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Partnership for South Hampshire Level 1 Strategic Flood Risk Assessment

PART 3 – Winchester City Council

Final Report

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	12th May 2022	Version 1 Draft Report	EC	Emily Craven	Associate Director
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Acronymns

Acronym	Definition
AEP	Annual exceedance probability
BGS	British Geological Survey
CFMP	Catchment flood management plan
CMP	Catchment management plan
FCERM	Flood and coastal erosion risk management
FRA	Flood Risk Assessment
FSA	Flood storage area
GWMP	Groundwater management plan
HCC	Hampshire County Council
LFRMS	Local flood risk management strategy
LLFA	Lead local flood authority
LPA	Local planning authority
NPPF	National planning policy framework
PCC	Portsmouth City Council
PFRA	Preliminary Flood Risk Assessment
PfSH	Partnership for South Hampshire
PPG	Planning practice guidance
SFRA	Strategic flood risk assessment
SOP	Standard of protection
SuDS	Sustainable Drainage Systems
SWMP	Surface water management plan
RBD	River basin district
RFCC	Regional flood and coastal committee
WWNP	Working with natural processes

1. Introduction

1.1.1 AECOM has been commissioned by Portsmouth City Council (PCC) on behalf of ten planning authorities in South Hampshire (the 'Partnership for South Hampshire' (PfSH)) to prepare an updated Strategic Flood Risk Assessment (SFRA). The PfSH SFRA covers the administrative areas of Portsmouth City, Havant Borough, Gosport Borough, Fareham Borough, Eastleigh Borough, Southampton City, Winchester City, Test Valley Borough, New Forest District and New Forest National Park Authority.

1.1.2 This document should be read in conjunction with SFRA Report Part 1. Together with Part 1, this document forms the SFRA for Winchester City Council (CC), excluding the National Park Authority area for which a separate SFRA has been prepared[1].

Table 1-1 SFRA User Guide

PART 1 MAIN REPORT	CONTENT
1 Introduction	Explains the need for the study and the objectives. Provides a user guide and identifies who has been consulted. Identifies when the SFRA may need to be updated in the future.
2 Legislation and Policy Framework	Provides an overview of the latest legislation and national and regional policies in relation to flood risk and coastal change.
3 Datasets	Identifies the datasets used to inform the SFRA and describes the approaches taken to use and update data as part of the SFRA.
4 Applying the Sequential Test	Describes how the sequential test should be applied using the SFRA.
5 Preparing Flood Risk Assessments	Describes how site specific FRAs should be prepared.
Appendix A: GIS Floodplain Analysis Methodology	Records the methodology applied for the GIS floodplain analysis to determine those areas that may be sensitive to changes in flood level in the future.
Appendix B: Coastal Modelling Technical Notes	East Solent Flood Inundation Model Re-Simulations Technical Note (Hayling Island, Portsea Island, Gosport to Warsash) Southampton Water Model Re-Simulation Technical Note

LPA SPECIFIC REPORTS	CONTENT
PART 2 TEST VALLEY **PART 3 WINCHESTER CITY** **PART 4 HAVANT** **PART 5 PORTSMOUTH CITY** **PART 6 GOSPORT** **PART 7 FAREHAM BOROUGH** **PART 8 EASTLEIGH BOROUGH** **PART 9 SOUTHAMPTON CITY** **PART 10 NEW FOREST DISTRICT AND NATIONAL PARK**	For each LPA, mapping of the flood risk datasets is provided as well as a report covering the following topics: 1 Introduction 2 Local policy and plans 3 Sources of flood risk and expected effects of climate change 4 Cumulative impacts of development and land use change 5 Current control, mitigation, and management measures 6 Opportunities to reduce the causes and impacts of flooding 7 Recommendations of how to address flood risk in development

[1] Amec Foster Wheeler Environment and Infrastructure UK Ltd, September 2017, South Downs National Park Level 1 and Level 2 SFRA. https://www.southdowns.gov.uk/planning-policy/south-downs-local-plan/local-plan-evidence-base/evidence-and-supporting-documents/level-1-update-and-level-2-strategic-flood-risk-assessment/

2. Local policies and plans

The SFRA Report Part 1 Section 2 provides a high level overview of the national and regional planning context for coastal change and flood risk management in the PfSH SFRA project area. This Section provides a summary of the local policy and guidance for Winchester CC.

2.1 Catchment Flood Management Plans

2.1.1 The role of Catchment Flood Management Plans (CFMPs) is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. CFMPs are produced by the Environment Agency. The CFMP considers all types of inland flooding, from rivers, groundwater, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding), which is covered by Shoreline Management Plans (SMPs).

2.1.2 The Winchester CC administrative area is covered by the Test and Itchen CFMP[2] and the South East Hampshire CFMP[3]. The policies for the sub-areas within Winchester CC are summarised in Table 2-1 and Table 2-2 and Figure 2-1 and Figure 2-2.

Table 2-1 Test and Itchen CFMP Policies

Sub-area & Preferred Policy	Summary of proposed actions
Rural Chalk / Upper/Middle and Lower Test Policy 3 Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.	Reducing frequency of groundwater flooding is not always feasible, so actions need to be taken to reduce flood risk such as improving maintenance and drainage pathways, as well as flood resilience measures to reduce the consequences of flooding. Raise awareness of groundwater flooding and promote flood-proofing schemes where appropriate. This will include advice concerning development control. Develop a Land Management Plan to explore the potential for changes in land use and land management practices within sub catchments, such as the Bourne Rivulet, River Dever, Wallop Brook, Cheriton Stream and River Alre.
Middle Itchen Policy 6 Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.	Investigate whether there are downstream benefits to be gained from storing floodwater in this area. Influence land management to adopt best practice and reduce flood risk. Implement the River Itchen Water Level Management Plan to identify and agree water level management that meets the need of flood risk management and the enhancement of wetland habitat.
Winchester Policy 5 Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.	Develop flood risk management strategy for Winchester focusing on channel conveyance improvements and local defences. Put in place policies that work towards long-term protection and re-creation of river corridors through sustainable land use management. consider options for redevelopment of more open river corridors through Winchester in the long-term.
Lower Itchen Policy 4 Areas of low, moderate, or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.	Investigate opportunities to protect or improve the condition of the River Itchen SSSI/SAC. Work with local planning authorities to ensure that urban development does not increase flood risk. Implement the River Itchen Water Level Management Plan to identify and agree water level management that meets the need of flood risk management and the enhancement of wetland habitat. Seek partnership opportunities in connection with new development in the short to medium-term and consider options for redevelopment of more open river corridors such as the Lower Itchen restoration study.

[2] Environment Agency, December 2009, Test and Itchen Catchment Flood Management Plan, Summary Report https://www.gov.uk/government/publications/test-and-itchen-catchment-flood-management-plan
[3] Environment Agency, December 2009, South East Hampshire Catchment Flood Management Plan, Summary Report https://www.gov.uk/government/publications/south-east-hampshire-catchment-flood-management-plan

Map of the policies in the Test and Itchen catchment.

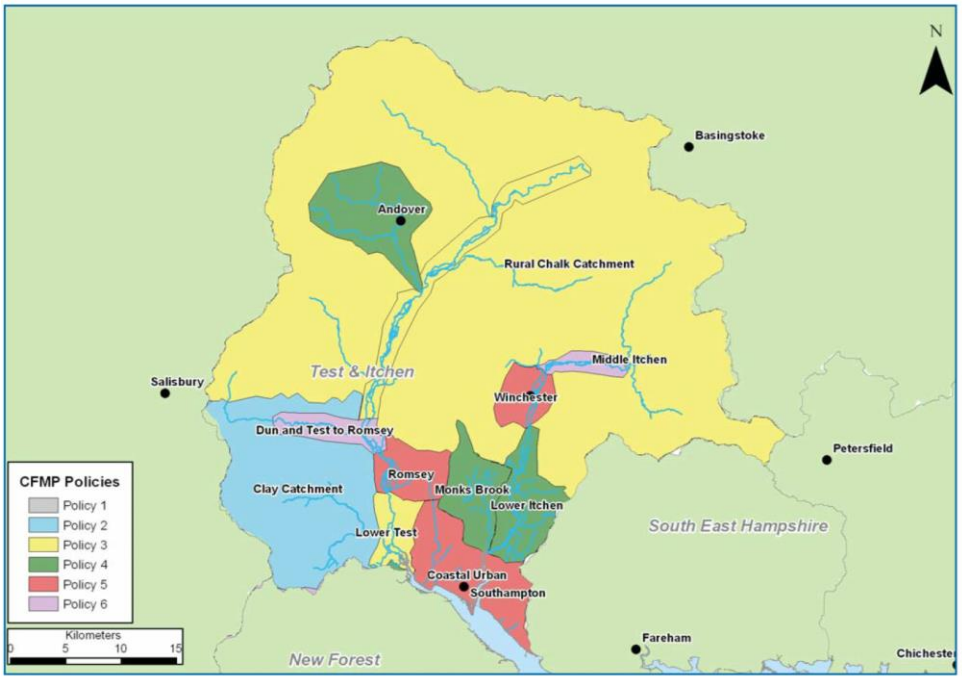

Figure 2-1 Map of the policies in Test and Itchen catchment, CFMP 2009

Table 2-2 South East Hampshire CFMP Policies

Sub-area & Preferred Policy	Summary of proposed actions
Hamble Policy 4 Areas of low, moderate, or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.	Surface water flooding will worsen with increased rainfall and more intense storms in the future. Mitigation measures against surface water flooding are required to reduce the flood risk to properties, including ensuring that drainage pathways are not blocked. New developments are expected to manage drainage so that there is no net increase in flood risk. Improve data mapping information and understanding of flood risk by undertaking S105 modelling, concentrating on Hedge End and Whiteley.
Wallington River Policy 3 Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.	Flood risk management activities are required in order to maintain the dam at Southwick Park Lake to ensure that there is no increase in downstream flood risk in Wallington Town and to comply with the Reservoirs Act 1975. There is a relatively low level of flood risk associated with a failure of the dam itself, but the reservoir at Southwick Park Lake provides flood storage reducing peak river flow, and also acts as a store of sediment.
Havant and Denmead Policy 4 Areas of low, moderate, or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.	Improve channel capacity and conveyance through Havant by seeking to remove the constraints from urban development and naturalise the river corridors. Improve flood warning on the Hermitage and Lavant Streams by seeking to expand the service, reducing lead-in times, and developing better predictive tools. Increased storminess resulting from climate change will put increased pressure on the urban drainage network. Develop a collaborative SWMP to address current and future pressures on the drainage network. Raise awareness of the impacts of blocked drainage pathways from the build-up of obstructions in the watercourses.
Chalk Catchment Policy 3 Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.	Reducing the frequency of groundwater flooding is not always feasible so alternative actions need to be taken to reduce flood risk, such as improving maintenance of the drainage pathway and local improvements in high risk areas like Hambledon and Wickham. Review the feasibility of the flood alleviation schemes for Hambledon and Wickham. Develop a Land Management Plan to reduce the occurrence of muddy floods and to reduce run-off during flood events. Raise awareness of groundwater flooding and promote flood-proofing schemes where appropriate, including improved flood resilience. Develop a groundwater flood warning plan to improve the levels of service across the Rural Chalk sub-area.

Map of the policies in the South East Hampshire catchment.

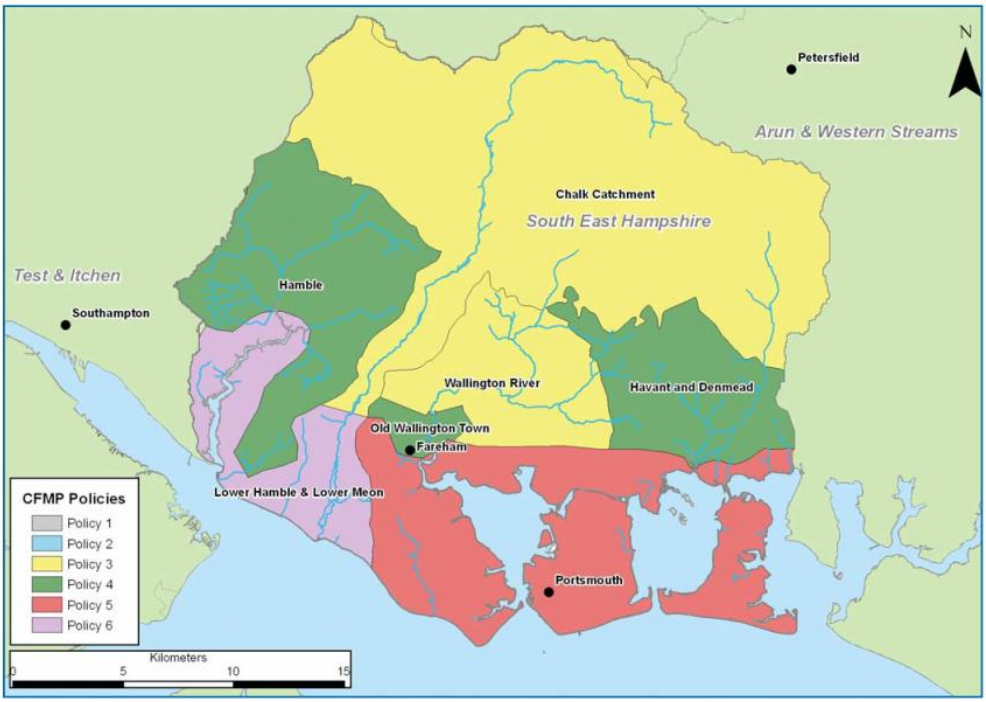

Figure 2-2 Map of the policies in South East Hampshire catchment, CFMP 2009

2.2 Shoreline Management Plans

2.2.1 The role of Shoreline Management Plans (SMPs) is to establish flood risk management policies in relation to coastal change, addressing the risks in a sustainable manner. The River Itchen in the southern part of the Winchester CC administrative area is tidally influenced.

2.2.2 This area is covered by the North Solent SMP[4] (which extends from Selsey Bill (Chichester) to Hurst Spit (New Forest)) , for which a review is currently underway. The policy for the unit from Satchell Marshes through to Curbridge and then to Burlesdon Bridge is no active intervention in the sort, medium and long term.

Table 2-3 North Solent SMP Policies

Location	Policies for the Short Term (0-20 yrs, Epoch 1), Medium Term (20-50 yrs, Epoch 2) and Long Term (50-100 yrs, Epoch 3)
Satchell Marshes to Botley to Curbridge to Bursledon Bridge	No active intervention in the short, medium, and long term.

