk 1 in 30 year outline is excluded from the medium risk 1 in 100 year outline and any area within the 1 in 100 year outline is excluded from the lower risk 1 in 1000 year outline. This allows a sequential assessment of risk at each site. Table 6-6 shows the number of sites at risk for each event. A number of these sites are also at fluvial and / or tidal flood risk.

NOTE: This assessment of surface water risk to sites DOES NOT take account of local circumstances, only that part of a site area falls within a surface water flood outline of the updated Flood Map for Surface Water.

Table 6-4: Number of sites at risk from surface water flooding

RoFSW event outline	Number of sites at risk
1 in 30 year	103
1 in 100 year	119
1 in 1000 year	164
In reality, sites within the 1 in 30 year outline will also be in the 1 in 100 year outline and those within the 1 in 100 year outline will also be in the 1000 year outline.	

As explained with the fluvial / tidal flood zones, the percentage thresholds are not included within any policy, it is merely considered that where a site has 10% or greater of its area at risk from the 1 in 30 or 1 in 100 year event outlines, or 20% or greater for the 1 in 1000 year event, then it could prove difficult to manage this surface water on-site. Therefore, a site-specific FRA should be carried out to investigate possible mitigation measures for flood storage or infiltration techniques through appropriate SuDS. The percentage thresholds do not consider local conditions.

For sites at surface water flood risk the following should be considered:

- Possible withdrawal, redesign or relocation of the site, certainly for those sites at higher risk from the 1 in 30 year event and those with a large percentage area at risk. This applies to the sites listed in table 6-5 where further investigation is recommended;
- A detailed site-specific Flood Risk Assessment incorporating surface water flood risk management;
- A FRA may want to consider detailed surface water modelling, particularly for the larger sites which may influence sites elsewhere;
- The size of development and the possibility of increased surface water flood risk caused by development on current Greenfield land, and cumulative impacts of this within specific areas;
- Management and re-use of surface water on-site, assuming the site is large enough to facilitate this and achieve effective mitigation;
- Larger sites could leave surface water flood prone areas as open greenspace, incorporating social and environmental benefits;
- Effective surface water management should ensure risks on and off site are controlled;
- SuDS should be used where possible. Appropriate SuDS may offer opportunities to control runoff to Greenfield rates. CIRIA has also produced a number of guidance documents relating to SuDS that should be consulted by the LPA and developers.. Restrictions on surface water runoff from new development should be incorporated into the development planning stage. For brownfield sites, where current infrastructure may be staying in place, then runoff should attempt to mimic that of Greenfield rates, unless it can be demonstrated that this is unachievable or hydraulically impractical;
- Whether the delineation of areas of critical drainage may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the LLFA, NWL and the EA would be required. It may then be beneficial to carry out a Surface Water Management Plan (SWMP) or drainage strategy for targeted locations with any such areas of critical drainage. Investigation into the capacity of existing sewer systems would be required in order to identify critical parts of the system. Drainage model outputs could be obtained to confirm the critical parts of the drainage network and subsequent recommendations could then be made for future development i.e. strategic SuDS sites, parts of the drainage system where any new connections should be avoided, and parts of the system that may have any additional capacity and recommended runoff rates.

6.6 Summary of Assessment Options

6.6.1 Rejection of site

A site which fails to pass the Sequential Test and / or the Exception Test would be rejected. Rejection would also apply to any more (residential, mixed use inclusive of residential) or less vulnerable (employment) sites within Flood Zone 3b where development should not be permitted. The FRCC-PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test and clearly demonstrate that it does not increase or exacerbate flood risk elsewhere. If the developer is able to avoid Flood Zone 3b, part of the site could still be delivered.

In terms of surface water flood risk, if risk is considered significant or where the size of the site does not allow for on-site storage or application of appropriate SuDS then such sites could be considered for rejection.

In some cases the NPPF states that the development can proceed if wider benefits outweigh that of flood risk and where the site can be made safe for the lifetime of the development e.g. through the provision of flood defence infrastructure.

6.6.2 Exception Test required

For those sites that, according to the FRCC-PPG vulnerability tables, would require the Exception Test. Only water-compatible and less vulnerable uses of land would not require the Exception Test in Flood Zone 3a. More vulnerable uses, including residential, and essential infrastructure are only permitted if the Exception Test is passed and all development proposals in Flood Zone 3a must be accompanied by a Flood Risk Assessment. To avoid having to apply the Exception Test, the developer / LPA should attempt to avoid the risk area altogether.

6.6.3 Consideration of site layout and design

Site layout and site design is important at the site planning stage where flood risk exists. The site area would have to be large enough to enable any alteration of the developable area of the site to remove development from the functional floodplain, or to leave space for on-site storage of flood water within Flood Zone 3a. Careful layout and design at the site planning stage may apply to such sites where it is considered viable based on the level of risk. Surface water risk and opportunities for SuDS should also be assessed during the planning stage.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from Flood Zone 3b to a lower risk zone then development should not be permitted. If it is not possible to adjust the developable area of a site to remove the proposed development from Flood Zone 3a to a lower risk zone or to incorporate the on-site storage of water within site design, then the Exception Test would have to be passed as part of a site-specific Flood Risk Assessment.

Any site layout and design options should take account of the 8 metre easement buffer along watercourses, from the top of the bank or the landward toe of a defence on main rivers, where development is not permitted. This easement buffer is recommended by the EA to allow ease of access to watercourses for maintenance works. Any site redesign, where Flood Zone 3a is included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of appropriate SuDS techniques.

6.6.4 Site-Specific Flood Risk Assessment

According to the FRCC-PPG (Para 030), a site-specific FRA is:

“...carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 5 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development’s lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability of FRCC-PPG).”

The objectives of a site-specific FRA are to establish:

Whether a proposed development is likely to be affected by current or future flooding (including effects of climate change) from any source. This should include referencing this SFRA to establish sources of flooding. Further analysis should be performed to improve understanding of flood risk including agreement with the council on areas of functional floodplain that have not been specified within this SFRA. Key objectives:

- Whether the development will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate;
- The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;
- Whether the development will be safe and pass the Exception Test, if applicable.

When is a Site-Specific FRA Required?

According to NPPF footnote 20, a site-specific FRA should be prepared when the application site is:

- Situated in Flood Zone 2 and 3; for all proposals for new development (including minor development and change of use)
- 1 hectare or greater in size and located in Flood Zone 1
- Located in Flood Zone 1 where there are critical drainage problems
- At risk of flooding from other sources of flooding, such as those identified in this SFRA
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding

The LPA may also like to consider further options for stipulating FRA requirements, such as:

- Situated in an area currently benefitting from defences
- Situated within 20 metres of the bank top of a Main River
- Situated over a culverted watercourse or where development will require controlling the flow of any river or stream or the development could potentially change structures known to influence flood flow

These further options should be considered during the preparation and development of the Local Plan

Paragraph 031 of the FRCC-PPG contains information regarding the level of detail required in that FRAs should always be proportionate to the degree of flood risk whilst making use of existing information, including this SFRA. Paragraph 068 of the FRCC-PPG contains an easy to follow FRA checklist for developers to follow.

