South Downs National Park Authority – Level 1 Strategic Flood Risk Assessment

Final Report

January 2025

Prepared for:

South Downs National Park Authority

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Document Status

Issue date	January 2025
Issued to	South Downs National Park Authority
BIM reference	LHM-JBAU-XX-XX-RP-HM-0001
Revision	D3-C01
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This report describes work commissioned by the South Downs National Park Authority by an instruction dated 31st August 2023. The Client's representative for the contract was Katharine Stuart of South Downs National Park Authority. Hannah Booth, Lucy Briscoe and Elise Coughlin of JBA Consulting carried out this work.

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Contents

List of Figures

List of Tables

Abbreviations

ADEPT	Association of Directors of the Environment, Economy, Planning and Transport
AEP	Annual Exceedance Probability
BGS	British Geological Survey
CDA	Critical Drainage Areas
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
CSO	Combined Sewer Overflow
DEFRA	Department for Environment, Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environment Agency
EU	European Union
FRA	Flood Risk Assessment
GSPZ	Groundwater Source Protection Zone
JBA	Jeremy Benn Associates
FCERM	Flood and Coastal Erosion Risk Management
FFL	Finished Floor Levels
FWMA	Flood and Water Management Act
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
m AOD	metres Above Ordnance Datum
NPPF	National Planning Policy Framework
NVZ	Nitrate Vulnerable Zones
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RMBP	River Basin Management Plan
RMA	Risk Management Authority
SAB	SuDS Approval Bodies
SDNPA	South Downs National Park Authority
SSSI	Special Site of Scientific Interest
SuDS	Sustainable Drainage Systems
WFD	Water Framework Directive

WWTW	Wastewater Treatment Works

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the planning policies for the South Downs National Park Authority (SDNPA). The review process is known as the Local Plan Review (LPR). This report uses the best available information, including input from key stakeholders. The SFRA applies the latest national planning policy and guidance, including:

- National Planning Policy Framework (NPPF) (gov.uk), revised in July 2021 and further updated in December 2023.
- Planning Practice Guidance (PPG): Flood risk and coastal change (gov.uk) updated in August 2022.
- Updates to the EA climate change guidance (gov.uk) in July 2021 and May 2022.

Introduction

To support the LPR for the SDNPA, the key objectives of the assessment are:

- To collate and analyse the latest available information and data for current and future (i.e., climate change) flood risk from all sources and how these risks may be mitigated against.
- To inform decisions in the emerging LPR, including informing the sustainability appraisal, the selection of development sites, and planning policies.
- To provide evidence to support the application of the sequential test for allocating new development sites, to support the Authority in the LPR.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the LPR.
- To help decide when a Flood Risk Assessment (FRA) will be required for individual planning applications.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments (FRAs), including those at risk from sources other than river flooding, or at risk of flooding in the future due to climate change, and outline specific measures or objectives that are required to manage flood risk.
- To provide the basis for applying the sequential test on planning applications, including by identifying sources of flooding other than those in ‘Flood Zones’ and those at risk of flooding in the future.
- To identify opportunities to reduce the causes and impacts of flooding and gather information on the land that is likely to be required for flood risk management structures.

Summary of the flood risk to the SDNPA area

This SFRA covers the SDNPA area. The SDNPA's administrative area is 16,500 km^2 with a population of 113,000 people. The authority area is predominantly rural with the towns of Petersfield, Midhurst, Lewes and Petworth as the main urban areas within the administrative area.

Flood risk from all sources has been assessed in this SFRA. Parts of the SDNPA area are shown to be at risk of flooding from the following sources: fluvial, surface water, groundwater, sewers, reservoir inundation. This study has shown that the most significant sources of flood risk across the SDNPA area are fluvial, surface water and groundwater. The points below summarise the findings:

Fluvial: The SDNPA area lies across several river catchments. The largest are River Rother, River Meon, River Itchen and River Lavant. These rivers affect several settlements in the SDNPA area including the main urban areas of Petersfield, Midhurst and Lewes.

Fluvial flood risk is discussed in Section 5.2 and the flood extents are shown in Appendix A.