2.3 Lead Local Flood Authority Plans

2.3.1 Hampshire County Council (HCC) are the Lead Local Flood Authority (LLFA) for the Winchester administrative area. HCC have a number of plans in place to assess and manage flood risk in the study area:

- Preliminary Flood Risk Assessment
- Surface Water Management Plan
- Groundwater Management Plan
- Local Flood Risk Management Strategy
- Catchment Plans

[4] North Solent Shoreline Management Plan, 2010 https://www.northsolentsmp.co.uk/

Preliminary Flood Risk Assessment

2.3.2 Under the 2009 Flood Risk Regulations, HCC is required to prepare a Preliminary Flood Risk Assessment (PFRA) for the area, which compiles high level information on significant local flood risk from past and potential flood events. The PFRA[5] helps to identify areas that should be prioritised for Surface Water Management Plans, which will in turn form the Local Flood Risk Management Strategy.

2.3.3 The Environment Agency has set out a national methodology identifying areas with the highest risk of flooding in England. Those with populations in excess of 30,000 people at risk should be identified as 'Flood Risk Areas' and may require further assessment. Areas below this threshold should be assessed by each LLFA and used to identify areas for which Surface Water Management Plans are required. No Flood Risk Areas above the Environment Agency threshold were identified within Hampshire, and therefore the PFRA focuses on identifying local flood risk areas within the region.

2.3.4 The PFRA identifies eight areas within Hampshire that are considered to have substantial potential flood risk, including Winchester within the Winchester administrative area, where 3,477 people are potentially at risk. More detailed assessments will be carried out in these areas, incorporating local knowledge and information on areas that have experienced flooding previously. This information will inform the developing Flood Risk Management Strategy and will in turn be used to help determine which, if any, further Surface Water Management Plans are required. This process may also lead to other areas, not been identified by the Environment Agency but for which substantial local information is available to justify the level of local flood risk, being included in these investigations.

Surface Water Management Plan

2.3.5 As an LLFA, Hampshire County Council is required to investigate and manage flood risk from non-main river sources within the administrative area. This takes the form of a Surface Water Management Plan (SWMP). SWMPs outline the preferred surface water management strategy in a region, taking account of the risks posed by sewers, drains, groundwater, and runoff from land, small watercourses, and ditches. SWMPs can function at different geographical scales and at differing levels of detail, from strategic to detailed[6]. Strategic and intermediate studies are completed to build up a picture of current flood risk within an area, normally county wide, to determine key locations for detailed study. A detailed study is undertaken to identify the causes and consequences in discrete locations, and to test the viability of certain flood risk mitigation measures.

2.3.6 Winchester is one of 11 District, Borough, or City authorities within Hampshire, all of which have a level of flood risk. The characteristics of each area and therefore the type and scale of flooding differs considerably. It was decided that intermediate SWMPs for each individual District / Borough / City would be undertaken, followed by detailed SWMPs where required for specific sites. The intermediate Winchester SWMP has not yet been published.

2.3.7 Whilst the intermediate SWMPs are being created, Hampshire County Council have made available a more generalised Surface Water Management Plan Strategic Assessment and Background Information report[7]. This provides information on general matters related to surface water flooding and flood risk across Hampshire, including identification of different forms of surface water flooding and who has responsibility for addressing them.

2.3.8 The key organisations with responsibility to become involved in the preparation of SWMPs within Hampshire are as follows:

- Hampshire County Council (and other LLFAs) is responsible for taking the lead in flood risk management,
- District / Borough Councils are responsible for managing flood risk enshrined in planning legislation,

[5] Hampshire County Council, April 2011, Preliminary Flood Risk Assessment https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/preliminary-flood-risk-assessment
[6] Portsmouth City Council, 2019, Surface Water Management Plan. https://www.portsmouth.gov.uk/services/environmental-health/safety/flood-protection-policies/
[7] Hampshire County Council, March 2010, Surface Water Management Plan Strategic Assessment and Background Information https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/catchment-management-plans

- The Environment Agency has a supervisory role over all aspects relating to flood defence,
- Water companies act as statutory consultees for Sustainable Drainage solutions that connect to the public network and are required to co-operate and share flood risk information with the LLFA, and,
- Landowners with a watercourse passing through or adjacent to their land (riparian owners) are responsible for maintenance of the watercourse bed, banks, and structures, as well as allowing the flow of water to pass without obstruction, diversion, or pollution.

2.3.9 Rather than each stakeholder working on individual issues separately, joining together all parties and sharing information allows for a cumulative flood risk improvement in an economically efficient way.

2.3.10 The Hampshire SWMP Strategic Assessment and Background Information report highlights a number of areas potentially at risk from surface water (and other forms of) flooding, including Winchester within the Winchester administrative area.

Groundwater Management Plan

2.3.11 Hampshire has an established risk from groundwater flooding, with over 400 properties flooded and significant disruption and damage to infrastructure occurring during the winter of 2000/2001. The Groundwater Management Plan (GWMP)[8] for Hampshire has therefore been prepared in partnership with a number of other risk management authorities to gain a better understanding of where the risk of groundwater flooding is greatest and how to manage this risk. The GWMP builds on the work undertaken on the Local Flood Risk Management Strategy for Hampshire.

2.3.12 The areas identified as being at high risk from groundwater flooding include Hambledon, Kings Worthy, Hursley, Bishops Sutton and West Meon in the Winchester administrative area. The GWMP highlights generic actions that could be applied across all high risk areas and suggests which organisation or body might be best places to deliver them, in addition to a more detailed assessment for each area in the form of an Action Plan. More information on the Action Plans is provided in Section 6.8.

Local Flood Risk Management Strategy

2.3.13 As an LLFA, HCC are required to develop a Local Flood Risk Management Strategy (LFRMS)[9] for the area. The priority of the council is to protect people, homes, businesses, and key infrastructure by avoiding risks and managing water resources through effective planning and design; preventing future flooding, adapting to flood risk; enabling communities to be better prepared for flood events, and adopting sustainable and affordable effective practices.

2.3.14 The Hampshire LFRMS sets out seven policies that aim to bring about effective flood risk management in Hampshire with the support of the Hampshire Strategic Flood Risk Management Partnership:

- Undertake effective partnership working,
- Develop a catchment approach to better understand the risks associated with the movement of water,
- Understand risks and develop clear priorities to help protect communities most vulnerable to flooding,
- Support the planning process by encouraging sustainable and resilient development,
- Record, prioritise and investigate flood events to increase knowledge and understanding,
- Work with multi-agency groups to develop schemes to reduce flood risk in vulnerable areas, and,
- Empower and support community resilience to improve adaptation to and recovery from flood events.

[8] Hampshire County Council, October 2013, Hampshire Groundwater Management Plan https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/groundwater-management-plan
[9] Hampshire County Council, October 2020, https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/local-flood-risk-management-strategy

2.3.15 In 2017, Atkins developed a Geographical Information System (GIS) tool[10] for Hampshire County Council which helped in prioritising catchments most at risk from flooding within Hampshire. The tool provides a robust, evidence-based approach to support strategic prioritisation of investment and informs discussions with key stakeholders and underpins HCC's LFRMS.

Catchment Management Plans

2.3.16 Following the approach set out in the LFRMS, HCC have developed Catchment Management Plans (CMP) for 18 catchments that cover the Hampshire CC area[11]. The purpose of the CMPs is to identify areas within each catchment that are at high risk of flooding and that have experienced flooding in the past, identify the causes and mechanisms of flooding and support the introduction of a stepped approach to interventions and measures that will reduce the risk now and in the future.

2.3.17 The main CMP of relevance to the Winchester CC study area is:

- CMP4 Itchen, in which the priority areas are Central Winchester and Winchester West.

2.3.18 The following CMPs also cover the edges of the study area, although there are no priority areas in Winchester CC identified:

- CMP3 Meon/Wallington
- CMP8 Hamble
- CMP11 Monks Brook
- CMP10 Test Middle
- CMP6 Test (Upper)

2.3.19 **Recommendation:** Review and implement the catchment policies and priority area policies set out by HCC in the CMP.

2.4 Other relevant plans

Greenprint for South Hampshire

2.4.1 Since the COVID-19 pandemic, there has been a demand from the public for more permanent and sustainable change, focusing more on the wellbeing of people and environmental impact. The Greenprint for South Hampshire: The Opportunities Ahead[12] is a report written by members of the Green Halo Partnership, Future South, and the Southern Policy Centre. It sets out a possible way forward, embracing ideas and partners from within and beyond the immediate PfSH area. The Greenprint is a model for policy making which could reflect commitment to a green recovery, shaping plans and programmes across sectors to deliver a world class economy in a world class environment.

2.4.2 Many communities across South Hampshire face common economic, social, and environmental opportunities and challenges. Working together under a common planning framework to find shared solutions will be more effective and beneficial for all parties, rather than trying to solve problems individually and potentially exacerbating issues elsewhere, or developing inconsistent, incompatible approaches in different localities.

Southern Water DWMP

2.4.3 Water and sewerage companies must produce Drainage and Wastewater Management Plans (DWMPs) covering a minimum of 25 years, setting out how they intend to improve and maintain a robust and resilient drainage and wastewater system in the face of risks to the network such as climate change and population growth. Companies will need to produce final plans in 2023 and the production of plans will be made statutory through the Environment Act.

[10] Atkins, January 2017, Hampshire Catchment Prioritisation Tool.
[11] Hampshire County Council, Catchment Management Plans
https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/catchment-management-plans
[12] Partnership for South Hampshire, September 2020, A Greenprint for South Hampshire: The Opportunities Ahead
Chttps://www.push.gov.uk/wp-content/uploads/2021/01/Item-7-Greenprint-for-South-Hampshire.pdf

2.4.4 Southern Water are currently developing 11 DWMPs across their entire operational region[13]. The Test and Itchen Catchment DWMP covers the Winchester CC administrative area and highlights that the main concerns for this river basin are nutrients, flooding in a 1 in 50 year storm event, storm overflow and annualised flood risk. Additional homes and businesses will increase the risks of non-compliance with Dry Weather Flow permits in 9 wastewater systems, including Millbrook, Chickenhall Eastleigh, Fullerton, Morestead Road Winchester, Harestock, Ivy Down Lane Oakley, Overton and Luggershall. New development will also mean that current permits for wastewater treatment quality might be exceeded by 2050 without further investment in 6 wastewater systems including Romsey, Whitchurch, Whiteparish and Evans Close Over Wallop.

2.4.5 Adaptation to the impacts of climate change will be vital in this area. This may require long term sustainable options such as reducing the volume of rainwater entering the sewer network, which will thereby provide capacity in the system for wastewater for future growth.

[13] Southern Water, Drainage and Wastewater Management Plans https://www.southernwater.co.uk/dwmp

3. Sources of flood risk and expected effects of climate change

This Section provides a description of the local geology and hydrology in the study area, and an assessment of the risk of flooding from all sources based on available datasets. Refer to Part 1 Main Report for details of the datasets.

3.1 Geology and Hydrology

Geology

3.1.1 The north of the Winchester administrative area is dominated by the chalk series of the Cretaceous period, with Upper Chalk being the youngest and most common outcrop[14]. The chalk series forms part of the Hampshire Downlands which lies to the north and east of Winchester. Many areas of chalk are overlain by a thin layer of clay.

3.1.2 Towards the south of Winchester, the bedrock consists of sands, silts, and clay deposits of the Tertiary period, forming the Reading Beds, London Clay, Bagshot Sands and Bracklesham Beds. To the very south at Portsdown Hill there is another outcrop of Upper Chalk.

3.1.3 Winchester has a diverse countryside, including chalk downs, large arable fields, woodland, river valleys, heath remnants, historic parks, and clay lowland pastures.

Hydrology

3.1.4 The principal watercourses and catchments are shown in Appendix A Figure 1 and described in Table 3-1.

3.1.5 Several principal river systems within the Test and Itchen and the East Hampshire Management Catchments make up the Winchester administrative area, along with a number of other smaller watercourses. The Itchen is a chalk fed watercourse and a designated Site of Special Scientific Interest and a Special Area of Conservation. It is located at the northern end of the Winchester administrative area and is fed by three major tributaries in its upper reaches: the Candover Stream, River Alre and the Cheriton Stream. The Itchen flows through Winchester and then through Eastleigh, from where it enters Southampton and is joined by the Monks Brook just above its tidal limit before flowing into Southampton Water at Woodmill. The section between Winchester and Southampton also includes the Itchen Navigation - a disused 18th century canal system linking Winchester to the sea. Nun's Walk Stream, Bow Lake and Old Alresford Pond are additional much smaller water bodies that flow into the Itchen. The Itchen hydrology is largely dominated by groundwater flow due to the Chalk bedrock that underlies much of the area[15].

3.1.6 The Hamble, Meon and Wallington, make up the main rivers at the southern end of the Winchester administrative area. Their sources are in the upland chalk, from where they flow into Southampton Water or Portsmouth Harbour.

3.1.7 The Hamble is a relatively small watercourse fed by the Moors Stream in its upper reach around Bishop's Waltham and meets Horton Heath Stream on the Winchester-Eastleigh border prior to flowing into Southampton Water on the Eastleigh-Fareham border. The river flows along a well-defined valley and is subject to tidal influence some miles inland[16]. The upper half of the catchment which lies within Winchester is relatively rural and underlain by chalk, meaning few properties are at risk from flooding[17].

[14] Winchester City Council, 2021, Landscape Character Assessment. https://www.winchester.gov.uk/planning/landscape---countryside/landscape-character-assessment/
[15] JBA Consulting, 2018, Eastleigh Hydrological Sensitivity Study. https://www.eastleigh.gov.uk/media/3407/itchen-hydrology-sensitivity-study.pdf
[16] LDA Design, 2017, Fareham Landscape Assessment. http://planningpdf.fareham.gov.uk/PDF/planning/local_plan/DraftLocalPlanEvidenceBase/EV40-FarehamLandscapeAssessment_FINAL.pdf
[17] Hampshire County Council, 2011, Preliminary Flood Risk Assessment. https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/preliminary-flood-risk-assessment

The lower half, within Eastleigh and bordering Fareham, has tidal influence and is highly urbanised meaning that surface water flooding often occurs due to drainage network and watercourse being overwhelmed.

3.1.8 The Meon has a very small, narrow catchment and flows from East Meon, through Winchester, crosses into Fareham just east of Park Gate, and discharges into the Solent. The upper half of the river flows over chalk, meaning very little fluvial flooding occurs as most rainfall is directly absorbed into the ground, and the lower section is protected from tidal inflow by a tidal sluice. The Meon was once an estuary which reached up as far as the former port of Titchfield; however it was dammed by a sea wall at Titchfield Haven and reclaimed from the sea in the early 17th century. The river consequently now has a predominantly freshwater or brackish character.

3.1.9 The Wallington flows from two branches in Hambledon and Denmead, through Southwick, where it is joined by the Potwell Tributary, into Fareham and enters the tidal system of Portsmouth Harbour where it assumes a more dominant scale and estuarine character. The Wallington catchment covers a large area and is typically prone to surface water flooding rather than fluvial flooding due to its large built up areas along the coast. Increased groundwater from the upstream chalk aquifers during the winter and spring months can also have an effect, as can tidal influences along the coastline.