Together with the information in the FRCC-PPG, there is further detail and support provided for the LPA and developers in the EA's FRA guidance²³ and also the EA guidance for FRAs for planning applications²⁴. CIRIA's report 'C624 Development and Flood Risk'²⁵ also provides useful guidance for developers and the construction industry.

²³ <https://www.gov.uk/flood-risk-assessment-local-planning-authorities>

²⁴ <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

²⁵ CIRIA C624 Development and Flood Risk - guidance for the construction industry. 2004
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6.6.5 Sites passing the Sequential and Exception Tests

Development sites can be allocated or granted planning permission where the Sequential Test and the Exception Test (if required) are passed. In addition, a site is likely to be allocated without the need to assess flood risk where the proposed use is for open space. Assuming the site is not to include any development and is to be left open then the allocation is likely to be acceptable from a flood risk point of view. However, for sites where there is potential for flood storage, options should be explored as part of an FRA.

In terms of opportunities for reducing flood risk overall as a requirement of the Exception Test, the FRCC-PPG states:

“Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally.” (Paragraph 50).

6.6.6 Surface water risk to potential sites

For sites at surface water flood risk the following should be considered:

- Possible withdrawal, redesign or relocation of the site for those sites at identified to be at significant risk;
- A detailed site-specific FRA incorporating surface water flood risk management or drainage strategy for larger strategic sites;
- A FRA may want to consider detailed surface water modelling, particularly for the larger sites which may influence sites elsewhere;
- The size of development and the possibility of increased surface water flood risk caused by development on current Greenfield land (where applicable), and cumulative impacts of this within specific areas;
- Management and re-use of surface water on-site, assuming the site is large enough to facilitate this and achieve effective mitigation. Effective surface water management should ensure risks on and off site are controlled;
- Larger sites could leave surface water flood prone areas as open greenspace, incorporating social and environmental benefits;
- SuDS should be used where possible. Appropriate SuDS may offer opportunities to control runoff to Greenfield rates or better. Restrictions on surface water runoff from new development should be incorporated into the development planning stage. For brownfield sites, where current infrastructure may be staying in place, then runoff should attempt to mimic that of Greenfield rates, unless it can be demonstrated that this is unachievable or hydraulically impractical. Developers should refer to the national 'non-statutory technical standards for sustainable drainage systems' and other guidance documents cited in this report;
- Runoff up to and including the 1% AEP event should be managed on site where possible;
- Measures of source control should be required for development sites;
- Developers should be required to set part of their site aside for surface water management, to contribute to flood risk management in the wider area and supplement green infrastructure networks;
- Developers should be required to maximise permeable surfaces;
- Flow routes on new development where the sewerage system surcharges as a consequence of exceedance of the 1 in 30 AEP design event should be retained; and
- Whether the delineation of Critical Drainage Areas may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the LLFA, NWL, any relevant Internal Drainage Board and the EA would be required. It may then be beneficial to carry out a SWMP or drainage strategy for targeted locations with

any such areas with critical drainage problems. Investigation into the capacity of existing sewer systems would be required in order to identify critical parts of the system. Drainage model outputs could be obtained to confirm the critical parts of the drainage network and subsequent recommendations could then be made for future development i.e. strategic SuDS sites, parts of the drainage system where any new connections should be avoided, and parts of the system that may have any additional capacity and recommended runoff rates.

6.7 Sustainability Appraisal and Flood Risk

The Sustainability Appraisal should help to ensure that flood risk is taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation.

By avoiding sites identified in this SFRA as being at significant risk, or by considering how changes in site layout can avoid those parts of a site at flood risk, such as any site included within Recommendation C, the Council would be demonstrating a sustainable approach to development.

In terms of surface water, the same approach should be followed whereby those sites at highest risk should be avoided or site layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques.

Surface water flood risk should be considered with the same importance as fluvial flood risk.

Once the LPA has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a site-specific FRA, a phased approach to development should be carried out to avoid any cumulative impacts that multiple developments may have on flood risk. For example, for any site where it is required, following the Sequential Test, to develop in Flood Zone 3, detailed modelling would be required to ascertain where displaced water, due to development, may flow and to calculate subsequent increases in downstream flood volumes. The modelling should investigate scenarios based on compensatory storage techniques to ensure that downstream or nearby sites are not adversely affected by development on other sites.

Using a phased approach to development, based on modelling results of floodwater storage options, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus ensuring a sustainable approach to site development. Also, it may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

6.8 Safeguarded Land for Flood Storage

Where possible, the LPA may look to allocate land designed for flood storage functions. Such land can be explored through the site allocation process whereby an assessment is made, using this SFRA, of the flood risk at potential sites and what benefit could be gained by leaving the site undeveloped. In some instances, the storage of flood water can help to alleviate flooding elsewhere, such as downstream developments. Where there is a large area of a site at risk that is considered large enough to hinder development, it may be appropriate to safeguard this land for the storage of flood water.

Applicable sites may include any current greenfield sites:

- That are considered to be large enough to store flood water to achieve effective mitigation,
- With large areas of their footprint at high or medium surface water flood risk (based on the RoFSW),
- That is within the functional floodplain (Flood Zone 3b),
- With large areas of their footprint at risk from Flood Zone 3a and Flood Zone 2, and

- That are large enough and within a suitable distance to receive flood water from a nearby development site, where storage is not feasible, using appropriate SuDS techniques which may involve pumping, piping or swales / drains.
- Brownfield sites could also be considered though this would entail site clearance of existing buildings and conversion to greenspace.
- By using the sequential approach to site layout, the LPA and developers should be able to avoid the areas at risk and leave clear for potential flood storage.

6.9 Guidance for Developers

This SFRA provides the evidence base for developers to assess flood risk at a strategic level and to determine the requirements of an appropriate site-specific FRA. Before carrying out an FRA, developers should check with the LPA whether the Sequential Test has been carried out. If not, the developer must apply the Sequential Test as part of their FRA by comparing their proposed development site with other available sites to ascertain which site has the lowest flood risk. The EA provides advice on this via:

<https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants>

When initially considering the development options for a site, developers should use this SFRA, the NPPF and the Planning Practice Guidance to:

- **Identify whether the site is**
 - *A windfall development, allocated development, within a regeneration area, single property or subject to a change of use to identify if the Sequential and Exception Tests are required.*
- **Check whether the Sequential Test and / or the Exception Test have already been applied**
 - *Request information from the LPA on whether the Sequential Test, or the likelihood of the site passing the Exception Test, have been assessed;*
 - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test.*
- **Consult with the LPA Development Control, the LLFA and the EA and the wider group of flood risk consultees, where appropriate, to scope an appropriate FRA if required**
 - *Guidance on FRAs provided in Section 6.6.4 of this SFRA;*
 - *Also refer to the EA Standing Advice, CIRIA Report C624, SuDS Design Guidance, the NPPF and the Planning Practice Guidance;*
 - *Consult LLFA.*
- **Submit FRA to Development Control, LLFA and the EA for approval, where necessary**

Table 6-6 identifies, for developers, when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who should apply the tests if required.