Surface Water: The Risk of Flooding from Surface Water map shows prominent overland flow routes that largely follow the lower topography of watercourses in the plan area, including the River Rother, River Arun and the River Adur. There are some areas where there are additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments and in low-lying areas. There are considerable flow routes following the roads and watercourses through the main urban areas of Lewes, Petersfield alongside isolated areas of ponding, which may affect many properties across these settlements. *Surface water flood risk is discussed in Section 5.4 and the flood extents are shown in the PDFs in Appendix A.*

Groundwater: Groundwater flooding is a significant risk in the SDNPA area. A large part of the study area is underlain by Principal Aquifers. The JBA Groundwater Emergence Map emulates this with large parts of the north and south of the SDNPA having groundwater levels that are either at or very near (within 0.025m of) the ground surface, particularly along the river corridors of the River Rother, River Ouse, Cuckmere River and around the urban areas of Petersfield, Midhurst as well as the south of the SDNPA area. There is no national groundwater flood dataset to inform the areas at risk from groundwater flooding; however, emergence mapping when considered in conjunction with topography and surface water flow paths can indicate areas where groundwater is likely to emerge, and the flow paths it may take once above the ground. *Groundwater flood risk is discussed in Section 5.5 and the Maps in Appendix A.*

Sewer: Southern Water and Thames Water provide sewerage services across the SDNPA area. Southern Water have provided details of historic sewer flooding across the SDNPA area and the LLFA have also identified incidents of sewer flooding. The areas identified with high number of previous sewer flooding events include, Lewes, Petersfield, Midhurst and Liss. Sewer *flood risk is discussed in Section 5.6.*

Reservoirs: There are 26 reservoirs where the 'wet day' or 'dry day' scenario extents encroach into the SDNPA area. There is a potential risk of flooding from reservoirs both

within the SDNPA area and those outside. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRAs (where relevant) in accordance with the updated PPG: Flood risk and coastal change. *Reservoir flood risk is discussed in Section 5.7 and in the Maps in Appendix A.*

Climate Change: Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas, due to climate change. Flood extents will increase; in some locations this may be minimal, but flood depth, velocity and hazard may have more of an impact due to climate change. This SFRA provides an assessment of the impacts of climate change on fluvial and surface water flood risk. *The approach to climate change is discussed in Section 6.5 and the flood extents are also shown in the Maps in Appendix A.* It is recommended that the Authority work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development when developing climate change plans and strategies.

Defences

The EA Asset Information Management System (AIMS) dataset provides information on flood defence assets across the SDNPA area. The only formal defence type located within the SDNPA area is embankments and high ground, with some sections of engineered high ground. *Further information on defences is available in Section 7 and shown in the Maps in Appendix A.*

How to use this report

Planners and developers

The SFRA provides recommendations regarding all sources of flood risk across the SDNPA area, which can be used to inform policy on flood risk within the emerging LPR. This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the sequential test, for both allocations and individual planning applications, and provides guidance on how to apply the exception test.

Links have been provided for relevant guidance documents and policies published by other RMAs such as the Lead Local Flood Authority (LLFA) and the Environment Agency (EA).

This SFRA is a strategic assessment of flood risk and does not replace the need for site-specific FRAs, where required. The SFRA provides guidance for the development industry and development management officers to establish when an FRA is required and to assess whether site-specific FRAs meet the required quality standard (Section 9). This should be used alongside the EA's FRA Guidance (gov.uk). The SFRA can be used to help identify which locations and development may require emergency planning provision.

Developers need to check and ensure that new development does not increase surface water runoff rates and volumes from a site or contribute to cumulative effects of development at sensitive locations, see Section 8 and Appendix E: Cumulative Impact

Assessment (CIA). Section 10 provides information on the surface water drainage requirements of the LLFA. Further assessments may also be required at this stage to manage the risk from sewer flooding to a site, and developers should contact Thames or Southern Water for further advice. SuDS should be considered at the earliest stages that a site is planned to be developed which will help to minimise costs and overcome any site-specific constraints.

At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, last updated in May 2022), inform master-planning, and demonstrate, if required, that the exception test is satisfied.

Neighbourhood Plans

Neighbourhood planning groups can use the information in this SFRA to assess the risk of flooding to sites within their community, using Section 5, the sources of flooding across the SDNPA area and the flood mapping in Appendix A. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events across the SDNPA area are listed in Section 5. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned are outlined in Section 7.5 and Section 7 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Mapping

The SFRA mapping highlights on a strategic scale flood risk from fluvial, surface water and reservoirs sources, and where groundwater emergence may occur; as well as where the effects of climate change are most likely. The maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or depict small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this mapping.