3.1.10 Part of the Dever is also located to the very north of the administrative area. The Dever is a tributary into the Test, which is located within the Test Valley. A section of the Dever is designated a Site of Special Scientific Interest.

3.1.11 The Winchester CC area therefore falls into three operational catchments as identified in the Catchment Data Explorer[18]; Test and Upper Middle, Itchen, and East Hampshire Rivers.

3.1.12 Table 3-1 provides a description of the watercourses and their study area and identifies the type of modelling and mapping that is available within the SFRA for each watercourse.

Table 3-1 Watercourses in Winchester CC

Test Upper and Middle Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Dever	20km chalk stream which rises at West Stratton (Winchester) and meanders through a number of villages before joining the Test on Bransbury Common opposite Wherwell.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

Itchen Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Itchen	88km chalk fed watercourse with several branches which flows west from New Alresford, south through Winchester, Hockley Meadows Nature Reserve and Berry Meadow in the Winchester administrative area, and then south into Itchen Valley Nature Reserve in the Eastleigh administrative area, and finally into Southampton Water in the Southampton administrative area.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12 (Itchen and two tributaries Colden Common Stream, Otterbourne Stream).
Candover Brook	9.5km chalk stream which flows from Brown Candover, through several villages and plantations and joins the Itchen just west of the Alresford Bypass.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Alre	6km chalk stream with two branches from Old Alresford and from Bishop's Sutton, meeting north of New Alresford and joining the Itchen northwest of the Alresford Bypass.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

[18] Environment Agency Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning

Itchen (Cheriton Stream)	11km chalk stream which flows from New Cheriton, through Cheriton and under the Alresford Bypass, and joins the Itchen approximately 0.7km north of the Bypass.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Nun's Walk Stream	3.5km chalk stream which flows from Headbourne Worthy, through Abbotts Barton, and joins the Itchen to the north of Winchester.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Itchen (Bow Lake)	4km stream which flows along the Winchester-Eastleigh border from northeast of Crowdhill, through a series of fields, and joins the Itchen northeast of Eastleigh town.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Old Alresford Pond	A Lake towards the north of New Alresford, which the Alre flows through.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

East Hampshire Rivers Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Hamble	10km stream, split into the Upper Hamble and Main River Hamble. The Upper Hamble has two branches that flow from Lower Upham and Bishop's Waltham and join together south of Bishop's Waltham. The Upper Hamble meets the Main River Hamble west of the B3035 and flows southwest into Southampton Water.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Moors Stream	5km stream which flows from south of Swanmore, through a series of fields, and joins the Main River Hamble west of Waltham Chase.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Horton Heath Stream	8.5km stream on the Winchester-Eastleigh border which flows from Lower Upham, through a series of fields, East Horton Golf Course, and joins the Main River Hamble southeast of Boorley Park.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Meon	46km watercourse which flows from East Meon (East Hampshire), through several villages in the Winchester administrative area, into the Fareham administrative area north of Titchfield, and discharges into the Titchfield Haven lake.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Wallington	14km stream split into the Upper Wallington and Wallington below Southwick. The Upper Wallington has two branches, from south of Hambleden and from Denmead, that meet at World's End and join the Wallington below Southwick at Southwick. The river then flows east and south into Fareham and discharges into Portsmouth Harbour.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Potwell Tributary	11km stream with two branches from north and south of Waterlooville, meeting east of Southwick Park Golf Course, and joining the Wallington below Southwick at Southwick.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

3.1.13 In the Upper Chalk areas, permanent watercourses are absent in all except the deepest valleys. Upper Chalk is a major aquifer capable of absorbing large amounts of rainfall and releasing it slowly over a long period. This buffering effect together with the mainly rural nature of the Upper Chalk area means that the Test, Itchen and Meon river systems, which are mainly spring fed by the chalk aquifers, have relatively narrow ranges of flows in a normal year and generally do not flood in response to short to medium duration heavy rainfall.

3.1.14 After prolonged rainfall the water table in the Upper Chalk aquifer can rise to the ground surface causing springs to erupt in the valley floors and the creation of ephemeral watercourses. These effects can lead

to “groundwater flooding” lasting for several months in the late parts of very wet winters. Public supply and agricultural water abstraction from the Upper Chalk tends to increase the Upper Chalk’s buffering effect, thereby suppressing the frequency at which ephemeral watercourses and springs occur.

3.1.15 However, when the water table is sufficiently high for the aquifer to flow freely into the valleys, the runoff from the Upper Chalk can be similar to that from a generally impermeable catchment. Snow melt and rainfall on a frozen Upper Chalk catchment also can lead to rapid surface water run off to the river system and widespread valley flooding.

3.1.16 In contrast, in the Hamble river system, where there is significant development, the geology is mainly tertiary and surface deposits have generally low permeability, causing this river to have a fairly “flashy” response to rainfall.

3.1.17 The other principal main river system serving the administrative area, the River Wallington, has a combination of a large chalk upper catchment containing few permanent watercourses, a large urban catchment, and a tertiary lower catchment. The flow characteristics of this river system are dominated by development runoff and the low permeability of the tertiary rocks and overlying soils in the southern part of the catchment. As a result the River Wallington responds rapidly to rainfall.

3.2 Historical flooding

3.2.1 The principal sources of flood risk in the area are fluvial, groundwater and surface water flooding during heavy rainfall events.

Fluvial and groundwater flooding

3.2.2 A brief history of significant flood events is set out below:

- 1916 – Groundwater/chalk river flooding.
- 1935 – Groundwater/chalk river flooding.
- 1965 – Groundwater/chalk river flooding.
- Early 1994 – Flooding at Exton, Botley Mill, Hambledon, Hursley.
- Early 1995 – Flooding at Hursley, Littleton, Kings Worthy and Wonston.
- 24 December 1999 – Flash flooding of Sorrell Drive, Whiteley.
- Winter of 2000-2001 - exceptionally high cumulative rainfall, causing considerable spring activity and very high flows in the chalk river systems, including along valley floors that are normally dry, leading to extensive flooding.
- Winter of 2002-2003 – Flood levels almost at 2000-2001 levels in some places, for similar reasons.
- 17 November 2006 – Flooding at Bishop’s Waltham, Waltham Chase and Winchester as a result of prolonged heavy rainfall.
- 26-29 November 2006 – Sewerage induced flooding at Fishers Pond, Colden Common and Otterbourne as a result of prolonged heavy rainfall.
- Winter of 2013-2014 – Flooding at Hambledon, Exton, Soberton, Twyford, Winchester, Littleton, Headbourne Worthy, and Kings Worthy.

3.2.3 More detail on specific locations of the 2000-2001 and 2002-2003 flood events is detailed below:

- 2000/2001 – Flooding from the River Dever at Micheldever, Stoke Charity, Wonston and Sutton Scotney.
- 2000-2001 – Flooding at Old Alresford.
- 2000-2001 – Extensive flooding from the Candover Stream.
- 2000-2001 winter – Flooding from the Lower Itchen (which commences at Easton) during unusually high flows. Most of this flooding occurred within fluvial Flood Zone 3.

- 2000-2001 – Flooding generally on ephemeral watercourses at Littleton, Hensting and Fisher's Pond, Owlesbury, Twyford and Hursley.
- 2000-2001 – Significant flooding at Bishops' Sutton, Cheriton and Bramdean on the Upper Itchen and Meonstoke and Corhampton, Exton, Warnford and West Meon on the upper Meon.
- 2000-2001 - Flooding at Bishop's Waltham, Shedfield, Shirrel Heath and Waltham Chase, Titchfield, Upham and Wickham.
- 2000-2001 - Flooding at Denmead, Hambledon, Soberton, and Southwick.
- 2002-2003 – Flooding at Old Alresford.
- 2002-2003 – Flooding at Bramdean, Cheriton, Bishop's Sutton, Exton and Meonstoke.
- 2002-2003 – Flooding at Soberton.

3.2.4 Reports for groundwater flooding in 2000-2001 were prepared for Bishops Sutton, Bishops Waltham, Bramdean, Chilland, Martyr Worthy and Easton, Denmead, Droxford, Exton, Hambledon, Headbourne Worthy, Hensting and Fishers Pond, Hursley, Kings Worthy, Littleton, Meonstoke and Corhampton, Old Alresford, Owlesbury, Shedfield, Shirrel Heath and Waltham Chase, Soberton, Southwick, Stoke Charity – Wonston – Sutton Scotney, Titchfield, Upham, Warnford, West Meon, West Stratton and Micheldever, Wickham and Winchester.

3.2.5 Reports on groundwater flooding in 2002-2003 were also prepared for Bishops Sutton, Bramdean, Cheriton, Droxford, Exton, Meonstoke, Old Alresford and Soberton[19].

3.2.6 It should be noted that these reports cover both groundwater and fluvial flooding in each parish investigated. In many cases it is not easy to differentiate between groundwater and fluvial flooding causes.

3.2.7 The Hampshire Groundwater Management Plan highlights several villages most at risk from groundwater flooding. This includes Hambledon, Kings Worthy, Hursley, Bishops Sutton and West Meon within the Winchester administrative area.

3.2.8 There is a significant history of flooding in Hambledon, with a major cause being due to the decline in drainage pathways which allow flood water to pass through the village. The reduced ability to drain water at the surface may also lead to the "backing up" of groundwater. In the 40 years prior to the 2000/2001 flood event, eight incidents of flooding had occurred, four of which led to significant property damage. The 2000/2001 event comprised significant long term groundwater flooding which in turn caused the Chalk aquifer storing the groundwater to effectively "overflow", and discharge via springs and seepages into the normally dry valleys occupied by East Street, West Street and Lower West Street. This flooding affected a total of 124 properties, 50 of which suffered ground floor flooding, 46 suffered cellar flooding and 28 were affected by external flooding. Substantial commercial losses were also suffered.

3.2.9 Minor groundwater flooding is understood to occur more often than once in 5 years in Kings Worthy, but serious flooding is relatively rare, having last occurred there about 50 years ago. During the floods of 2000/2001, 9 properties suffered internal flooding, 12 properties had flooding beneath floor level (basements and cellars) and 3 had problems with toilet flushing due to surcharged sewers. The flooding episode lasted 60-106 days. Property flooding was directly or indirectly related to spring flow and all the properties flooded were on or close to Springvale Road, a major thoroughfare through the village that follows a normally dry Chalk valley. Due to high groundwater levels, a number of springs broke out around the road and in the fields to the north-east, and the resulting surface flow overwhelmed the surface drainage system in the road.

3.2.10 Hursley has a previous history of flooding, including events in 1963, 1967, 1994 and 1995. During the floods of 2000/2001, 18 properties were affected, one of which was flooded internally, 12 had flooded cellars / damp floors and eight suffered external flooding contaminated with sewage. During these floods, extreme groundwater levels led to exceptional spring flows within the village, runoff from periodic episodes of heavy rainfall further increased surface flows, and the high groundwater levels caused the

[19] These reports were prepared by the Halcrow Group and may be requested from the Customer and Engagement Team at the Environment Agency.

local Chalk aquifer effectively to "overflow" by discharging via springs. The 2000/2001 flooding at Hursley, and flooding prior to it, could be attributed directly (in the case of cellar flooding) or indirectly to high groundwater levels. Some property owners successfully utilised pumps to prevent/minimise the ingress of groundwater into their cellars.

3.2.11 Bishops Sutton is located in a valley with fairly steep sides (about 1 in 15). Extreme high groundwater levels appear to generate groundwater flow from the valley sides. The southern valley side seems to be most prone to the emergence of groundwater and can cause flooding of cellars and ground floors of some properties in the village as well as flooding of the roads. During the 2000/2001 floods 12 properties flooded, including seven with cellar flooding (one of which appears to flood every three years or so) and four with ground floor flooding. One property was flooded externally by sewage contaminated water. Severe flooding of the main road (A31) about 1km from Bishop's Sutton village required emergency pumping and road raising works, although it is believed that a more permanent solution has now been put in place. The Ford Stream provides the main watercourse for the drainage of groundwater and surface run-off. During the winter of 2000/2001, the unusually high run-off discharge, pumped floodwaters from the A31 and from cellars, and the constrictions within the channel caused the Ford Stream to be overwhelmed. This in turn may have diminished the stream's capacity to draw down the high groundwater levels in parts of the village affecting the level of cellar and internal flooding in properties which had not previously been affected.

3.2.12 There is a history of flooding in West Meon, with records of eight homes flooding at Long Priors in 1979. The A32 and High Street flood regularly (possibly annually) associated with the overtopping of the River Meon. The winter of 2000/2001 was the wettest water year (March-April) on record with a probability of occurrence that was less frequent than once in 100 years. As a result, groundwater levels rose to record levels and led to exceptional spring flows within the village. Runoff from periodic episodes of heavy rainfall further increased surface flows. The drainage of the exceptional flows arising in the catchment of the River Meon caused the river to be overwhelmed within West Meon. The river overtopped and damaged its banks in a number of places and sheet flow caused flooding of properties in the village. Groundwater also flowed along the valley sides and emerged as springs at the foot of the valley. This groundwater run-off overwhelmed road drainage in places and could not flow freely into the River Meon, leading to groundwater flooding in 16 properties, including three with cellar flooding, 11 with ground floor flooding and three with contaminated sewage ground floor flooding. External flooding also caused substantial damage to a number of properties, and some external flood waters also contained sewage.

3.2.13 Groundwater flooding follows the topography in Littleton affecting low points along South Drive, Main Road, North Drive, Fyfield Way and Pitter Close. Groundwater flooding events of varying size (typically for a duration of 4-6 weeks) have occurred in the winter months of 1994/1995, 2000/2001, 2002/2003, and 2014 in Littleton[20].

3.2.14 The A32 highway was closed in both directions in Wickham in response to flooding of the road in early February 2019 although the source of flooding wasn't specified.

3.2.15 As well as information recorded in the previous 2007 SFRA and the Hampshire Groundwater Management Plan, Recorded Flood Outlines published by the Environment Agency, as seen in Appendix A Figure 2, provide additional historic flood information. These outlines show that much of the recorded flooding is concentrated to the northwest of the catchment, potentially attributed to flooding from the River Test and its tributaries. Flooding is also concentrated around the Meon, whilst the rest of the Winchester administrative area is relatively bare, with small areas of flooding scattered around. Most of the flooding recorded within the outlines in the Test Valley administrative area occurred in January to April 1995, November to December 2000, December 2002 to January 2003, and January to February 2014.