Table 6-6: Development types and application of Sequential and Exception Tests for developers

Development	Sequential Test Required	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Allocated Sites	No (assuming the development type is the same as that submitted via the allocations process)	LPA should have already carried out the test during the allocation of development sites	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Yes	Developer provides evidence, to the LPA that the test can be passed. An area of search will be defined by local circumstances relating to the catchment and for the type of development being proposed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration Sites Identified Within Local Plan	No	-	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Redevelopment of Existing Single Properties	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Changes of Use	No (except for any proposal involving changes of use to land involving a caravan, camping or chalet site)	Developer provides evidence, to the LPA that the test can be passed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

6.9.1 Development Management Sequential & Exception Test

This section of the SFRA has been developed to provide a useful tool to inform the development management process regarding the potential risk of flooding associated with future planning applications and the basis for requiring site-specific FRAs.

According to the NPPF Paragraph 103:

“When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- *Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and*
- *Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.”*

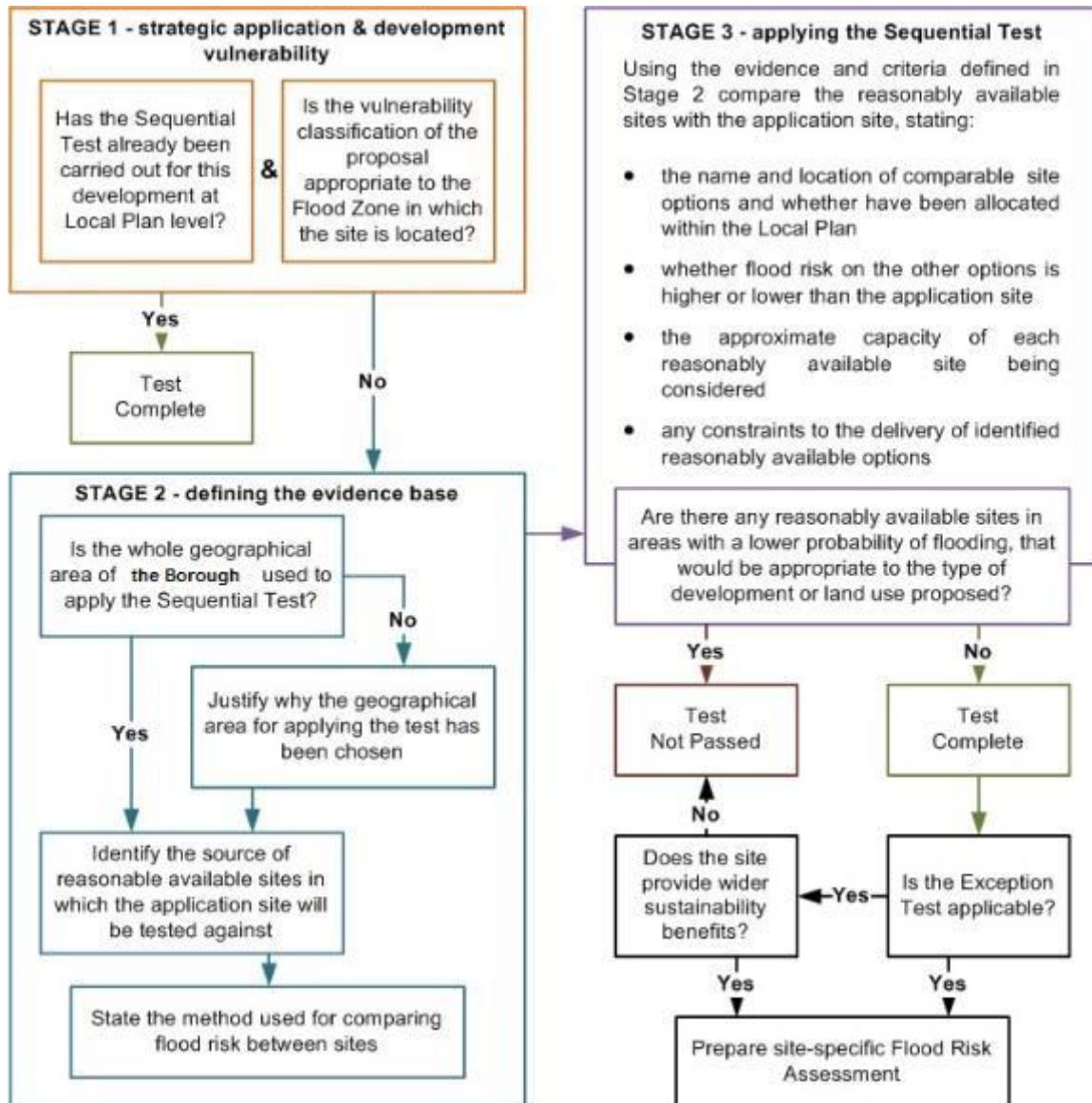
6.9.2 Demonstrating the Sequential Test for Planning Applications

The EA provides advice via:

<https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants>

This advice recommends the approach illustrated by Figure 9 is used by LPAs to apply the Sequential Test to planning applications located in flood zones 2 or 3.

Figure 6-3: Development management Sequential Test process



The approach provides an open demonstration of the Sequential Test being applied in line with the NPPF and the FRCC-PPG. The EA works with local authorities to agree locally specific approaches to the application of the Sequential Test and any local information or consultations with the Lead Local Flood Authority should be taken into account.

In accordance with the EA's advice, the following process should be followed:

- First, check the Local Plan for sites that have already been allocated for development and could be suitable for the development you are proposing,
- Also look at sites that have not been allocated in the Local Plan, but that have been granted planning permission for a development that is the same or similar to the development you are proposing,
- Finally, check whether there are any 'windfall sites' in your search area. Windfall sites are sites that are not allocated in the Local Plan and do not have planning permission, but could be available for development. You can look for windfall sites yourself and also reference the Council's SHLAA.

The Sequential Test does not apply to change of use applications unless it is for change of land use to a caravan, camping or chalet site, or to a mobile home site or park home site. The Sequential Test can also be considered adequately demonstrated if both of the following criteria are met:

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (Local Plan); and
- The development vulnerability is appropriate to the Flood Zone (see Table 3 of the FRCC-PPG).

If both these criteria are met, reference should be provided for the site allocation of the Local Plan document and the vulnerability of the development should be clearly stated.

When applying the Sequential Test, the following should also be considered:

- **The geographic area in which the Test is to be applied. For SCC, this would be the whole city;**
- **The source of reasonable available sites in which the application site will be tested against; and**
- **The evidence and method used to compare flood risk between sites.**

Sites should be compared in relation to flood risk; Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development on the local area, and future environmental conditions that would be experienced by the inhabitants of the development.