The mapping data should always be supplemented by direct consultation with the relevant wastewater company to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

Cumulative Impact Assessment (CIA)

Under the NPPF, strategic policies and their supporting SFRAs are required to ‘consider cumulative impacts in, or affecting, local areas susceptible to flooding’ (Paragraph 166). A Cumulative Impact Assessment (CIA) has identified which catchments in the borough are more sensitive to the cumulative impact of development and where more stringent policy regarding flood risk is recommended. Any development in these areas should seek to contribute to work that reduces wider flood risk in those catchments.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

The South Downs National Park Authority (SDNPA) commissioned JBA Consulting to prepare a Level 1 Strategic Flood Risk Assessment (SFRA) for SDNPA area in September 2023. This study provides a comprehensive and robust evidence base to support the understanding of flood risk in the South Downs National Park. This SFRA is an update to the previous assessment from 2017 and provides a comprehensive and robust evidence base to support the preparation of the new Local Plan. An updated Level 1 SFRA is required as part of the evidence base for the forthcoming Local Plan and future selection of site allocations, as well as for use in future development management and policy decision making.

This plan and its supporting evidence base will establish a framework for future development, identifying land at the lowest flood risk from all sources, both now and in the future, which can be safely allocated for residential development, employment uses and associated infrastructure.

Key objectives of the 2024 SFRA are:

- *To provide information and guidance on flood risk for the SDNPA area, taking into account the most recent flood risk information and the future impact of climate change, as well as the current state of national planning policy, legislation and relevant studies.*
- *To provide the flood risk information and data to enable the Sequential Test to be applied and identify if consideration of the Exception Test is needed within a Level 2 SFRA.*
- *To inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk in the SDNPA area.*

1.2 Level of SFRA

The Planning Practice Guidance (PPG) Flood Risk and Coastal Change identifies the following two levels of SFRA:

1. Level One: where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow the application of the Sequential Test.
2. Level Two: where land at low risk of flooding cannot appropriately accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within areas at higher risk of flooding.

This report fulfils the Level One SFRA requirements.

1.3 SFRA outputs

The outputs of this SFRA include:

- Identification of policy and technical updates.
- Identification of any strategic flooding issues which may have cross-boundary implications.
- Appraisal of all potential sources of flooding, including fluvial, tidal, surface water, sewers, groundwater, reservoirs and canals.
- Review of historic flooding incidents.
- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk from all sources of flooding.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.
- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.4 Consultation

The following parties were consulted during the preparation of this SFRA:

- Environment Agency
- South Downs National Park Authority
- Hampshire County Council
- East Sussex County Council
- West Sussex County Council
- Brighton and Hove City Council
- The Aquifer Partnership
- River Arun Internal Drainage Board (IDB)
- Pevensey and Cuckmere Water Level Management Board
- Southern Water
- Thames Water

1.5 Use of SFRA data

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the Local Plan and any future flood risk policies.

Developers will still be required to undertake site-specific Flood Risk Assessments to support planning applications, where necessary. However, developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail for individual sites.

The government have provided specific guidance on SFRAs. This further explains how SFRA data should be used, including reference to relevant sections of the SFRA and how to consider different sources of flood risk.

On the date of publication, the SFRA contains the latest flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models, flood event information, new defence schemes and updates to policy and legislation. Developers should check the Environment Agency's Flood Map for Planning in the first instance to identify any major changes to the Flood Zones for rivers and the sea. The Environment Agency's Long term flood risk mapping should also be checked for periodic updates to surface water and reservoir flood risk mapping.

2 Study area

2.1 About the study area

The SDNPA's administrative area is 16,500 km^2 (Figure 2-1) with a population of 113,000 people (from the 2021 census). The authority area is predominantly rural with the towns of Petersfield, Midhurst, Lewes and Petworth as the main urban areas within the administrative area. The boundary borders other major settlements such as Portsmouth, Winchester and Brighton, and there are a number of major road and railway networks that pass through the authority area connecting these sites.