Sewer flooding

3.2.16 Historic records from Southern Water, published as part of the 2007 Winchester SFRA, state that 63 incidents of foul and combined sewer flooding occurred within the Winchester Administrative area between 1998 and 2006 in the following localities: the city of Winchester, Otterbourne, Colden Common, South Wonston, Twyford, Kings Worthy, Hursley Alresford, Highbridge, Brambridge, Fishers Pond, Southwick, Wickham, Bishops Waltham, Durley, Waltham chase, Swanmore, Denmead and

[20] Flood Risk in the Littleton and Harestock area https://lhpc.org.uk/wp-content/uploads/2020/02/2020-LHPC-Flood-Risk.pdf

Waterlooville. Two reports of surface water flooding were also recorded in the city of Winchester in 1997, and in Waterlooville in 2004.

3.2.17 During the winter of 2000/2001 and again in 2012/2013, the foul sewerage in a number of areas has experienced infiltration into the system which causes it to become overloaded with water. In Hambledon this occurs on a more frequent basis, meaning some householders are unable to flush their toilets, manholes pop up and it can cause “sewage flooding” in the settlement and downstream pollution to local watercourses.

3.2.18 As well as problems with infiltration, the 2000/2001 flood event caused the sewerage system to become overwhelmed by floodwater egress in Hambledon, causing the flood water in both East Street and West Street to be contaminated with sewage.

3.2.19 During the 2000/2001 flood event, a significant contributor to the severity of the flooding in Kings Worthy was the surface drainage system becoming overwhelmed. The issues reported with the surface water system from this event have partly been addressed by Winchester City Council through culvert clearance. There were outstanding deficiencies still reported in 2002, although it is not known if further action has been undertaken since then.

3.2.20 The 2000/2001 floods caused floodwater at Hursley to inundate the sewerage system, making it to overflow in places. Although some improvements to surface water drainage had been made prior to these events and some significant surface water flooding problems resolved, 2000/2001 still resulted in significant flooding along the A3090 and adjacent properties.

3.2.21 Recorded highway flooding data was provided by HCC for use in this SFRA. This data broadly matches up with the above information, with 139 recorded events distributed throughout the area, the majority being in and around the places aforementioned as well as Ovington, Bighton and Bishops Waltham.

Surface Water Flooding

3.2.22 A Section 19 Investigation Report[21] was undertaken by HCC in June 2021 to examine the surface water flooding experienced across Winchester on 27 August 2020. Affected areas included the High Street, Stockbridge Road, Cranworth Road, Andover Road, and parts of Harestock.

3.3 Flood mapping

River flooding

3.3.1 Appendix A Figure 1 shows Flood Zones 2 and 3 for the principal watercourses within the study area (see Table 3-1 in the Main Report for more information on Flood Zones). Most of the flood risk is concentrated towards the north of the River Itchen and around its tributaries. Flood Zones 2 and 3 are also found around the Dever, Hamble, Meon and Wallington. The Flood Zones 2 and 3 in the Winchester administrative area cover several roads and developments.

3.3.2 No areas have been recognised as benefiting from flood defences in the Winchester administrative area, although flood defences are present across the region. The Winchester Flood Alleviation Scheme has been developed to provide protection to areas Park Avenue and Durngate in North Winchester following the 2013/2014 winter flooding. More information on flood defences is included in Section 5.1 and Appendix A Figure 2.

Functional floodplain

3.3.3 Flood Zone 3b functional floodplain is defined as land where water has to flow or be stored in times of flooding. This is identified by land having a 3.3% or greater annual probability of flooding (1 in 30 year), with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

3.3.4 Part 1 (Main Report) Table 3-3 identifies which watercourses have detailed modelled available for Flood Zone 3b functional floodplain. For the Itchen and tributaries the 3.3% AEP (1 in 30 year) flood extent is

[21] Hampshire County Council Winchester Section 19 Investigation Report (2021) https://documents.hants.gov.uk/environment/Winchester-S19-Final-Report.pdf

available. For the Meon through Wickham, the 3.3% AEP (1 in 30 year) extent is not available but the 5% AEP (1 in 20 year) and 1.3% AEP (1 in 75 year) are available. Winchester CC have selected to use the 1.3% AEP (1 in 75 year) flood extent as this is a built-up area that has experienced flooding issues in the past and therefore a conservative approach is justified. For the Wallington upstream of North Fareham, the 2% AEP (1 in 50 year) extent has been used to define flood Zone 3b functional floodplain. Extents of Flood Zone 3b are shown in Appendix A Figure 1. The mapping shows that the functional floodplain interacts with a number of roads and properties.

3.3.5 **Where modelled information for the 3.3% AEP (or similar) event is not available to identify the functional floodplain, the extent of Flood Zone 3a should be used as a surrogate for Flood Zone 3b to ensure the risk isn't underestimated.** The Environment Agency guidance 'How to prepare a Strategic Flood Risk Assessment'[22] encourages the use of site specific flood risk assessments to determine whether a site is affected by functional floodplain. If sites are proposed for development in such areas in any of the LPA's Local Plans, it may be necessary to undertake additional assessment to map the location of the functional floodplain as part of a Level 2 SFRA.

Future flood risk

3.3.6 Climate change is expected to increase the frequency, extent, and impact of flooding, reflected in peak river flows. Wetter winters and more intense rainfall may increase fluvial flooding and surface water runoff and there may be increased storm intensity in summer. Rising river levels may also increase flood risk.

3.3.7 As detailed in Table 3-1, where available, hydraulic models have been run for the 1% AEP flood event for the central and higher central climate change allowances to provide an indication of the future flood risk. The maps in Appendix A Figure 12 show the risk of flooding from the Itchen and two of its tributaries, the Otterbourne Stream and Colden Common Stream.

3.3.8 The results of the hydraulic modelling studies for the main rivers suggest that climate change will slightly increase the extent of river flooding within most areas. However, it is important to note that these areas, as well as those areas that are currently at risk of flooding may also be susceptible to more frequent, more severe flooding in future years. This is because the changes in climate patterns and physical conditions, as a result of climate change, can increase the volume and frequency of precipitation, leading to an increase in the frequency of flooding. It is essential therefore that the measures are implemented during the development management process to carefully mitigate the potential impact that climate change may have upon the risk of flooding to a property.

3.3.9 For this reason, all of the development management recommendations set out in Section 7 require all floor levels, access routes, drainage systems and flood mitigation measures to be designed with an allowance for climate change; and the potential impact that climate change may have over the lifetime of a proposed development should be considered as part of a site-specific FRA. This provides a robust and sustainable approach to the potential impacts that climate change may have over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

3.3.10 Where detailed hydraulic models are not available, GIS floodplain analysis has been undertaken to identify those areas of floodplain that could be sensitive to increases in flood levels. The results of the analysis are presented in Appendix A Figure 11. The mapping shows narrow bands along the floodplains of the Dever, Candover Stream, Alre, Cheriton Stream that could be sensitive if water levels were higher. The floodplains around Whiteley in the south, and Kingsworthy and Headbourne Worthy to the north of Winchester could be sensitive to increases in water levels. Should development be proposed in these areas, it is recommended that hydraulic modelling is carried out to map the future risk of flooding more accurately.

Tidal Flooding

3.3.11 Although the study area does not have a coastline, the River Hamble is tidally influenced in the southern part of the Winchester administrative area.

[22] Defra, Environment Agency, How to Prepare a Strategic Flood Risk Assessment https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment

3.3.12 Flood Zones provide an indication of the risk of flooding from rivers and the sea ignoring the presence of flood defences. (Refer to Table 3-1 in the Main Report for more information on Flood Zones). Appendix A Figure 1 shows Flood Zones 2 and 3 for the study area.

3.3.13 As part of this SFRA, coastal modelling has been updated, to determine the impact of predicted tidal flooding. Details of the modelling undertaken are presented in SFRA Part 1 Appendix B. Maps showing the outputs for some of the key model scenarios are presented in Appendix B of this Report. (The full set of outputs have been provided to the LPAs as GIS files).

3.3.14 The maps show the extent of tidal flooding around Curbridge.

3.3.15 Appendix B Figures 3 and 10 show that for the 0.5% AEP event for the year 2022, the route along the A3051 at Curbridge is at Low hazard rating. In the future (2122) this increases to Significant and Extreme hazard rating (Appendix B Figures 4 – 7 and 11 – 14).

3.3.16 The route along the A334, between Botley and Curdrige, is also at risk of flooding in the future (2122), with hazard ratings of Significant for the 0.5% AEP for 2122 upper end climate change allowance (Appendix B Figure 13).

Groundwater Flooding

3.3.17 The BGS dataset 'Susceptibility to Groundwater Flooding' is mapped in Appendix A Figure 5. This map does not show the risk of groundwater flooding, rather it identifies areas where geological conditions could enable groundwater flooding to occur. A suite of rules founded upon geological, hydrogeological, and topographic data were used to assign a class value indicating the susceptibility to groundwater flooding to each vector polygon. The three classes are as follows:

- A: Limited potential for groundwater flooding to occur
- B: Potential for groundwater flooding of property situated below ground level
- C: Potential for groundwater flooding to occur at surface

3.3.18 The remaining areas are not considered to be prone to groundwater flooding. The 'Susceptibility to Groundwater Flooding' should be used, in conjunction with other relevant information, to establish the relative risk of groundwater flooding, and is most suitable for informing land-use planning decisions at the strategic scale. The dataset shouldn't be employed in isolation to inform land-use planning decisions at any scale and shouldn't be utilised for this purpose at the site scale.

3.3.19 The map shows a general pattern within the Winchester administrative area of potential for groundwater flooding to occur at the surface around watercourses; potential for groundwater flooding of property situated below ground level slightly further away from the watercourses, and limited potential for groundwater flooding to occur even further away from the watercourses. This corresponds with the Itchen CMP which notes that there is significant risk of groundwater flooding across the Central Winchester priority group.

3.3.20 Towards the west and south of the administrative area, the pattern still broadly follows with the vulnerability reducing further from watercourses but is less defined with some areas of higher vulnerability not close to watercourses and vice versa. There are also several areas, most notably towards the west and south, where there is not considered to be any potential for groundwater flooding to occur.

3.3.21 'Areas Susceptible to Groundwater Flooding' is a national dataset produced by the Environment Agency which shows the proportion of 1km squares where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring but provides a useful tool to identify where further studies may be useful. This dataset is mapped in Appendix A Figure 4.

Future flood risk

3.3.22 Most climate change models indicate we are likely to experience drier summers, albeit with more intense rainfall when it occurs, and wetter winters. As groundwater flooding occurs primarily as a response to extended periods of rain during late autumn and early winter, there may be an increased risk of groundwater flooding arising from these changing rainfall patterns. However the complex

relationship between rainfall, recharge, groundwater storage and flow make the response to climate change uncertain.

Surface water

3.3.23 The Risk of Flooding from Surface Water (RoFSW) dataset is presented in Appendix A Figure 3. This map shows generally low surface water flood risk in the north of the Winchester administrative area, with higher risk areas scattered around. The risk becomes much higher around watercourses towards the south of the area, especially the Meon and Wallington.

Future Flood Risk

3.3.24 Section 3.2 of Part 1 Main Report describes the impact of climate change on surface water flood risk and summarises the peak rainfall intensity climate change allowances for the study area which range from 20% - 45% depending on the specific location and epoch under consideration.

3.3.25 The RoFSW does not include specific scenarios to determine the impact of climate change on the risk of surface water flooding and it is not within the scope of this SFRA to undertake such modelling. However a range of three annual probability events have been modelled, 3.3%, 1% and 0.1%, and therefore it is possible to use with caution the 0.1% outline as a substitute dataset to provide an indication of the implications of climate change on surface water flood risk in the future.

Reservoir flooding

3.3.26 Three Reservoir Act registered impoundments with the potential to cause flooding within the Winchester administrative area have been identified, comprising Old Alresford Pond in New Alresford, Fisher's Pond between Brambridge and Crowdhill, and Southwick Park Lake in Southwick. There are also several ponds in Wickham where it is thought a breach has the potential to cause flooding, as well as a small pond close to Purbrook Junior and Infant School which may contribute to the flooding potentially caused by a breach of Southwick Park Lake.

3.3.27 Appendix A Figure 6 shows the potential extent of flooding in the unlikely event of a failure of these water bodies when river levels are normal and when rivers are in flood. The mapping shows that the areas at risk follow the floodplains of the Alre, the upstream end of the Itchen adjoining the Alre, Bow Lake along with the section of the Itchen it adjoins, the Meon and the Wallington. Flooding is also predicted to extend past the floodplain at to the southeast of Wickham, towards Wickham Common. All of the flooding within the Winchester administrative area is predicted to occur in the event of reservoir failure when river levels are normal, except around Bow Lake; some of this flooding is only predicted to occur when there is also flooding from rivers.

4. Cumulative impact of development and land use change

4.1 Cumulative impact assessment

4.1.1 The NPPF states that strategic policies should be informed by a strategic flood risk assessment, and should consider cumulative impacts in, or affecting, local areas susceptible to flooding (paragraph 160).

4.1.2 When allocating land for development consideration should be given to the potential cumulative impact on flood risk with a catchment. Development increases the impermeable area within a catchment, which, if not effectively managed, can cause increased rates and volumes of surface water runoff and changes to floodplain storage, thereby resulting in increased flood risk further downstream. Whilst individual development with appropriate site mitigation measures should not result in measurable local effects with respect to hydrology and flood risk, the cumulative effect of multiple development may be more severe at downstream locations in the catchment. Locations where there are existing flood risk issues will be particularly sensitive to cumulative effects.

4.1.3 As described in SFRA Part 1 Section 3.7, as part of this SFRA an assessment of the study area has been undertaken to identify those catchments where there is greater potential for cumulative effects on flood risk. For each catchment, consideration has been made of the:

i. The size and nature (rural or urban) of the catchment

ii. The risk of flooding in the catchment from rivers, surface water and groundwater, based upon data from the Hampshire Catchment Prioritisation Tool, and

iii. The scale of potential future development in the catchment, based upon a review of potential development sites and growth locations provided by the LPA.

4.1.4 Appendix A Figure 7 shows the outputs for Winchester. A red, amber, green rating has been used to highlight those catchments where there is a higher, medium, and lower potential for cumulative effects of development on flood risk. This figure shows that there is higher potential in the Monks Brook and Itchen catchments where there is already a greater level of urbanisation and higher risk of flooding. There is broadly a lower potential for cumulative impact in the upper Test, Candover Brook, Bow Lake and Wallington catchments.

4.1.5 In those areas with a medium and higher potential for cumulative impact on flood risk, it is recommended that Winchester CC consider area specific policies or guidance for new development to help reduce the cumulative impact, and where possible, identify opportunities for new development to provide cumulative betterment with respect to flood risk. This may be achieved through implementing the types of measures described in Section 6.

4.2 Cross boundary considerations

4.2.1 The Winchester CC administrative area is made up of a number of different Management and Operational Catchments that extend into other Boroughs and districts, and hence cross boundary considerations are important when, for example, looking at the impact of a new development in the upper reaches of a river catchment.