The test should conclude if there are any reasonably available sites, in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

The LPA should now have sufficient information to be able to assess whether or not the proposed site has passed the Sequential Test. If the Test has been passed, then the developer should apply the Exception Test in the circumstances set out by tables 1 and 3 of the FRCC-PPG.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific FRA has not already been carried out, a site-specific FRA should be completed in line with the NPPF and the FRCC-PPG. More detailed guidance on site-specific FRAs is provided in Section 6.6.4.

In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach to locating development within the site. As part of their application and master planning discussions with applicants, LPAs should seek whether or not:

- Flood risk can be avoided by substituting less vulnerable uses or by amending the site layout;
- Less vulnerable uses for the site have been considered; or
- Density can be varied to reduce the number or the vulnerability of units located in higher risk parts of the site.

6.9.3 Taking Climate Change into Account

Climate change will increase flood risk over the lifetime of a development. This SFRA has considered a precautionary approach to climate change, as discussed in Section 6.1. A more detailed assessment of the impacts of climate change on flooding from the land and rivers should be carried out as part of a Level 2 SFRA or FRA. This should be carried out using the sensitivity ranges presented in this section which will provide an appropriately robust response to the uncertainty about climate change impacts on rainfall intensities and river flow.

Considering the impacts of climate change within a FRA / Level 2 SFRA will have implications for both the type of development that is appropriate according to its vulnerability to flooding and design standards for any SuDS or mitigation schemes proposed. For example, through very flat floodplains, using the +30 per cent from 2070 to 2115 allowance for peak river flows, could see

an area currently within lower risk zones (Flood Zone 2), in future be re-classified as lying within a higher risk zone (Flood Zone 3a). Therefore, residential development may not be appropriate without suitable flood mitigation measures or flood resilient or resistant houses. In well-defined floodplains, the same climate change allowance could have significant impacts on flood depths influencing building type and design (e.g. finished floor levels).

The EA revised the climate change allowances, in February 2016, for use in FRAs and SFRAs and will use these revised allowances when providing advice:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

The revised climate change allowances are predictions of anticipated change for:

- Peak river flow by River Basin District;
- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

Deciding on which of the peak river flow allowances to use is based on the flood zone the development is within and the associated vulnerability classification (see Table 2 of the FRCC-PPG). Table 6-7 shows the peak river flow allowances for the Northumbria River Basin District.

Table 6-7: Recommended Peak River Flow Allowances for the Northumbria River Basin District

Allowance Category	Total Potential Change Anticipated for...		
	2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Upper end	+20%	+30%	+50%
Higher central	+15%	+20%	+25%
Central	+10%	+15%	+20%

The peak rainfall intensity allowance applies to the whole of England. SFRAs and FRAs should assess both the central and upper end allowances to gauge the range of impacts. Table 6-8 shows these allowances.

Table 6-8: Peak Rainfall Intensity Allowance in Small and Urban Catchments for England

Allowance Category	Total Potential Change Anticipated for...		
	2015-2039	2040-2069	2070-2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Allowances for sea level rise are based on different regions of England. The allowances for the North East of England are shown in Table 6-9. The number in brackets is the cumulative sea level rise for each year within each range.

Table 6-9: Sea Level Allowance for North East England

1990 - 2025	2026 - 2055	2056 - 2085	2086 - 2115	Cumulative Rise 1990 - 2115 (metres)
2.5 mm (87.5 mm)	7 mm (210 mm)	10 mm (300 mm)	13 mm (390 mm)	0.99 m

The EA will also require consideration, if appropriate, of the 'high++ allowances' for peak river flows and mean sea level rise where a development is considered to be very sensitive to flood risk and with lifetimes beyond the end of the century. This could include infrastructure projects or developments that significantly change existing settlement patterns. The high++ allowances can be found in the EA's *Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities*²⁶, which uses science from UKCP09. This guidance is based on

Government's policy for climate change adaptation, and is specifically intended for projects or strategies seeking Government Flood Defence Grant in Aid (FDGiA) funding. However, RMAs in England may also find it useful in developing plans and making Flood and Coastal Erosion Risk Management (FCERM) investment decisions even if there is no intention of applying for central government funding. This is important for any future large scale infrastructure used to support the delivery of strategic sites such as flood defence schemes.

Although, it is anticipated that increases in river flows will lie somewhere within the range of the central to upper end estimates of the February 2016 allowances, more extreme change cannot be discounted. The high++ allowances can be used to represent more severe climate change impacts and help to identify the options that would be required. The UKCP09 high++ allowances for peak river flows and relative mean sea level rise are presented in Table 6-10 and Table 11 respectively.

Table 6-10: UKCP09 High++ Allowances for Peak River Flow for the Northumbria River Basin District (relative to 1961-90 baseline)

River Basin District	Total Potential Change Anticipated for...		
	2020s (2015-39)	2050s (2040-69)	2080s (2070-2115)
Northumbria	+20%	+35%	+65%

Table 6-11: UKCP09 High++ Mean Sea Level Allowance (compared to 1990 baseline, includes land movements)

Sea Level Rise mm/yr up to 2025	Sea Level Rise mm/yr 2026 to 2050	Sea Level Rise mm/yr 2051 to 2080	Sea Level Rise mm/yr 2081 to 2115
6	12.5	24	33

Modelled climate change outputs, using the February 2016 allowances, are not available at the time of writing for this Level 1 SFRA. However, any Level 2 assessment, following on from this Level 1, could involve the modelling of appropriate climate change events, where fully functioning EA hydraulic models are available.

6.10 Sustainable Drainage Systems (SuDS)

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and consequently a potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding.

The FWMA, 2010, originally transferred the adoption and maintenance of SuDS to Sustainable Drainage Systems Approval Bodies (SABs) that were supposed to be established by local authorities, or LLFA's, under Schedule 3 of the Act. However, the designation of a SAB has since been removed following lengthy consultation, with the announcement from the Department for Communities and Local Government (DCLG) in December 2014 that local planners will be responsible for delivering SuDS²⁷. Changes to planning legislation give provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the non-statutory technical standards for sustainable drainage systems²⁸, published in March 2015. This builds on the existing planning system, the NPPF, which developers and local authorities are already using. Policy changes to the planning system can also be introduced relatively quickly ensuring

²⁷ <http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/>

²⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

that flood risk benefits from sustainable drainage systems can be brought forward as part of planning application proposals.

The NPPF continues to reinforce how planning applications that fail to deliver SuDS above conventional drainage techniques could be rejected and sustainable drainage should form part of integrated design secured by detailed planning conditions so that the SuDS to be constructed must be maintained to a minimum level of effectiveness.

Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers; and, set out a minimum standard to which the sustainable drainage systems must be maintained.

The runoff destination should always be the first consideration when considering design criteria for SuDS including the following possible destinations in order of preference:

1. To ground;
2. To surface water body;
3. To surface water sewer;
4. To combined sewer.

Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination. Developers should also establish that proposed outfalls are hydraulically capable of accepting the runoff from SuDS through consultation with the LLFA, EA and NWL.