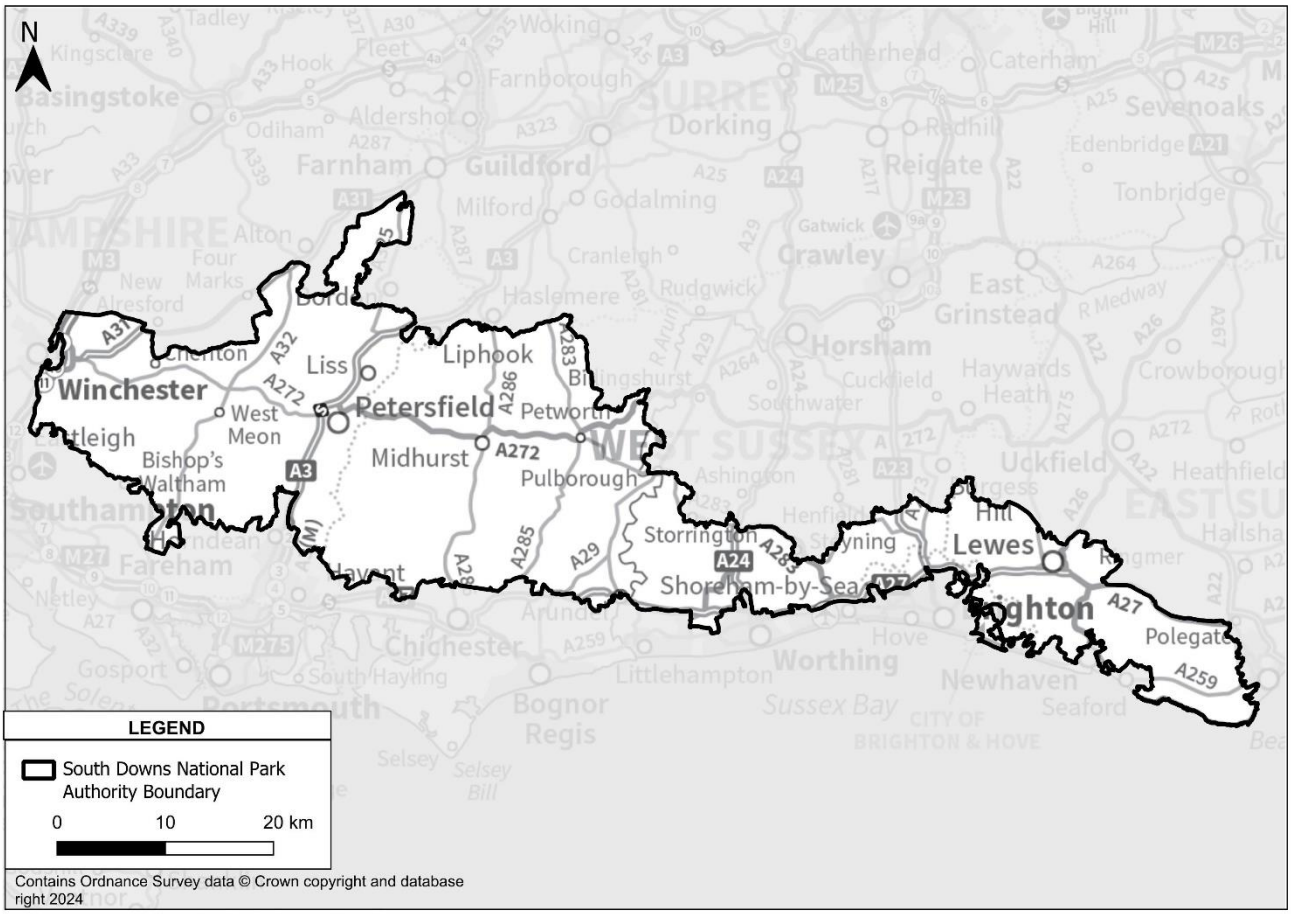


Figure 2-1 Boundary of the SDNPA

2.2 Neighbouring authorities

The SDNPA is the planning authority for all development within its boundary. There are however multiple local and district councils that overlap the SDNPA boundary. These authorities review all strategic issues within their own boundaries for the area outside of the national park and have their own planning and flood risk management obligations. They do however work with the SDNPA to address cross boundary issues. The SDNPA's neighbouring authorities (Figure 2-2) are:

- Adur District
- Arun District
- Chichester District
- East Hampshire District
- Eastbourne Borough
- Eastleigh Borough
- Havant Borough
- Horsham District
- Lewes District
- Mid Sussex District
- The City of Brighton and Hove
- Waverly Borough
- Wealden Borough
- Winchester City
- Worthing Borough