4.2.2 The Itchen and its tributaries at the upper reach (the Candover Brook, Alre and the Cheriton Stream) cross the border into and out of South Downs National Park. This is also the case for the Meon.

4.2.3 Another important cross boundary consideration is the proximity of the River Test to the Winchester administrative area. The Test is located parallel to the north-western boundary of the administrative area at a distance of approximately 3 to 6km. Much of the historic flooding recorded in the north-western corner of the administrative area looks to be attributed to flooding from the Test and its tributaries, and therefore development close to the Test Valley-Winchester border may impact upon flood extents in both administrative areas.

4.2.4 Other cross boundary flows to consider include:

- The Dever rises in West Stratton within Winchester CC, from where it flows into the Test within Test Valley BC,
- The Candover Brook rises at the very south of the Basingstoke and Deane BC administrative area before flowing into Winchester, CC,
- The Itchen flows in and out of South Downs National Park Authority and Winchester CC, before flowing through Eastleigh BC and into Southampton Water in Southampton CC,
- The Monks Brook does not fully enter the Winchester CC administrative area but does border it, and flows through Test Valley BC and Eastleigh BC, into Southampton Water in Southampton CC,
- Bow Lake flows along the border between Winchester CC and Eastleigh BC,
- The Horton Heath Stream borders Eastleigh,
- The downstream end of the River Hamble borders Eastleigh BC and discharges into Southampton Water in Fareham BC,
- The Meon rises in East Hampshire BC, flows through Winchester CC and into Fareham BC,
- The source of the Potwell Tributary is on the Winchester CC – Havant BC border,
- The Wallington flows into from Winchester CC into Fareham BC.

4.2.5 Where there are cross boundary flows, communication between LPAs is of high importance to ensure action in one does not negatively impact upon another.

4.2.6 Where watercourses border or have very small reaches within another district, the flood extents may significantly encroach into the other district and therefore cross boundary flows need to be considered.

5. Current control, mitigation, and management measures

5.1 Defences

5.1.1 Data provided by the Environment Agency from their Asset Information Management System (AIMS) is included in Appendix A Figure 2.

5.1.2 The mapping shows that the majority of the Itchen and its tributaries (Candover Stream, River Alre, Cheriton Stream, Nun's Walk Stream and Bow Lake) have high ground on both sides of the watercourses. However, there are several short sections of river wall in Cheriton along Cheriton Stream and in Winchester along Nun's Walk Stream and the Itchen. In Winchester these walls include demountable defences. The Itchen is also lined by walls on both sides where the M3 crosses the river, and there is a short stretch of embankment along the left side immediately downstream. The Itchen Navigation is also lined by an embankment along the left upstream of Shawford and upstream of Allbrook.

5.1.3 The Hamble, Meon and Wallington in the south of the study area are also mostly lined by high ground on either side. There are small sections of embankments, along the Main River Hamble east of Boorley Park and along the Meon downstream of West Meon, west of Soberton Heath and upstream of Wickham. The Meon also has several short sections of river wall in West Meon, Meonstoke and Wickham.

5.1.4 The high ground on either side of the Itchen and its tributaries are reported to have a design standard of protection (SOP) of approximately 4% AEP (1 in 25 year). In the south of the study area the high ground either side of the Wallington has a reported design SOP of 50% AEP (1 in 2 year). Along the Meon and the Hamble the majority of high ground has a design SOP of 20% AEP (1 in 5 year), increasing up to 2% AEP (1 in 50 year) in urban areas such as Wickham and Botley.

5.1.5 The upstream reach of the Dever located within the study area is lined by high ground on either side, which is reported to have a design SOP of 10% AEP (1 in 10 year).

5.2 Flood Alleviation Scheme, Winchester

5.2.1 Winchester was badly affected by the 2013/2014 winter flooding, and the Winchester Flood Alleviation Scheme was developed to protect the areas around Park Avenue and Durngate in North Winchester[23]. The works included:

- Phase 1 – Flood defence walls and demountable barriers to defend River Park Leisure Centre and buildings around Park Avenue,
- Phase 2 – Sluice gates, earth embankments and dwarf walls around Durngate.

5.3 Flood Alleviation Scheme, Outer Winchester

5.3.1 In the winter of 2013/2014 Littleton, Headbourne Worthy and Kings Worthy and the surrounding area were badly affected by a combination of groundwater flooding, surface water flooding and foul sewer overflows[24]. Groundwater emerging at the surface is the primary cause of historic flooding in these areas. Restrictions in the watercourse and drainage network, a lack of riparian maintenance and buildings obstructing flow paths, are all factors that have resulted in this flooding. The Outer Winchester Flood Alleviation Scheme was developed to better understand the causes of flooding and ensure the existing drainage system can operate at maximum capacity. Hampshire County Council has been working together with several different organisations, including the parish councils, to implement the scheme. The proposed works include:

[23] Winchester Flood Alleviation Scheme – Phase 2 https://www.winchester.gov.uk/assets/attach/18311/Public-Consultant-Event-Durngate-Flood-Alleviation-Scheme.pdf
[24] Hampshire County Council Outer Winchester Flood Alleviation Scheme. https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/outer-winchester

- Removing vegetation to ensure flow paths for water are clear,
- Undertaking maintenance, clearance and surveying of existing ditches, culverts, and pipes, and,
- Replacing, upsizing, and installing some new pipes or culverts.

5.3.2 The works completed to date include:

- Installation of new pipes, catch pits and gullies, and weir kerb repairs in Springvale Road and Down Farm Lane, and
- Enhancement of ditches and culverts in Lovedon Lane and Springvale Road.

5.4 Flood Alleviation Scheme, Hambledon

5.4.1 There is a significant history of groundwater flooding in the village of Hambledon. A Flood Alleviation Scheme was developed in two phases from 2014 to 2016 to mitigate this risk and better protect 124 houses[25]. The works included:

- Phase 1 - Improvements to the drainage network downstream of the village,
- Phase 2 - Floodwater culverts and resurfacing the highways (East and West Street) to improve drainage.

5.5 Flood Warning Service

5.5.1 The Environment Agency provides a free Flood Warning Service[26] for many areas at risk of flooding from rivers and as a result of elevated groundwater. Three different codes are issued depending on the type of flooding forecasted:

- Flood Alert – Flooding is possible, be prepared.
- Flood Warning – Flooding is expected, immediate action is required.
- Severe Flood Warning – Severe flooding, danger to life.

5.5.2 The Environment Agency's website offers up-to-date flood information, monitoring information of river and sea levels and latest flood risk forecast, as well as a page to sign up to warnings by phone, text, email, or fax[27].

5.5.3 There are 15 Flood Warning Areas in Winchester CC which are shown in Appendix A Figure 9 and are as follows:

- Micheldever to Bransbury on the River Dever
- The Candovers
- Alresford
- Cheriton
- Ovington to Abbots Worthy on the River Itchen
- Winchester
- Shawford to Bishopstoke on the River Itchen
- Bishops Waltham on the River Hamble
- Waltham Chase, Durley Mill and Botley on the River Hamble
- Hamble Estuary

[25] Hambledon Flood Alleviation Scheme https://documents.hants.gov.uk/flood-water-management/hambledon-scheme/HambledonFloodAlleviationScheme-April2015Exhibition.pdf?web=1&wdLOR=c941917E4-5088-4BAC-BAAE-90292EF04EE2
[26] Environment Agency, Check for Flooding in England https://flood-warning-information.service.gov.uk/warnings
[27] Environment Agency, 2022, Sign up for Flood Warnings https://www.gov.uk/sign-up-for-flood-warnings

- East Meon to Mislingford on the River Meon
- Wickham on the River Meon
- Titchfield on the River Meon
- Denmead
- Wallington

5.5.4 The Environment Agency publishes 'Water situation: area monthly' reports for England'[28] for each of its areas. These reports identify monthly rainfall, soil moisture deficit, river flows, groundwater levels and reservoir levels. The Environment Agency also publishes 'Groundwater situation'[29] reports which provide the latest update on monitored groundwater levels and whether there are any groundwater alerts or warnings in force. These reports will give an indication as to when groundwater levels may be high and groundwater flooding may be imminent.

5.5.5 The Environment Agency also provide a targeted groundwater flood warning service through issue of groundwater "Flood Alerts" for specific locations and communities. As groundwater flooding rises more slowly than fluvial flooding, there is a lesser requirement for immediate action and there is unlikely to be a danger to life. On this basis the Environment Agency do not issue "Flood Warnings" or "Severe Flood Warnings" for this type of flooding and for groundwater flooding the Environment Agency only issue "Flood Alerts". There are currently no groundwater flood alert areas in Winchester.

5.6 Residual Risk

5.6.1 The risk of flooding from the rivers can never be fully mitigated, and there will always be a residual risk of flooding that will remain after measures have been implemented to protect an area or a particular site from flooding. This residual risk is associated with a number of potential risk factors including (but not limited to):

- a flooding event that exceeds that for which the flood risk management measures have been designed e.g. flood levels above the designed finished floor levels,
- the structural deterioration of flood defence structures (including informal structures acting as a flood defence) over time, and/or
- general uncertainties inherent in the prediction of flooding.

5.6.2 The modelling of flood flows and flood levels is not an exact science, therefore there are inherent uncertainties in the prediction of flood levels used in the assessment of flood risk. Whilst the Flood Map for Planning Flood Zones provide a relatively robust depiction of flood risk for specific conditions all modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response.

5.6.3 Steps should be taken to manage these residual risks through the use of flood warning and evacuation procedures, as described in Section 7.

[28] Water situation: area monthly reports for England 2022 https://www.gov.uk/government/publications/water-situation-local-area-reports
[29] Groundwater: current status and flood risk https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk

6. Opportunities to reduce the causes and impacts of flooding

The NPPF appreciates that it may not always be possible to avoid locating development in areas at risk of flooding. This Section provides guidance on the range of measures that could be considered in order to control and mitigate flood risk. These measures should be considered when preparing a site-specific FRA.

6.1 Maintenance of watercourses

Main River

6.1.1 The Environment Agency is likely to seek an 8 metre wide undeveloped buffer strip alongside main fluvial rivers for maintenance purposes and would also ask developers to explore opportunities for riverside restoration as part of any development.

6.1.2 Under the Environmental Permitting (England and Wales) Regulations (2016)[30], an environmental permit is required if works are to be carried out:

- on or near a main river
- on or near a flood defence structure, or
- in a floodplain.

6.1.3 Since requirements of the consenting process in relation to flood risk, biodiversity and pollution may result in changes to development proposals or construction methods, the Environment Agency aims to advise on such issues as part of its statutory consultee role in the planning process. Should proposed works not require planning permission the Environment Agency can be consulted regarding permission to do work on or near a river, or a flood or sea defence by contacting enquiries@environment-agency.gov.uk.

6.1.4 **Policy Recommendation:** Safeguard an 8 metre wide undeveloped buffer strip alongside Main Rivers or flood defence structure and prioritise riverside restoration.

Ordinary watercourse

6.1.5 Ordinary watercourses are watercourses that are not part of a main river and include streams, ditches, drains, cuts, culverts, dykes, sluices, sewers (other than public sewers) and passages, through which water flows.

6.1.6 As the LLFA, Hampshire County Council is responsible for the consenting of works to ordinary watercourses and has powers to enforce un-consented and non-compliant works. This includes any works (including temporary) that place or alter a structure within an ordinary watercourse or affect the flow or storage of water within an ordinary watercourse. Hampshire CC will seek a 5 metre wide undeveloped buffer strip to be retained alongside ordinary watercourses. Enquiries and applications for ordinary watercourse consent can be submitted to Hampshire County Council on their website[31].

6.1.7 Hampshire County Council intends to work with riparian owners (those living adjacent to an ordinary watercourse) who are responsible for maintaining ordinary watercourses to ensure that the effectiveness of the existing ditches is improved and ensure that future maintenance is undertaken at appropriate intervals. Hampshire County Council have prepared a Flood Risk Management Guidance for Landowners document which provides information on the rights and responsibilities of riparian owners[32].

[30] The Environmental Permitting (England and Wales) Regulations 2016 http://www.legislation.gov.uk/uksi/2016/1154/contents/made
[31] Hampshire County Council, Making a change to a watercourse https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse
[32] Hampshire County Council, 2020, Flood Risk Management Guidance for Landowners https://documents.hants.gov.uk/flood-water-management/HCCFloodRiskManagement-Landowners.pdf

6.1.8 **Policy Recommendation:** Safeguard an undeveloped buffer strip of at least 5 metre wide alongside ordinary watercourses for maintenance purposes. Developers should prioritise riverside restoration as part of any development adjacent to ordinary watercourses.

6.2 River restoration

6.2.1 During the last century, many rivers were modified using hard engineering techniques to often straighten or canalise them. The disadvantages of these techniques have now become apparent which include the damage to the environment and ecosystems as well as an increase in flooding.

6.2.2 River restoration contributes to flood risk management by supporting the natural capacity of rivers to retain water. By re-connecting brooks, streams and rivers to floodplains, former meanders, and other natural storage areas, and enhancing the quality and capacity of wetlands, river restoration increases natural storage capacity and reduces flood risk. Excess water is stored in a timely and natural manner in areas where values such as attractive landscape and biodiversity are improved and opportunities for recreation can be enhanced.

6.2.3 Returning rivers to a more natural state can often include the removal of structures such as weirs or culverts which can have multiple benefits for biodiversity in addition to improving the flow regime[33]. Further guidance on river restoration is available from the Environment Agency[34].

River Itchen

6.2.4 The Test and Itchen River Restoration Strategy[35] sets out a way forward to appraise the geomorphological condition of the Sites of Special Scientific Interest (SSSI) units of the Test and Itchen. Although this report focuses on restoring the environment and habitats around the rivers, the strategy put forward also increases resilience to flooding and future pressures as a result of climate change.

River Hamble

6.2.5 The River Hamble Soft Sediment Habitat Retention feasibility study[36] investigates opportunities for management and restoration of the saltmarsh in the lower Hamble, bringing it back to its natural form and in turn providing flood risk benefits.

River Meon

6.2.6 The Meon is currently the subject of an ongoing river restoration project[37]. The first phase of the river restoration project has recently been completed, and evaluation of whether or not to expand the scope of the project to the remaining sections of the untreated channel will be undertaken after its response to an 'average' summer and winter is witnessed.

River Wallington

6.2.7 Wallington was successful in its bid for funding from the DEFRA Green Recovery Challenge Fund in 2020[38], which will involve restoring 50km of waterways along the river corridors, enabling natural processes to prevail.

Urban areas

6.2.8 The policies within the CFMP strongly encourage improvement of channel conveyance through urban areas such as Winchester. This may involve de-culverting sections and removing the constraints imposed by the urban environment to enable more adaptive response to changes in water levels.