The non-statutory technical standards for sustainable drainage systems (March 2015) set out appropriate design criteria based on the following:

1. Flood risk outside the development;
2. Peak flow control;
3. Volume control;
4. Flood risk within the development;
5. Structural integrity;
6. Designing for maintenance considerations;
7. Construction.

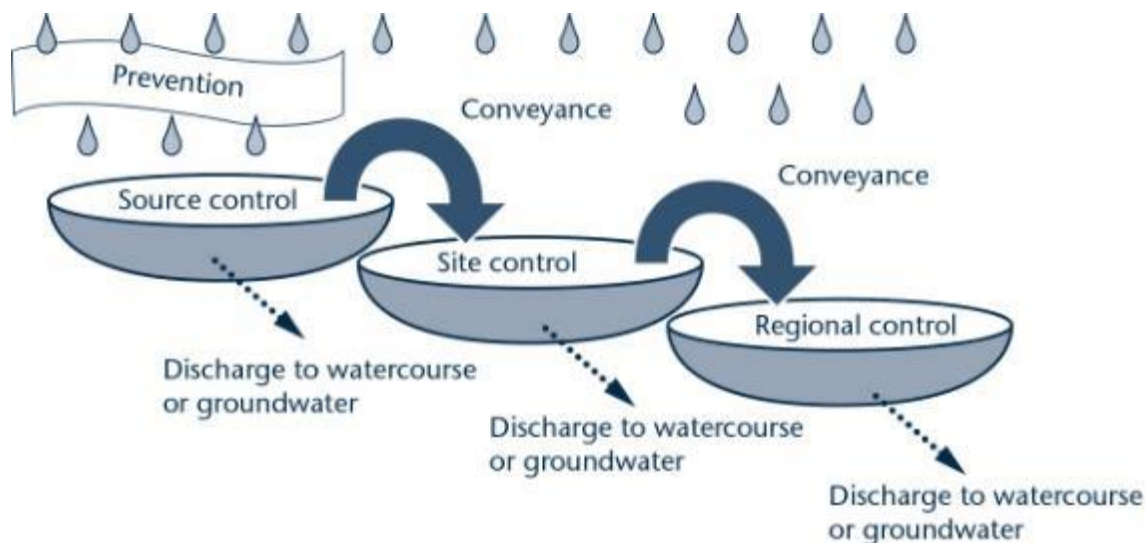
In addition, the LPA may set local requirements for planning permission that include more rigorous obligations than these non-statutory technical standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high risk areas. This could include improvements on Greenfield runoff rates. CIRIA has also produced a number of guidance documents relating to SuDS that should be consulted by the LPA and developers. The Local Authority SuDS Officer Organisation (LASOO) has also produced a very useful Best Practice Guidance on the DEFRA Standards²⁹.

Many different SuDS techniques can be implemented depending on the local conditions and circumstances. As a result, there is no one standard correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle (see Figure 5-15), will be required, where source control is the primary aim.

Requirements in LFRMs

The responsibility for the approval process lies with the City Council. The SuDS approval process is integrated into the NPPF, the LLFA have a role as statutory consultee. Being at the forefront of the SuDS approval process will affect local decisions on planning and drainage and will make a significant contribution to the vision of the Local Plan Core Strategy.

Figure 6-4 SuDS Management Train Principle³⁰



The effectiveness of a flow management scheme within a single site is heavily limited by land use and site characteristics including (but not limited to) topography; geology and soil (permeability); and available area. Potential ground contamination associated with urban and former industrial sites should be investigated with concern being placed on the depth of the local water table and potential contamination risks that will affect water quality. The design, construction and ongoing maintenance regime of any SuDS scheme must be carefully defined as part of a site-specific FRA. A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential for successful SuDS implementation.

6.10.1 Coal Authority SuDS /infiltration suitability.

Large areas of the North East have been undermined by coal mine workings. Historically, mine water pumping artificially lowered groundwater levels providing drainage pathways. However, following mine closures and cessation of pumping, groundwater levels are now recovering to the pre-mining position. In some areas with specific geology and a high-water table, infiltration sustainable drainage system (SuDS) may not work.

The large network of mining beneath the North East has also resulted in some areas where mine water is close to the surface, being controlled by either surface discharges or being actively controlled by Coal Authority pumping sites. Infiltration (SuDS) in some of these areas could have a detrimental impact on the amount and quality of water entering mine workings resulting in increased mine water pollution, flooding risks, or impacts on pumping infrastructure.

The Coal Authority (CA) and the Environment Agency (EA) have developed a management tool, in the form of a GIS based risk map, to help protect and manage the groundwater resource, reduce pollution risk and empower the competent planning and flood risk authorities.

The purpose of this management tool and the project is to help raise awareness of the current situation and to identify the associated risks to and from recovered, rising and actively controlled mine waters.

The mapping effectively indicates where infiltration SuDS will not be appropriate, as there is potential to influence mine workings and increase mine water discharges. The Coal Authority are also looking to reduce pumping across the region and will be considering how and when to turn mine pumps off. They did agree that a risk assessment would be required to ensure that any adaptations would not result in any increase in localised flood risk.

Whilst there is no impact on site selection as part of the SFRA process, developers and the council will need to consult with the Coal Authority and confirm the appropriate use of SuDS on a site by site basis

6.10.2 Local standards

In addition to the national standards, the LPA and LLFA may set local requirements for planning permission that include more rigorous obligations than these non-statutory technical standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high risk areas. This could include improvements on Greenfield runoff rates.

The LPA should always be contacted with regards to these local requirements at the earliest opportunity in development planning.

The CIRIA SuDS Manual³¹ 2007 should also be consulted by the LPA and developers. The SuDS manual (C697 & C753) is highly regarded and was updated in 2016 to incorporate the latest research, industry practice, technical advice and adaptable processes to assist in the planning, design, construction, management and maintenance of good SuDS. The SuDS Manual complements the non-statutory technical standards and goes further to support the cost-effective delivery of multiple benefits.

Drainage for New Developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

Managing surface water discharges from new development is crucial in managing and reducing flood risk to new and existing development.

Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in setting standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance by the water companies on their assets. Water companies plan their investment on a five year rolling cycle, in consultation with key partners, including the EA.

SCC LPA and LLFA expect the content for a SuDS Design Statement for a typical housing development should include:

- Description and plan showing the characteristics of the site including – topography, ground conditions, natural directions and paths for water movement
- Options analysis of discharge routes offsite (infiltration, watercourse, surface water sewer) with information on any agreements / confirmed information.
- Options analysis of drainage solutions demonstrating considerations of SuDS principles in development layout. Particularly - keeping water on or near the surface from collection to conveyance to storage, the use of sub-catchments and SuDS in sequence from management at source to larger features in open space, integration with landscape. NOTE If no agreement on discharge route has been established alternatives must be explored.
- Outline figures to support drainage options
- Principles of management of return periods both within and external to the drainage system up to 1 in 100 plus climate change
- Proposed management arrangements for all drainage infrastructure including who is responsible, what maintenance activities and how resourced.
- Concept plan and critical sections to demonstrate feasibility of solutions

31 https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx
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The most successful SuDS schemes are delivered through a collaboration between the Drainage Engineer and the design team for example, the architect, landscape architect and Highway Engineer.