6.2.9 **Policy recommendations:**

[33] European Centre for River Restoration https://www.ecrr.org/River-Restoration/Flood-risk-management/Healthy-Catchments-managing-for-flood-risk-WFD/Environmental-improvements-case-studies/Remove-culverts
[34] Environment Agency, Fluvial Design Guidance Chapter 8 https://assets.publishing.service.gov.uk/media/60549ae1e90e0724c0df4619/FDG_chapter_8_-_Works_in_the_river_channel.pdf
[35] Atkins, 2013, Test & Itchen River Restoration Strategy Technical Report. https://www.therrc.co.uk/sites/default/files/files/Designated_Rivers/Test_Itchen/technical_report_issue_5_final.pdf
[36] AHTI Group, 2016, River Hamble Soft Sediment Habitat Retention Feasibility Study. https://documents.hants.gov.uk/Hamble/RiverHambleSaltmarshandSoftSedimentHabitatRetentionFeasibilityStudy2016.pdf
[37] South Downs National Park, Case Study: East Meon River Restoration.://www.southdowns.gov.uk/wp-content/uploads/2017/05/East-Meon-River-Restoration-Case-Study.pdf
[38] National trust, A Green Recovery at Wallington. https://www.nationaltrust.org.uk/wallington/features/a-green-recovery-at-wallington

- Where development is planned in urban areas, opportunities for de-culverting watercourse sections should be sought in order to bolster local channel capacity and conveyance. Within the Winchester CC area, this recommendation is most apposite for the Mead End stream in Waterlooville, the River Dever in Sutton Scotney, Nuns Walk Stream north of Winchester, and the below-ground watercourses in central Winchester.
- In partnership with relevant risk management authorities (for example Environment Agency, Hampshire County Council and land owners) explore opportunities for river restoration (removal of structures, reinstatement of sinuous channels, floodplain reconnection) on the floodplains of the River Itchen upstream and downstream of Winchester, as well as the River Meon upstream and downstream of Wickham, in order to reduce the risk of groundwater, surface water, and fluvial flooding to flood-sensitive receptors downstream.

6.3 Flood storage

6.3.1 Flood Storage Areas (FSAs) are natural or man-made areas that temporarily fill with water during periods of high river level, retaining a volume of water which is released back into the watercourse after the peak river flows have passed. There are two main reasons for providing temporary detention of floodwater:

- To compensate for the effects of catchment urbanisation, and
- To reduce flows passed downriver and mitigate downstream flooding.

6.3.2 Providing flood storage within a development area or further upstream of a development can manage and control the risk of flooding. In some cases it can provide sufficient flood protection on its own; in other cases it may be chosen in conjunction with other measures. The advantage of flood storage is that the flood alleviation benefit generally extends further downstream, whereas other methods tend to benefit only the local area and may increase the flood risk downstream.

6.3.3 Further guidance on Flood Storage is provided within Chapter 10 of the Environment Agency's Fluvial Design Guide[39].

Silver Hill

6.3.4 Wallingford HydroSolutions produced a Flood Risk Assessment reviewing of the key flood risk issues for the Silver Hill area in central Winchester in in 2017[40]. This assessment highlighted a number of potential mitigation options, including flood storage upstream of the site along the Itchen, north of Swifts Lake, as well as compensatory storage downstream of the site, south of Colebrook Street.

6.3.5 **Policy Recommendation:** In partnership with relevant risk management authorities (for example Environment Agency, Hampshire County Council and land owners) identify and appraise options for the creation of flood storage areas along the River Itchen upstream of Winchester, both as part of proposed developments and as stand-alone flood risk management strategies. This will be most likely achieved through the artificial lowering of ground levels and the removal of flood defences.

Floodplain compensation

6.3.6 Where proposed development results in a change in building footprint, land raising or other structures such as bunds, the developer must ensure that it does not impact upon the ability of the floodplain to store water and should seek opportunities to provide betterment with respect to floodplain storage.

6.3.7 Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain must be provided to ensure that the total volume of the floodplain storage is not reduced.

6.3.8 Floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and linked to the site. Floodplain compensation must be considered in the context of the 1% AEP flood level including an appropriate

[39] Environment Agency, Fluvial Design Guidance Chapter 10
https://assets.publishing.service.gov.uk/media/60549b7a8fa8f545cf209a29/FDG_chapter_10_-_Flood_storage_works.pdf
[40] Wallingford HydroSolutions, 2017, Central Winchester Regeneration Area FRA.
https://www.winchester.gov.uk/regeneration/central-winchester-regeneration-technical-reports

allowance for climate change. When designing a scheme flood water must be able to flow in and out and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the life of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624[41].

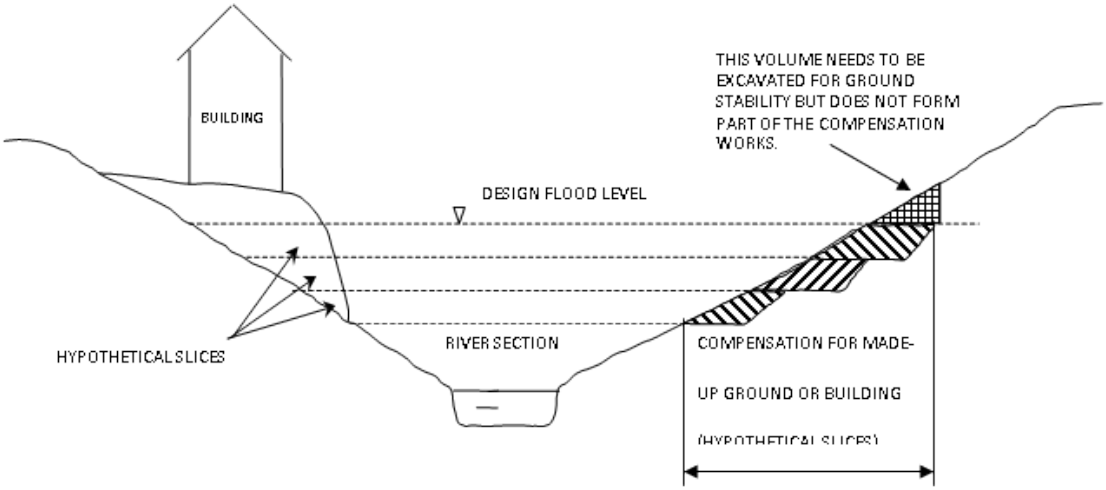

Figure 6-1 Example of Floodplain Compensation Storage (Environment Agency 2009)

6.3.9 The requirement for no loss of floodplain storage means that it is not possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, or indirect compensation, by lowering land already within the floodplain, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation or could be used in combination with other measures to limit the impact on floodplain storage.

6.3.10 Where car parks are specified as areas for the temporary storage of surface water and fluvial floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the susceptibility of flooding and flood warning should be available to provide sufficient time for car owners to move their vehicles if necessary.

6.3.11 **Policy recommendation:** Where proposed development results in a change in building footprint, land raising, or other structures, that impact upon the ability of the floodplain to store water, floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary.

6.4 Flood and Coastal Erosion Risk Management (FCERM) schemes

6.4.1 The programme of FCERM schemes[42] identifies two proposed schemes in the Winchester administrative area for the next 6-year period:

- Outer Winchester Flood Alleviation Scheme
- Hampshire Property Flood Resilience Scheme

Outer Winchester Flood Alleviation Scheme

6.4.2 As described in Section 5.3, the Outer Winchester Flood Alleviation Scheme was developed to better understand the causes of flooding in Littleton, Headbourne Worthy, Kings Worthy and the surrounding

[41] CIRIA (2004) CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry
[42] Programme of flood and coastal erosion risk management (FCERM) schemes
https://www.gov.uk/government/publications/programme-of-flood-and-coastal-erosion-risk-management-schemes

area, and to ensure the existing drainage system can operate at maximum capacity[43]. The works yet to be completed include drainage system repair, improvements and other flood resilience works.

Hampshire Property Flood Resilience Scheme

6.4.3 The Property Flood Resilience Initiative was set up by the Environment Agency and Hampshire County Council with the aim of reducing the risk of flooding for those who don't benefit from larger flood risk schemes[44]. The scheme will initially aid around 30 homes a year for the next six years.

6.5 Working with natural processes

6.5.1 Natural flood management involves techniques that aim to work with natural hydrological and morphological processes, features, and characteristics to manage the sources and pathways of flood waters. Techniques include the restoration, enhancement and alteration of natural features and characteristics, but exclude traditional flood defence engineering that works against or disrupts these natural processes.

6.5.2 Appendix A Figure 8 provides information from the Environment Agency's 'Working with Natural Processes – Evidence Directory'[45] about where these measures could be applied. This map shows that although there are a lot of existing woodland constraints within the Winchester administrative area, there are also a wide range of opportunities to implement natural processes to alleviate flooding. There are many potential opportunities for floodplain woodland planting and riparian woodland planting around almost all of the watercourses in the administrative area, as well as some wider catchment woodland opportunities towards the south. Further information about these datasets is included in SFRA Report Part 1. Riparian woodland planting also holds the potential to confer environmental benefits such as improved water quality, Biodiversity Net Gain, wildlife corridors, and carbon sequestration, in unison with natural flood management.

Green Infrastructure

6.5.3 Green Infrastructure (GI) is a strategically planned and managed network of natural and semi-natural green (land) and blue (water) spaces that intersperse and connect urban centres, suburbs and rural fringe, consisting of:

- Open spaces e.g. parks, woodland, nature reserves and lakes,
- Linkages e.g. river corridors, canals, pathways, cycle routes and greenways,
- Networks of 'urban green' e.g. private gardens, street trees, verges and green roofs.

6.5.4 The identification and planning of GI is critical to sustainable growth and flood risk management. GI can provide a wide range of ecosystem services, including climate mitigation and adaptation, and is central to climate change action. GI also provides additional green spaces for storm flows, freeing up water storage capacity in existing infrastructure and reducing the risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. Additionally, GI can improve accessibility to waterways and water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

6.5.5 South Hampshire currently benefits from a strategic GI network that includes rivers, country parks, the coast, large tracts of woodland and an extensive public rights of way network. May local areas also benefit from smaller scale GI features. Maximising the potential of GI across South Hampshire is a critical environmental priority for PfSH, and hence a GI Strategy and associated GI Implementation Plan have been developed to provide an ambitious long term framework for GI and set out the strategic GI projects for South Hampshire into the future[46].

[43] Hampshire County Council Outer Winchester Flood Alleviation Scheme. https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/outer-winchester
[44] Hampshire Media Pilot Project for Flood Resilience Measures 2020. https://www.hantsdirect.com/post/pilot-project-for-flood-resilience-measures
[45] Working with Natural Processes – Evidence Directory https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681411/Working_with_natural_processes_evidence_directory.pdf
[46] Partnership for South Hampshire, 2019, Green Infrastructure, Flooding and Water Management https://www.push.gov.uk/work/planning-and-infrastructure/green-infrastructure-flooding-water-management/

6.5.6 **Policy Recommendation:** In partnership with relevant risk management authorities (for example Environment Agency, Hampshire County Council and land owners), extend and enhance existing GI within the borough through the implementation of floodplain and riparian woodland planting schemes in order to attenuate surface water runoff and groundwater recharge, both in, and preferably upstream, of areas that contain vulnerable receptors at risk of groundwater, surface water, and fluvial flooding. These strategies are most likely to be effective, and feasible in the riparian zones and floodplains of the River Dever, the River Itchen (outside of Winchester), the Candover Brook, the Cheriton Stream, the River Hamble (particularly upstream of Bishops Waltham), the River Alre, and the groundwater fed streams proximal to Hursley. There are also more limited opportunities to extend the existing woodland along the River Meon and the Whiteley Stream.

Nutrient Neutral Development

6.5.7 The water quality of rivers and coastal waters can be affected by excessive levels of nutrients. High levels of nitrogen and phosphorus in water environments can cause eutrophication, reducing available oxygen and harming aquatic insects, fish, and wildlife. The nutrient inputs are largely from a combination of agricultural sources and from public and private wastewater systems.

6.5.8 Areas of special interest within Winchester and downstream from Winchester which need to be protected from these effects include the River Itchen Special Area of Conservation (SAC), Solent Maritime SAC, Solent and Southampton Water Ramsar designation and Special Protection Area (SPA). It is important that new development does not lead to an increase in nutrients which could lead to a significant impact on these protected sites.

6.5.9 Some mitigation measures to achieve nutrient neutrality can also deliver further benefits in terms of managing surface water flooding. For example, mitigation of the increased nutrient load generated by new residential developments can potentilla be achieved through the creation of new inception wetlands which strip nutrients from the wastewater, or natural buffer zones. Natural buffer zones increase the area of permeable surfaces, thereby increasing infiltration rates and reducing surface runoff. Reduced surface runoff reduces the probability of localised surface water flooding in urbanised areas, as well as the release of water during storm events into catchments. The creation of new wetlands can reduce the probability and severity of flooding downstream, by bolstering the water storage capacity of floodplains.

6.6 Surface water management

6.6.1 Development should be designed so that there is no increase in flood risk elsewhere and the development will be safe from surface water flooding. This must be the case during the 3.33% AEP and 1% AEP rainfall event including the relevant allowances for climate change (described in Part 1 Main Report Table 3-4) based on the lifetime of the development:

- For development with a lifetime beyond 2100, use the upper end allowances for the 2070s epoch.
- For development with a lifetime of between 2061 and 2100 use the central allowance for the 2070s epoch.
- For development with a lifetime up to 2060 use the central allowance for the 2050s epoch.

6.6.2 HCC will support only those developments which offer surface water management systems that ensure all runoff is restricted to greenfield runoff rates if the development area is in a greenfield site; or restricted to pre-existing runoff rates, with preference to greenfield runoff rates if reasonably practicable if the development area is in a brownfield site; all in accordance with best practice and industry standards (i.e., the SuDS Manual C753) for water quality and quantity.

Sustainable Drainage Systems

6.6.1 Sustainable drainage systems (or SuDS) are designed to control surface water run off close to where it falls, combining a mixture of built and nature-based techniques to mimic natural drainage as closely as possible, and accounting for the predicted impacts of climate change.

6.6.2 Suitable surface water management measures should be incorporated into new development designs to reduce and manage surface water flood risk to, and posed by, the proposed development. This should

ideally be achieved by incorporating Sustainable Drainage Systems (SuDS). Consideration of sustainable drainage systems early in the design process for development, including at the pre-application or master-planning stages, can lead to better integration, multi-functional benefits and reduced land-take.

6.6.3 SuDS are typically softer engineering solutions inspired by natural drainage processes such as ponds and swales which manage water as close to its source as possible. Wherever possible, a SuDS technique should seek to contribute to each of the four following goals:

- Reduce flood risk (to the site and neighbouring areas),
- Improve water quality,
- Provide biodiversity, wildlife benefits and,
- Provide amenity and landscape benefits.