Overland Flow Paths

Underground drainage systems have a finite capacity and regard should always be given to larger events when the capacity of the network will be exceeded. Hence there is a need to design new developments with exceedance in mind. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

Master planning should ensure that existing overland flow paths are retained within the development. As a minimum, the developer should investigate, as part of a FRA, the likely extents, depths and associated hazards of surface water flooding on a development site, as shown by the RoFSW dataset. This is considered to be an appropriate approach to reduce the risk of flooding to new developments. Green infrastructure should be used wherever possible to accommodate such flow paths. **Floor levels should always be set a minimum of 300 mm above adjacent roads** to reduce the consequences of any localised flooding.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography; geology and soil (permeability); development density; existing drainage networks both on-site and in the surrounding area; adoption issues; and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

6.10.3 Green Infrastructure Assessments

Open space, or Green Infrastructure (GI), should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities and should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

Open space can provide many social, economic and environmental benefits close to where people live and work including:

- Places for outdoor relaxation and play;
- Space and habitat for wildlife with access to nature for people;
- Environmental education;
- Local food production - in allotments, gardens and through agriculture;
- Improved health and well-being – lowering stress levels and providing opportunities for exercise;
- Climate change adaptation - for example flood alleviation and cooling urban heat islands.

The NPPF explains that open space can perform many functions, including flood risk mitigation, and that Local Plans should account for increased flood risk, resulting from climate change, through the planning of Green Infrastructure. GI can have an important role to play in reducing the likelihood of flooding by providing space for flood storage, reducing runoff and increasing infiltration, whilst also providing other benefits as stated above.

Alongside GI should be the implementation of SuDS, specifically within potential development sites, where possible. The suitability of GI and SuDS can be informed by this SFRA through utilisation of open space for water in the areas of greatest flood risk, which would be key to helping deliver sustainable development. Examples include:

- Restoration of the natural character of floodplains;
- Keeping and preserving of areas of existing natural floodplain;
- Introduction of new areas and enhancing existing areas of greenspace whilst incorporating sustainable drainage within new development; and
- Reduction of downstream flood risk.

The Town and Country Planning Association together with The Wildlife Trusts produced a guidance document for Green Infrastructure³². The guidance states that local plans should identify funding sources for GI and provision should be made for GI to be adequately funded as part of a development's core infrastructure. For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. LPAs may include capital for the purchase, design, planning and maintenance of GI within the Community Infrastructure Levy (CIL) programme.

³² Planning for a Healthy Environment - Good Practice Guidance for Green Infrastructure and Biodiversity, Published by the Town and Country Planning Association and The Wildlife Trusts, July 2012

Emergency Planning

The provisions for emergency planning for local authorities as Category 1 responders are set out by the Civil Contingencies Act, 2004 and the National Flood Emergency Framework for England, December 2014³³. This framework is a resource for all involved in emergency planning and response to flooding from the sea, rivers, surface water, groundwater and reservoirs. The Framework sets out the Government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies,
- Give all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies,
- Establish clear thresholds for emergency response arrangements,
- Place proper emphasis on the multi-agency approach to managing flooding events,
- Provide clarity on the means of improving resilience and minimising the impact of flooding events,
- Provide a basis for individual responders to develop and review their own plans, and
- Being a long-term asset that will provide the basis for continuous improvement in flood emergency management.

Along with the EA flood warning systems, there are a range of flood plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and tactical response framework for key responders.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The SFRA Maps in Appendix A and accompanying GIS layers should be made available for consultation by emergency planners during an event and throughout the planning process.

6.11 Civil Contingencies Act

Under the Civil Contingencies Act (CCA, 2004)³⁴, SCC is classified as a Category 1 responder and has duties to assess the risk of emergencies occurring, and uses this to:

- inform contingency planning;
- put in place emergency plans;
- put in place Business continuity management arrangements;
- put in place arrangements to make information available to the public about civil protection matters;
- maintain arrangements to warn, inform and advise the public in the event of an emergency;
- share information with other local responders to enhance coordination;
- cooperate with other local responders to enhance coordination and efficiency and to provide advice and assistance to businesses and voluntary organisations about business continuity management.

During an emergency such as a flood event, the local authority must also co-operate with other Category 1 responders (such as the emergency services and the EA) to provide the core response.

6.11.1 Northumbria Local Resilience Forum

SCC is a partner of the Northumbria Local Resilience Forum (NLRF)³⁵. The role of the Resilience Forum is to ensure an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities

³³ <https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england>

³⁴ <https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act>

³⁵ <http://www.northumberland.gov.uk/Partners/NLRF.aspx>

of Sunderland City Council and other areas in the North East. NLRF consists of representatives from the Emergency Services, all six of the North East's local authorities (SCC, Newcastle City Council, Gateshead Council, North Tyneside Council, Northumberland County Council and South Tyneside Council), Northumbria Police, NHS England, the EA, Public Health England and the Maritime and Coastguard Agency.

6.11.2 Community Risk Register

As a strategic decision-making organisation, the NLRF prepared a Community Risk Register (CRR)³⁶, last updated in 2013, which considers the likelihood and consequences of the most significant risks and hazards the area faces, including fluvial and urban flooding. This SFRA can help to inform this. The CRR is considered as the first step in the emergency planning process and is designed to reassure the local community that measures and plans are in place to respond to the potential hazards listed within the CRR.

6.11.3 Community Emergency Plan

Communities may need to rely on their own resources to minimise the impact of an emergency, including a flood, before the emergency services arrive. Many communities already help each other in times of need, but experience shows that those who are prepared cope better during an emergency. Communities with local knowledge, enthusiasm and information are a great asset and a Community Emergency Plan can help. Details on how to produce a community emergency plan, including a toolkit and template, are available from the government's website³⁷.

6.11.4 Household Emergency Checklists

The NLRF recommends individual families should complete a Household Emergency Checklist and Grab Bag to prepare for emergencies. A template checklist and advice on how to prepare for floods and other emergencies is available from:

<http://www.northumberland.gov.uk/Partners/NLRF/Help-yourself/Before-an-emergency.aspx>

6.11.5 Local Flood Plans

This SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. SCC will be unable to write specific flood plans for new developments at flood risk. Developers should write their own. Guidance can be found on the EA web site³⁸. Generally, owners with individual properties at risk should write their own individual flood plans, however larger developments or regeneration areas, such as retail parks, hotels and leisure complexes, should consider writing one collective plan for the assets within an area.