6.6.4 Generally, the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable:

- Into the ground (infiltration),
- To a surface water body,
- To a surface water sewer, highway drain, or another drainage system, and
- To a combined sewer.

6.6.5 SuDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e., natural watercourse or public sewer etc.). The SuDS Manual[47] identifies several processes that can be used to manage and control runoff from developed areas. Each option can provide opportunities for storm water control, flood risk management, water conservation and groundwater recharge. Refer to the non-technical standards[48] for guidance on the design, maintenance, and operation of SuDS. Adoption arrangements for SuDS scheme should be considered for the lifetime of the development.

6.6.6 Some parts of the Winchester administrative area have low permeability geology, making the implementation of some SuDS difficult. However their viability should still always be considered. The Winchester Local Plan[49] states in policy CP17 that the Local Planning Authority will support development that includes sustainable water management systems such as SuDS.

6.6.7 The Winchester District Local Plan Core Strategy[50], which sets out the main social and physical infrastructure that might be required to support development in the Winchester administrative area, identifies SuDS as the flood defence requirement at the strategic allocation sites (Winchester North, West of Waterlooville and North Whiteley).

6.6.8 HCC have outlined their stance towards SuDS in the Local Flood and Water Management Strategy (2020) document[51], which contains two policies specifically related to SuDS, namely that post development no greater volume of surface water leaves the site and/or no surface water leaves the site at a faster rate than occurred predevelopment, and that HCC will encourage LPAs to ensure that a formal adoption process and robust maintenance regime for SuDS is secured through the granting of the planning permission (e.g. Section 106 agreements where necessary). Although not a specific policy, the document also indicates that ideally all new developments, both major and minor, should utilise SuDS where applicable.

6.6.9 The benefits of SuDS were recognised in the Central Winchester Regeneration Area FRA, which assessed flood risk in Silver Hill. SuDS have been proposed to ensure development within the

[47] CIRIA C697 SuDS Manual. Available from: https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS
[48] Sustainable drainage systems: non-statutory technical standards, 2015 https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[49] Winchester City Council, 2013, Winchester Local Plan. https://www.winchester.gov.uk/planning-policy/winchester-district-local-plan-2011-2036-adopted/local-plan-part-1-joint-core-strategy-adopted-march-2013-local-plan-review-2006/local-plan-part-1-joint-core-strategy-adopted-2013
[50] Winchester City Council, Winchester District Local Plan Part 1 – Joint Core Strategy Infrastructure Delivery Plan. CIL-10-Infrastructure-Delivery-Plan-Winchester-City-Council-November-2011.pdf
[51] Hampshire County Council Local Flood and Water Management Strategy https://documents.hants.gov.uk/flood-water-management/local-flood-water-management-strategy.pdf

floodplain does not increase flood risk elsewhere. Infiltration SuDS were identified as the preferred solution due to their sustainability and effectiveness, however the viability of infiltration SuDS will not be confirmed until the detailed design stage. Alternate options have also been provided, including attenuating discharge to a watercourse or sewer.

6.6.10 **Policy Recommendation:** Strengthen the existing surface water management requirements for proposed greenfield and brownfield developments in urban areas of the Winchester CC area that are at greatest risk from surface water flooding, such as Sutton Scotney, New Alresford, Winchester, Waterlooville, Whiteley, Wickham, and Bishops Waltham.

Limiting urban creep

6.6.11 The CMPs set out that in residential parts of the priority areas, HCC will liaise with Winchester CC to limit permitted development rights regarding the paving or covering of permeable surfaces with impermeable surfacing.

6.7 Flow routing

6.7.1 Redevelopment in areas at risk of flooding from surface water, river flooding or groundwater flooding has the potential to affect flood routing and increase flood risk elsewhere. For example, redevelopment may give rise to backwater effects or divert floodwaters on to other properties.

6.7.2 Consideration should be given to configuring road and building layouts to preserve existing flow paths and improve flood routing, whilst ensuring that flows are not diverted towards other properties. Consideration should be given to the use of fences and landscaping walls so as to prevent causing obstruction to flow routes and increasing the risk of flooding to the site or neighbouring areas.

6.7.3 Opportunities should be sought within site design to make space for water, such as:

- Removing boundary walls or replacing with other boundary treatments such as hedges, fences (with gaps).
- Considering alternatives to solid wooden gates or ensuring that there is a gap beneath the gates to allow the passage of floodwater.
- On uneven or sloping sites, consider lowering ground levels to extend the floodplain without creating ponds. The area of lowered ground must remain connected to the floodplain to allow water to flow back to river when levels recede.
- Create under-croft car parks or consider reducing ground floor footprint and creating an open area under the building to allow flood water storage.
- Where proposals entail floodable garages or outbuildings, consider designing a proportion of the external walls to be committed to free flow of floodwater.

6.7.4 **Policy Recommendation:** All new development should not adversely affect flood routing which could increase flood risk elsewhere. Opportunities should be sought within the site design to make space for water.

6.8 Groundwater Management Plan Action Plans

6.8.1 HCC has developed settlement specific Actions Plans for areas with the highest groundwater flood risk in Hampshire, Hambledon, Kings Worthy, Hursley, Bishops Sutton and West Meon within the Winchester administrative area[52]. These Action Plans detail the measures that have been put in place since the floods of 2000/2001, as well as mitigation methods currently proposed and further measures required to reduce the risk in the future, which will be reviewed following consultation with and comments from residents.

6.8.2 Common measures that have already been put in place across all Action Plan areas in the Winchester administrative area include:

[52] Hampshire County Council, 2013 Groundwater Management Plan.
https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/groundwater-management-plan

- Improvements to the Environment Agency's Flood Warning Service (for all areas except Kings Worthy, where other measures are proposed),
- Development of a Village Flood Plan (for all except West Meon),
- Creation of a Flood Action Group (for all except West Meon), and
- Development of a Foul Flooding Emergency Plan.

6.8.3 Common mitigation methods currently proposed to reduce groundwater flood risk include:

- Reviewing the maintenance and provision of the surface water drainage system and establishing a proactive maintenance schedule and flood incident reaction plan,
- Reviewing the need to install a pumping system to reduce groundwater cellar flooding in individual properties,
- Signing up to Parish Lengthsman initiative 2014-15, and
- Information gathering.

6.8.4 Common further measures required to reduce risk in the future include:

- Continued improvements to the sewerage system to reduce ingress as part of infiltration reduction plans,
- Ensuring surveys of road drainage / pipework are carried out and that maintenance and repair is undertaken as necessary,
- Routine inspection of surface water channels, drainage pathways culverts etc. to check for blockage and clear as necessary,
- Establishing and formalising a proactive maintenance response schedule in response to high groundwater levels,
- Ensuring that residents are aware of the risk of flooding and are registered with the Environment Agency flood alert service,
- Ensuring that residents are aware of advice on how to protect themselves and their property during flooding,
- Encouraging individuals to create a bespoke flood action plan, and
- Keeping accurate records of flood events as they occur.

6.9 Risk of groundwater flooding

6.9.1 **Policy Recommendation:** New development should not result in an increased risk of groundwater flooding elsewhere. Where development is proposed that involves work below ground and/or changes to drainage, a Hydrogeological Risk Assessment (HRA) should be undertaken to determine the potential impact on groundwater and identify proposed mitigation measures.

6.9.2 The geology underlying Test Valley creates pathways for groundwater to flow through the subsurface and the potential for groundwater flooding to occur, which is exacerbated when water levels in the watercourses are elevated. Additional subsurface development or additional infiltration has the potential to modify groundwater flows, leading to potential flooding elsewhere and/or impacting on groundwater abstractions downstream.

A Flood Risk Assessment (FRA) should be undertaken for all proposed developments. The FRA should identify:

i. the depth and geometry of the penetration of works into the sub-surface from the construction of the proposed development (for example piled foundations, basements, excavation for services). These features can disrupt groundwater flow, alter groundwater levels and therefore increase the risk of groundwater flooding at or around the site.

ii. any changes in drainage, for example impermeable surfaces or infiltration/SuDS systems which could alter groundwater flow patterns and the elevation of the water table.

If the FRA identifies works below ground and/or changes in drainage a Hydrogeological Risk Assessment (HRA) (sometimes called a Basement Impact Assessment) will be required. The scope and detail required for the HRA will vary depending on the scale of sub-surface construction proposed and the local geological and hydrogeological conditions.

The HRA should be used to determine the geological and hydrogeological setting and whether sub-surface development will reach the water table. The water table will move up and down depending on rainfall; the assessment should consider the highest level. If the development does extend down to the water table it may disrupt groundwater flow in the aquifer by creating a barrier and increase the risk of flooding. The HRA should identify the impact and any required mitigation measures.

In some settings there may be an aquifer at depth and, depending on the proposed depth of the development, this may also have to be assessed. A site specific ground investigation (GI) with trial pits and boreholes should be obtained to inform the FRA and HRA if there is uncertainty over the geological or hydrogeological conditions at any proposed development site.

The HRA should also identify changes in drainage as these may create additional inflows to ground which can also exacerbate groundwater flood risk.

6.10 Consulting Water companies

6.10.1 Southern Water are responsible for maintaining surface, foul and combined public sewers to ensure effective drainage of the area. If flows are proposed to enter public sewers, as part of their pre-application service, Southern Water will assess whether the public system has the capacity to accept the flows or provide a solution that identifies necessary mitigation if not.

6.10.2 As summarised in Section 2.4, there is a pressing need to reduce the volume of rainwater entering the sewer system, to enable capacity for wastewater processing and reduce discharges from storm overflows.

6.10.3 **Recommendation**: As part of their site allocation process, Winchester CC should consult with Southern Water to determine any areas with sewer capacity issues. New development provides an opportunity to reduce the causes and impacts of flooding associated with sewer systems and local surface water runoff.

6.11 Emergency planning

6.11.1 Emergency planning can help manage flood related incidents. In the UK, emergency planning is performed under the direction of the 2004 Civil Contingencies Act (CCA), and seeks to prevent, or if not mitigate, the risk to life, property, business, infrastructure and the environment.

6.11.2 Flood risk emergency planning involves developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. In development planning, a number of these activities are already integrated in national building control and planning policies e.g. the NPPF.

6.11.3 Safety is a key consideration for any new development and includes the likely impacts of climate change and, where there is a residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding.

6.11.4 **Recommendation:** Winchester CC should take account of this updated SFRA in future reviews of their emergency plans.

Emergency planning considerations for reservoirs

6.11.5 Winchester CC will need to evaluate the potential damage to buildings or loss of life in the event of dam failure, compared to other risks, when considering development downstream of a reservoir. Winchester CC is also advised to consult with the owners/operators of raised reservoirs, to establish constraints upon safe development.

6.11.6 Winchester CC should also consider any implications for reservoir safety and reservoir owners and operators caused by new development located downstream of a reservoir, such as the cost of measures to improve the design of the dam to reduce flood risk, the operation of the reservoir, and general maintenance costs, by consulting with reservoir owners and operators on plan and development proposals. Local authorities, as category 1 responders, can access more information about reservoir risk and reservoir owners using the Resilience Direct system. Developers should be expected to cover any additional costs incurred, as required by the National Planning Policy Framework's 'agent of change' policy (paragraph 187). This could be through Community Infrastructure Levy or section 106 obligations for example.

7. Recommendations of how to address flood risk in development

*When allocating sites for development, LPAs must apply the Sequential Test to **avoid** flood risk and steer development towards those areas at least risk of flooding. The process for applying the Sequential Test described in Part 1 Section 4.*

*Following the application of the Sequential Test, it may not always be possible to **avoid** locating development in areas at risk of flooding. This section builds on the findings of the SFRA to provide guidance on the range of measures that could be considered on individual development sites in order to **mitigate** and **manage** the risk of flooding. These measures should be considered when preparing a site-specific FRA. This section outlines the approach that Winchester CC should consider in relation to flood risk planning policy and development management decisions.*

7.1 Sequential approach

7.1.1 **Policy Recommendation:** A sequential approach to site planning should be applied.

7.1.2 Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. Most large development proposals include a variety of land uses of varying vulnerability to flooding. The sequential approach should be applied within development sites to locate the most vulnerable elements of a development in the lowest risk areas (considering all sources of flooding) e.g. residential elements should be restricted to areas at lower probability of flooding whereas parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding.

7.2 Appropriate types of development

7.2.1 **Policy Recommendation: Location of development must take into account the vulnerability of users.**

7.2.2 Table 4-2 in SFRA Report Part 1 (reproduced from PPG Table 2) provides a compatibility matrix and determines which types of development are appropriate in areas of flood risk[53].

7.3 Flood resilience measures

7.3.1 **Policy Recommendation:** Where development or redevelopment is proposed in areas at risk of flooding, flood resilience measures should be implemented.

7.3.2 'Property Flood Resilience' is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice[54], which provides advice for both new-build and retrofit. It includes specific guidance for local authority planners.

7.3.3 Resistance and recovery measures are unlikely to be suitable as the only mitigation measure to manage flood risk, but they may be suitable in some circumstances, such as:

- Water Compatible and Less Vulnerable uses where temporary disruption is acceptable and the development remains safe.
- Where the use of an existing building is to be changed and it can be demonstrated that the avoidance measures are not practicable, and the development remains safe.

[53] Planning Practice Guidance Flood Risk and Coastal Change https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2

[54] Kelly, D, Barker, M, Lamond, J, McKeown, S, Blundell, E and Suttie, E (2020) Guidance on the code of practice for property flood resilience, C790B, CIRIA, London (ISBN: 978-0-86017-895-8) https://www.ciria.org/CIRIA/Resources/Free_publications/CoP_for_PFR_resource.aspx

- As a measure to manage residual flood risk from flood risk management infrastructure when avoidance measures have been exhausted.

7.3.4 Flood resistance and recovery measures cannot be used to justify development in inappropriate locations.

7.3.5 Where historic buildings are involved, early consultation with Historic England should be undertaken and their guide[55] on flood resilience for historic properties provides additional information.

Flood Resistance 'Water Exclusion Strategy'

7.3.6 Flood resistant construction can prevent entry of water or minimise the amount that may enter a building where there is short duration flooding with water depth up to approximately 0.6 metres, depending on the building's characteristics. Where measures to exclude water in this way are proposed above this level, advice should be sought from a suitably qualified building surveyor, architect or structural engineer.

7.3.7 There is a range of flood resistance and resilience construction techniques that can be implemented in new developments to mitigate potential flood damage. Flood resistance measures, or dry-proofing, stops water entering a building up to a safe structural limit. Resistance measures can be passive, such as flood doors which are normally closed; or active, such as air brick covers or removable flood barriers. Passive measures are to be prioritised over active measures.

7.3.8 This form of construction needs to be used with caution and accompanied by measures that will speed-up flood recovery, as effective flood resistance can be difficult to achieve. Hydrostatic pressures exerted by floodwater can cause long-term structural damage, undermine the foundations of a building or cause leakage through the walls, floor or sub-floor, unless the building is specifically designed to withstand such stresses. In addition, temporary and demountable defences are not appropriate for new-build developments.

7.3.9 There is a range of property flood protection devices available on the market, designed specifically to resist the passage of floodwater. These include removable flood barriers and gates designed to fit openings, vent covers and stoppers designed to fit WCs. These measures can be appropriate for preventing water entry associated with fluvial flooding as well as surface water and sewer flooding. The efficacy of such devices relies on their being deployed before a flood event occurs. It should also be borne in mind that devices such as air vent covers, if left in place by occupants as a precautionary measure, may compromise safe ventilation of the building in accordance with Building Regulations.

Flood Recovery 'Water Entry Strategy'

7.3.10 Flood recoverability measures (or wet-proofing), accept that water will enter the building, but through careful design and changes to the construction will minimise damage and allow faster cleaning, drying, repairing and re-occupancy of the building after a flood. Measures are preferably passive, such as the use of resilient building materials, or active such as moving sensitive equipment or belongings to upper floors when flooding is expected.

7.3.11 Materials should be used which allow the passage of water whilst retaining their structural integrity and they should also have good drying and cleaning properties. Alternatively sacrificial materials can be included for internal and external finishes; for example the use of gypsum plasterboard which can be removed and replaced following a flood event. Flood resilient fittings should be used to at least 0.1m above the design flood level. Recovery measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.

7.3.12 A variety of flood recovery tools can be implemented, such as:

- Using materials with either, good drying and cleaning properties or, sacrificial materials that can easily be replaced post-flood.
- Design for water to drain away after flooding.

[55] Historic England, April 2015, Flooding and Historic Buildings. https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/

- Design access to all spaces to permit drying and cleaning.
- Raise the level of electrical wiring, appliances and utility metres.

7.3.13 Structures such as (bus, bike) shelters, park benches and refuse bins (and associated storage areas) located in areas with a high flood risk should be flood resilient and be firmly attached to the ground and designed in such a way as to prevent entrainment of debris which in turn could increase flood risk and/or breakaway posing a danger to life during high flows.

7.4 Finished floor levels

7.4.1 **Policy Recommendation:** More Vulnerable and Highly Vulnerable development within Flood Zones 2 and 3 should set Finished Floor Levels above the 1 in 100 annual probability (1% AEP) flood level including an appropriate allowance for climate change and freeboard.

7.4.2 Where developing in Flood Zone 2 and 3 is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (residential) and Highly Vulnerable development types (as outlined in Table 2 of the PPG), is to ensure internal floor levels are raised a freeboard level above the design flood level including an appropriate allowance for climate change. For fluvial flooding, the design flood is the 1% AEP (1 in 100 year) event. Less Vulnerable development should also aim to raise floor levels. Where this is not achievable, flood resilience measures should be incorporated to make up the shortfall. These measures should be detailed within the FRA.

7.4.3 Guidance document "Accounting for residual uncertainty: an update to the fluvial freeboard guide – technical report"[56] explains how to determine the appropriate residual uncertainty allowances. The process involves identifying sources of uncertainty in the datasets upon which the assessment is based, estimating the magnitude of residual uncertainties, and determining the appropriate response. Section 3.2 focuses on applying the process for development planning. The resulting residual uncertainty allowances range from 300mm to 900mm. The majority of developments should use this guidance document to determine freeboard, the only exceptions to this being minor developments that fall under the standing advice for flood risk.

7.4.4 With reference to the 'Flood risk assessment: standing advice for flood risk'[57], finished floor levels should be a minimum of whichever is higher, 300mm above the general ground level of the site or 600mm above the estimated river or sea flood level.

7.4.5 In certain situations (e.g. for proposed extensions to buildings with a lower floor level or conversion of existing historical structures with limited existing ceiling levels), it could prove impractical to raise the internal ground floor levels to sufficiently meet the general requirements. In these cases, the Environment Agency and/or Winchester CC should be approached to discuss options for a reduction in the minimum internal ground floor levels provided flood resistance measures are implemented up to an agreed level.

7.4.6 There are also circumstances where flood resilience measures should be considered first. For both Less and More Vulnerable developments where internal access to higher floors is required, the associated plans showing the access routes and floor levels should be included within any site-specific FRA.

7.5 Protection against groundwater flooding

7.5.1 Although many of the measures used to provide resistance and resilience to surface water and fluvial flooding are also suited to groundwater flooding, many traditional methods of flood protection, such as sandbags, may not be effective against flooding from groundwater. This is because water can come up through the floor and remain for a long time.

[56] Accounting for residual uncertainty: an update to the fluvial freeboard guide https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/accounting-for-residual-uncertainty-an-update-to-the-fluvial-freeboard-guide?web=1&wdLOR=c7DCE6B52-35F0-469F-843D-3238FA827B79
[57] Environment Agency Preparing a flood risk assessment: standing advice https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

7.5.2 There are differences in impacts related to the long duration of groundwater flooding (weeks compared with days). These include potential structural impacts on foundations and impacts on sub surface drainage (both main sewer systems and local systems such as cess pits and soakaways).

7.5.3 Whilst the duration of groundwater flooding is problematic, as it generally takes some time to build up, there is generally a greater length of time to move valuable items or undertake a planned "evacuation"

7.5.4 *Resistance* measures are intended to limit entry of water to the building. Those that may be effective in a building include:

- Installing waterproof floors and sealing walls (including making good pointing, rendering etc.),
- Sealing (tanking) basements and using sump pumps for clearance if water ingress cannot be prevented,
- Covering susceptible ingress points such as airbricks (e.g. flood proof airbricks are available) and sealing weep holes,
- Installing one-way valves, toilet plugs and pipe bungs may prevent the entry of water from flooded sewers, and,
- 'Sump and pump' – the use of a drain around a property to intercept rising groundwater and direct it to a sump, from where it is pumped to disposal.

7.5.5 *Resilience* involves modifying the interior of a building, for example by using materials that are less prone to damage by floodwater and / or dry quickly so that the post-flooding clean-up will be easier, cheaper, and quicker. Any surface water / fluvial resilience measure will be equally suitable for groundwater flooding. Typical measures include:

- Mounting electrical sockets, fittings, and equipment at high level above expected flood water,
- Using solid or tile floors rather than fitted carpets,
- Having readily demountable equipment (such as TVs etc.) that can be moved to a safe location,
- Raising less easily demountable portable equipment (e.g., kitchen fittings) to high level, and,
- Using plaster and other building materials that are more resilient to long periods under damp conditions.

7.5.6 The Environment Agency provides advice on preparing properties for flooding in the following publications:

- Homeowners Guide to Flood Risk[58] – lists various measures that are applicable to flooding in general, and,
- Flooding from groundwater[59] - Practical advice to help homeowners reduce the impact of flooding specifically from groundwater.

7.6 Access / escape

7.6.1 Policy recommendation: New development must have safe access / escape during design flood conditions including an allowance for climate change.

7.6.2 For developments located in areas at risk of fluvial flooding safe access / escape must be provided for new development as follows in order of preference:

- Safe dry route for people and vehicles.
- Safe dry route for people.

[58] Homeowners guide to flood resilience. Know Your Flood Risk, July 2018. https://www.floodguidance.co.uk/wp-content/uploads/2018/07/KnowYourFloodRiskGuide_July18.pdf
[59] Environment Agency, 2011, Flooding from groundwater. https://www.gov.uk/government/publications/flooding-from-groundwater

- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause risk to people.
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles. However the public should not drive vehicles in floodwater.

7.6.3 Where access and escape are important to the overall safety of development in areas of flood risk, the local planning authority should consult with emergency planning staff and, where appropriate with the emergency services, unless local standards or guidelines have been put in place in lieu of consultation.

7.6.4 A safe access/escape route should allow occupants to safely enter and exit the buildings and be able to reach land outside the flooded area (e.g. within Flood Zone 1) using public rights of way without the intervention of emergency services or others during design flood conditions, including climate change allowances (i.e. 1% AEP fluvial flood event and surface water event including an appropriate climate change allowance). Where a dry route is not possible the FRA should provide an assessment of the flood hazard rating along the route and demonstrate that the route is a low hazard (as defined in the FD2320 Flood risk to people calculator[63]).

7.6.5 In exceptional circumstances, safe access above the 1% annual probability (1 in 100 year) flood level for river flooding and surface water flooding including climate change may not be achievable. In these circumstances the Environment Agency and the LPA should be consulted to determine whether the safety of the site occupants can be satisfactorily managed. This will be informed by the type of development, the number of occupants and their vulnerability and the flood hazard along the proposed egress route. For example, this may entail the designation of a safe place of refuge on an upper floor of a building, from which the occupants can be rescued by emergency services. It should be noted that sole reliance on a safe place of refuge is a last resort, and all other possible means to evacuate the site should be considered first. Provision of a safe place of refuge will not guarantee that an application will be granted.

7.6.6 The guidance document 'Flood Risk Emergency Plans for New Development' published by the Environment Agency and ADEPT[64] provides more detail on safe access and escape

7.7 Emergency plans

7.7.1 Evacuation is where flood alerts and warnings provided by the Environment Agency enable timely actions by residents or occupants to allow them to get to safety unaided, i.e. without the deployment of trained personnel to help people from their homes, businesses, and other premises. Rescue by the emergency services is likely to be required where flooding has occurred and prior evacuation has not been possible.

7.7.2 For all developments (excluding minor developments and change of use) proposed in Flood Zone 2 or 3, an Emergency Plan should be prepared to demonstrate what actions site users will take before, during and after a flood event to ensure their safety, and to demonstrate that their development will not impact on the ability of the local authority and the emergency services to safeguard the current population.

7.7.3 For sites in Flood Zone 1 that are located on 'dry islands', it may also be necessary to prepare an Emergency Plan to determine potential egress routes away from the site through areas that may be at risk of flooding during the 1% annual probability (1 in 100 year) flood event including an allowance for climate change.

7.7.4 The Environment Agency has a tool on their website to create a Personal Flood Plan[65]. The Plan comprises a checklist of things to do before, during and after a flood and a place to record important contact details. Where proposed development comprises non-residential extension <250m^2 and

[63] Defra Environment Agency Flood and Coastal Defence R&D Programme, 2004, https://assets.publishing.service.gov.uk/media/602a9348e90e070559970f9d/Operations_and_Maintenance_Concerted_Action_Report_pdf.pdf
[64] ADEPT, Environment Agency, September 2019, Flood Risk Emergency Plans for New Development https://www.adeptnet.org.uk/floodriskemergencyplan
[65] Environment Agency Tool 'Make a Flood Plan'. Available from: https://www.gov.uk/government/publications/personal-flood-plan

householder development (minor development), it is recommended that the use of this tool to create a Personal Flood Plan will be appropriate.

7.7.5 Emergency Plans should include:

- How flood warning is to be provided, such as:
  - Availability of existing flood warning systems,
  - Where available, rate of onset of flooding and available flood warning time, and,
  - How flood warning is given.
- What will be done to protect the development and contents, such as:
  - How easily damaged items (including parked cars) or valuable items (important documents) will be relocated,
  - How services can be switched off (gas, electricity, water supplies),
  - The use of flood protection products (e.g. flood boards, airbrick covers),
  - The availability of staff/occupants/users to respond to a flood warning, including preparing for evacuation, deploying flood barriers across doors etc., and,
  - The time taken to respond to a flood warning.
- Ensuring safe occupancy and access to and from the development, such as:
  - Occupant awareness of the likely frequency and duration of flood events, and the potential need to evacuate,
  - Safe access route to and from the development,
  - If necessary, the ability to maintain key services during an event,
  - Vulnerability of occupants, and whether rescue by emergency services will be necessary and feasible, and,
  - Expected time taken to re-establish normal use following a flood event (clean-up times, time to re-establish services etc.).

7.7.6 There is no statutory requirement for the Environment Agency or the emergency services to approve emergency plans. Winchester CC is accountable via planning condition or agreement to ensure that plans are suitable. Should there be an expectation that development will be coming forward in flood risk areas with implications on emergency planning, Winchester CC should work with their emergency planning officers to produce local guidelines setting out requirements for flood warning, evacuation and places of safety, against which individual planning applications can then be judged. These should avoid additional burdens on emergency services, explore opportunities for development proposals to address any shortfall in emergency service and infrastructure capacity, and minimise the need for further consultation at planning application stage

7.8 Local Design Codes

7.8.1 **Recommendation:** It is recommended that Winchester CC incorporate expectations for future development with respect to flood risk into any emerging local design codes. The local design code would need to accord with the National Model Design Code[66] (parts 1 and 2) requirements on water and drainage and follow the approach to flood risk management set out in PPG paragraphs 003 and 004 (Assess, Avoid, Control, Mitigate, Manage), ensuring all development will be appropriately flood resistant and resilient, with reference to the CIRIA Property Flood Resilience Code of Practice. The local design code should be prepared with input from the Environment Agency and the LLFA Hampshire County Council.

[66] https://www.gov.uk/government/publications/national-model-design-code

8. Next Steps

8.1 Next steps

8.1.1 Winchester CC should use this SFRA and associated mapping to:

- Develop their Local Plan and associated strategic policies,
- Safeguard land for flood risk management and green infrastructure,
- Carry out the sequential test for potential allocation sites,
- Carry out the sequential test for individual planning applications,
- Make decisions about individual planning applications,
- Decide whether a development can be made safe without increasing flood risk elsewhere,
- Identify the need for local design guidance or codes,
- Aid discussions with emergency planning teams.

8.1.2 Where development must be allocated in areas at risk of flooding further assessment of the risk of flooding may be required, for example through the preparation of a Level 2 SFRA.

8.2 Future monitoring and update

8.2.1 This SFRA should be reviewed when there are changes to:

- The predicted impacts of climate change on flood risk,
- Detailed flood modelling - such as from the Environment Agency or Lead Local Flood Authority. **The Environment Agency have confirmed they will be re-simulating the hydraulic models for the River Itchen and tributaries for the latest climate change allowances as part of their programme of work for the next few years. Outputs from this modelling should be included in future updates of the SFRA.**
- Local Plans, spatial development strategies or relevant local development documents,
- Local flood management schemes,
- Flood Risk Management Plans,
- Shoreline Management Plans,
- Local Flood Risk Management Strategies, and,
- National planning policy or guidance.

8.2.2 The SFRA may also need to be reviewed after a significant flood event.

Appendix A Figures

Appendix B Coastal Modelling Figures

Maximum Flood Depth Figures

Defended

Undefended

Maximum Flood Hazard Figures

Defended

Undefended