This SFRA can help to:

- Update these flood plans if appropriate;
- Inform emergency planners in understanding the possibility, likelihood and spatial distribution of all sources of flooding (emergency planners may however have access to more detailed information, such as for Reservoir Inundation Maps, which have not been made available for this SFRA);
- Identify safe evacuation routes and access routes for emergency services;
- Identify key strategic locations to be protected in flooding emergencies, and the locations of refuge areas which are capable of remaining operational during flood events;
- Provide information on risks in relation to key infrastructure, and any risk management activities, plans or business continuity arrangements;
- Raise awareness and engage local communities;
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk;

³⁶ <http://www.northumberland.gov.uk/partners/nlrf.aspx?nccredirect=1>

³⁷ <https://www.gov.uk/guidance/resilience-in-society-infrastructure-communities-and-businesses#community-resilience>

- Provide flood risk evidence for further studies.

6.12 Flood Warning and Evacuation Plans

Developments that include areas that are designed to flood (e.g. ground floor car parking and amenity areas) or have a residual risk associated with them, will need to provide appropriate flood warning and instructions so users and residents are safe in a flood. This will include both physical warning signs and written flood warning and evacuation plans. Those using the new development should be made aware of any evacuation plans.

Whilst there is no statutory requirement on the EA or the emergency services to approve evacuation plans, SCC is accountable under its Civil Contingencies duties, via planning condition or agreement, to ensure that plans are suitable. This should be done in consultation with Development Management Officers. Given the cross cutting nature of flooding, it is recommended that further discussions are held internally to SCC between emergency planners and policy planners / development management officers, the LLFA, drainage engineers and also to external stakeholders such as the emergency services, the EA, NWL, Internal Drainage Boards and Canal & River Trust.

It may be useful for both the LLFA and spatial planners to consider whether, as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. The application of such a condition is likely to require policy support in the Local Plan, and discussions within the Northumbria Local Resilience Forum are essential to establish the feasibility / effectiveness of such an approach, prior to it being progressed. It may also be useful to consider how key parts of agreed flood evacuation plans could be incorporated within local development documents, including in terms of protecting evacuation routes and assembly areas from inappropriate development.

Once the development goes ahead, it will be the requirement of the plan owner (developer) to make sure the plan is put in place, and to liaise with SCC regarding maintenance and updating of the plan.

6.12.1 What should the Plan Include?

Flood warning and evacuation plans should include the information stated in Table 6-12. Advice and guidance on plans is accessible from the EA website and there are templates available for businesses and local communities

Table 6-12: Flood warning and evacuation plans

Consideration	Purpose
Availability of existing flood warning system	The EA offers a flood warning service that currently covers designated Flood Warning Areas in England and Wales. In these areas, they are able to provide a full Flood Warning Service.
Rate of onset of flooding	The rate of onset is how quickly the water arrives and the speed at which it rises which, in turn, will govern the opportunity for people to effectively prepare for and respond to a flood. This is an important factor within Emergency Planning in assessing the response time available to the emergency services.
How flood warning is given and occupants awareness of the likely frequency and duration of flood events	Everyone eligible to receive flood warnings should be signed up to the EA flood warning service. Where applicable, the display of flood warning signs should be considered. In particular sites that will be visited by members of the public on a daily basis such as sports complexes, car parks, retail stores. It is envisaged that the responsibility should fall upon the developers and should be a condition of the planning permission. Information should be provided to new occupants of houses concerning the level of risk and subsequent procedures if a flood occurs.
The availability of staff / occupants / users to respond to a flood warning and the time taken to respond to a flood warning	The plan should identify roles and responsibilities of all responders. The use of community flood wardens should also be considered.

Consideration	Purpose
Designing and locating safe access routes, preparing evacuation routes and the identification of safe locations for evacuees	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and flood hazard rating, including allowance for climate change, should be considered when identifying these routes.
Vulnerability of occupants	Vulnerability classifications associated with development as outlined in the FRCC-PPG. This is closely linked to its occupiers.
How easily damaged items will be relocated and the expected time taken to re-establish normal use following an event	The impact of flooding can be long lasting well after the event has taken place affecting both the property which has been flooded and the lives that have been disrupted. The resilience of the community to get back to normal will be important including time taken to repair / replace damages.

6.13 Flood Awareness

Emergency planners may also use the outputs from this SFRA to raise awareness within local communities. This should include raising awareness of flood risks, roles and responsibilities and measures that people can take to make their homes more resilient to flooding from all sources whilst also encouraging all those at fluvial flood risk to sign up to the EA's Flood line Warnings Direct³⁹ service.

It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas, to ensure that adequate pre-planning, response and recovery arrangements are in place.

³⁹ <https://fwd.environment-agency.gov.uk/app/olr/home>
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7 Conclusions and Recommendations

7.1 Conclusions

This SFRA provides a single repository planning tool relating to flood risk and development in Sunderland. Key flood risk stakeholders namely the EA, Northumbrian Water, Sunderland City Council, Lead Local Flood Authority and Canal & River Trust were consulted to collate all available and relevant flood risk information on all sources into one comprehensive assessment. Together with this report, this SFRA also provides a suite of interactive GeoPDF flood risk maps (Appendix A) and a Development Site Assessment spreadsheet (Appendix B) illustrating the level of risk to sites identified in the SHLAA, with subsequent recommendations.

The flood risk information, assessment, guidance and recommendations of the SFRA will provide the Council with the evidence base required to apply the Sequential and Exception Tests, as required under the NPPF, and demonstrate that a risk based, sequential approach has been applied in the preparation of its new Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas where the council is looking for continued growth, this will not always be possible. This SFRA therefore provides the necessary links between spatial development, wider flood risk management policies, local strategies / plans and on the ground works by combining all available flood risk information together into one single repository. As this is a strategic study, detailed local information on flood risk is not fully accounted for. For a more detailed assessment of specific areas or sites, a Level 2 SFRA may be carried out following on from the completion of a Level 1 assessment, if required.

7.2 Planning Policy and Flood Risk Recommendations

The following planning policy recommendations relating to flood risk are designed to enable the Council to translate the information provided in this Level 1 SFRA into meaningful Local Plan policy for flood risk and water management:

Policy Recommendation 1: No development within Flood Zone 3b...

...as per the NPPF and FRCC-PPG, unless in exceptional circumstances such as for essential infrastructure or where development is water compatible.

Development must not impede the flow of water within Flood Zone 3b nor should it reduce the volume available for storage of flood water.

Refer to tables 1 to 3 of the FRCC-PPG.

Policy Recommendation 2: Consider surface water flood risk...

...alongside fluvial risk, including possible withdrawal, redesign or relocation for sites at significant surface water risk.

Flood Risk Assessments should always consider surface water flood risk management and options for on-site flood storage.

Policy Recommendation 3: Sequential approach to site allocation and site layout...

...must be followed by the LPA to ensure sustainable development when either allocating land in Local Plans or determining planning applications for development.

The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test, if required.

This SFRA, the NPPF and FRCC-PPG should be consulted throughout this process.

Policy Recommendation 4: Requirement for a site-specific Flood Risk Assessment...

...from a developer when a site is:

- Within Flood Zone 3a or Flood Zone 2
- Within Flood Zone 1 and 1 hectare or greater in size
- Within a Critical Drainage Area and is 0.5ha or greater in size
- At risk from surface water flooding
- Situated in an area currently benefitting from defences
- Situated within 20 metres of the bank top of a Main River
- Situated over a culverted watercourse or where development will be required to control or influence the flow of any watercourse

Before deciding on the scope of the FRA, this SFRA should be consulted along with the LPA, LLFA and EA. The FRA should be submitted to and approved by the LPA including

Policy Recommendation 5: Use of appropriately sourced of SuDS...

...required for all major developments of 10 or more residential units or equivalent commercial development. This is in accordance with the interim national standards published in March 2015 and the LFRMS published April 2016..

SuDS scoping and design, as part of a site-specific FRA, must be included within the early stages of the site design in order to incorporate appropriate SuDS within the development.

The LPA, LLFA, Northumbrian Water must be consulted during the site design stage and the FRA must be submitted to and approved by the LPA, considering all consultation with key stakeholders.

The EA should be consulted with regards to surface water if surface water is being discharged from the site to a Main River.

Policy Recommendation 6: Phasing of development...

...should be carried out by the LPA to avoid any cumulative impacts of flood risk.

Using a phased approach to development, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus contributing to a sustainable approach to site development.

It may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

Policy Recommendation 7: Planning permission for at risk sites...

...can only be granted by the LPA where a site-specific FRA shows that:

- The NPPF and FRCC-PPG have been referenced together with appropriate consultation with the LLFA, the EA, Northumbria, where applicable
- The effects of climate change have been taken into account using the February 2016 allowances developed by the EA, though modelled climate change outputs are not available and have not been used in this Update
- There is no loss in floodplain storage resulting from the development
- The development will not increase flood risk elsewhere
- There is no adverse effect on the operational functions of any existing flood defence infrastructure
- Proposed resistance / resilience measures designed to deal with current and future risks are appropriate
- Appropriate SuDS techniques have been considered and are to be incorporated into the design of the site, where applicable
- Whether the development will be safe and has passed the Exception Test, if applicable.

7.3 Recommendations for Further Work

The SFRA process has developed into more than just a planning tool. Sitting alongside the Council's LFRMS and PFRA, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are a number of plans and assessments listed in Table 7-1 that would be of benefit to SCC as the LLFA, in developing their flood risk evidence base to support the delivery of their Local Plan or to help fill critical gaps in flood risk information.

7.3.1 Level 2 SFRA

The Council should review the sites where they expect the main housing numbers and employment sites to be delivered, using Section 0 of this report, the SFRA Maps in Appendix A and the Development Site Assessment spreadsheet in Appendix B. A Level 2 SFRA will be required if a large site, or group of sites, are within Flood Zone 3 and have strategic planning objectives, which means they cannot be relocated or avoided. A Level 2 SFRA may also be required if the majority of the sites are within Flood Zone 2 or are at significant risk of surface water flooding. Residual flood risk should also be taken account of when considering options for future work.

As discussed in Section 6.7.3, a Level 2 assessment can be used to model the February 2016 climate change allowances, where current EA models are available.

A Level 2 SFRA should build on the source information provided in this Level 1 assessment and should show that a site will not increase risk to others and will be safe, once developed, and will

pass the Exception Test, if required. A Level 2 study may also assess locations and options for the implementation of open space, or Green Infrastructure, to help manage flood risk in key areas.

The LPA will need to provide evidence in their Local Plan to show that the housing numbers (and other sites) can be delivered. The Local Plan may be rejected if a large number of sites require the Exception Test to be passed but with no evidence that this will be possible.

Once all sites within this Level 1 assessment have been reviewed by the LPA then further advice or guidance should be sought to discuss possible next steps.

Table 7-1: Recommended further work for SCC

Type	Study	Explanation	Timeframe
Understanding of local flood risk	EA Flood Risk Mapping updates	EA modelling updates of older models	Medium term
	Level 2 SFRA	Further, more detailed assessment of flood risk to high risk sites, as notified by this Level 1 SFRA The Plan identifies the Port of Sunderland as an employment area. This site may have a range of port-related development uses within Use Classes B1, B2 and B8. As 60% of this site is located (out of necessity) in FZ3 a more detailed Level 2 assessment is recommended to provide more detailed information.	Short term
	drainage strategy	For those high surface water risk sites / areas as notified by this Level 1 SFRA	Short term
Climate change (February 2016 allowances)	Level 2 SFRA	Modelling of climate change for available EA models, where applicable	Short term
CDA designation	Level 2 SFRA	Exploration of the possibility of designating official CDAs as notified to the LPA by the EA or identification of areas of critical drainage for use in SCC's Local Plan	Short term
Flood storage	Community Infrastructure Levy (CIL)	For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. The LPA could include capital for the purchase, design, planning and maintenance of GI within its CIL programme.	Short term
Data Collection	Flood Incident Data	SCC, has a duty to investigate and record details of locally significant flood events within the area. General data collected for each incident, should include date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any RMA.	Short Term / Ongoing
	FRM Asset Register	SCC should continue to update and maintain their flood risk management register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Risk assessment	Asset Register Risk Assessment	SCC should carry out a strategic assessment of structures and features on the FRM Asset Register to inform capital programme and prioritise maintenance programme.	Short Term
Capacity	SuDS review / guidance	SCC should identify internal capacity required to deal with SuDS applications, set local	Specification adopted

Type	Study	Explanation	Timeframe
		specification and set policy for adoption and maintenance of SuDS.	
Partnership	Northumbrian Water	SCC should continue to work with NWG on sewer and surface water projects.	Ongoing
	EA	SCC should continue to work with the EA on fluvial and tidal flood risk management projects. SCC should also identify potential opportunities for joint schemes to tackle flooding from all sources.	Ongoing
	Community	Continued involvement with the community through SCC's existing flood risk partnerships.	Ongoing

Appendices

A SFRA Maps

Interactive GeoPDF Maps

Open the Overview Map in Adobe Acrobat (2016s4798_SCC_SFRA_Overview.pdf). The Overview Map contains a set of four index squares covering four quarters of the city. Clicking on one of the four index squares will open up an Index Map for that area, by way of a hyperlink.

Each of the four Index Maps contain a further set of index squares covering different areas of the city at a scale of 1:10,000. Clicking on one of these index squares will open up a more detailed map of that area (scale = 1:10,000) by way of a hyperlink.

Within the detailed maps, use the zoom tools and the hand tool to zoom in/out and pan around the open detailed map. In the legend on the right-hand side of the detailed maps, layers can be switched on and off when required by way of a dropdown arrow. The potential development site reference labels can also be switched on and off if, for example, smaller sites are obscured by the labels.

B Development Site Assessment Spreadsheet

C Functional Floodplain Delineation

Technical note explaining the methodology behind the delineation of the functional floodplain (Flood Zone 3b) for this SFRA.

JBA
consulting

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office

South Barn
Broughton Hall
SKIPTON
North Yorkshire
BD23 3AE
United Kingdom

t:+44(0)1756 799919
e:info@jbaconsulting.com

Jeremy Benn Associates Ltd
Registered in England
3246693



Visit our website
www.jbaconsulting.com