These authorities fall within the following Counties

- Hampshire County
- West Sussex County
- East Sussex County

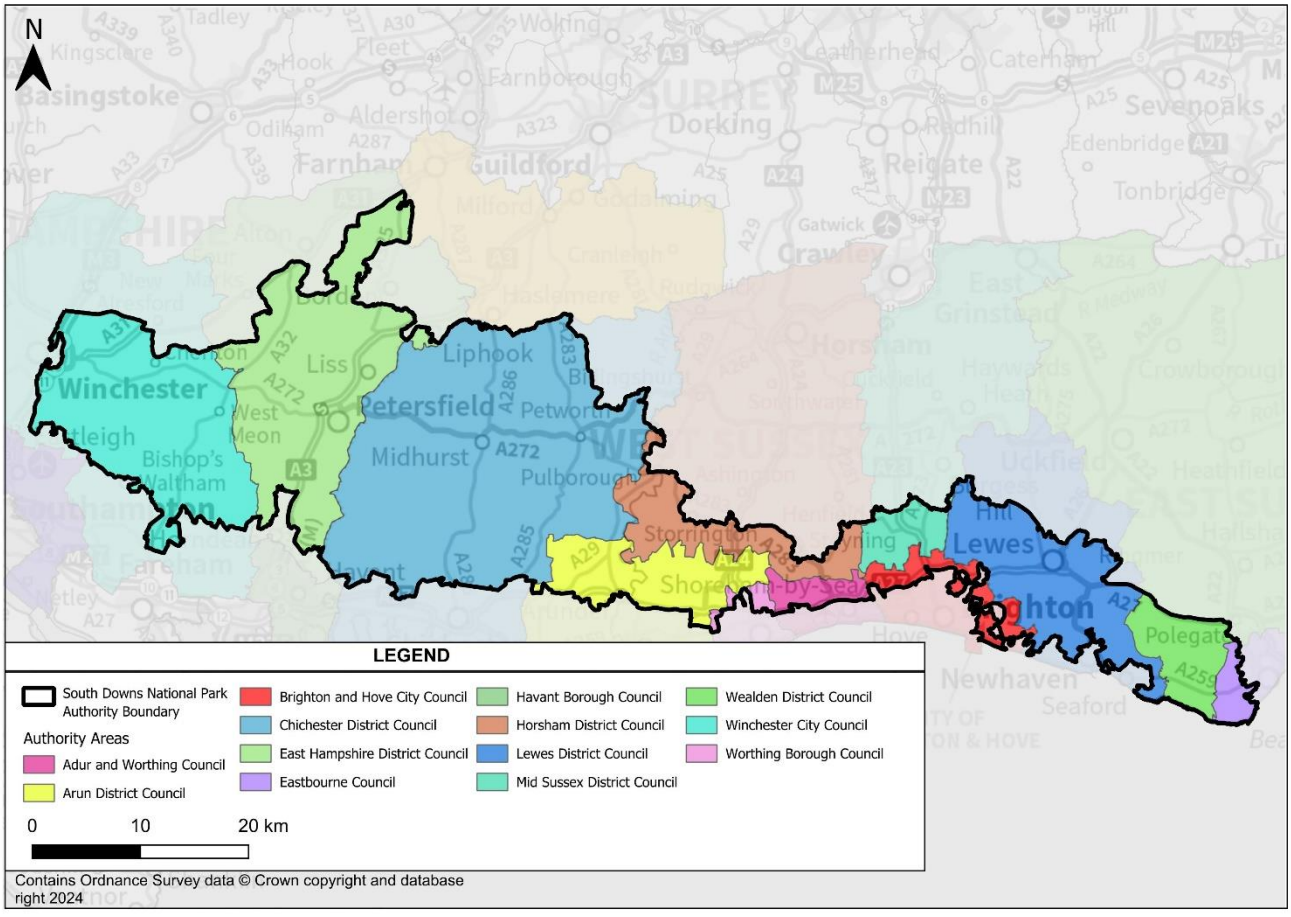


Figure 2-2 Neighbouring districts for the SDNPA

2.3 Topography

The topography of the National Park varies with the highest elevation being 279mAOD (near Fenhurst), to flat, low-lying areas close to the river courses with the lowest elevation occurring at 1.15mAOD (in between North Lancing and Shoreham By-Sea). The park has coastal area there four main instances of flat lands to the south and southeast, where the higher terrain is predominantly to the north and north west.

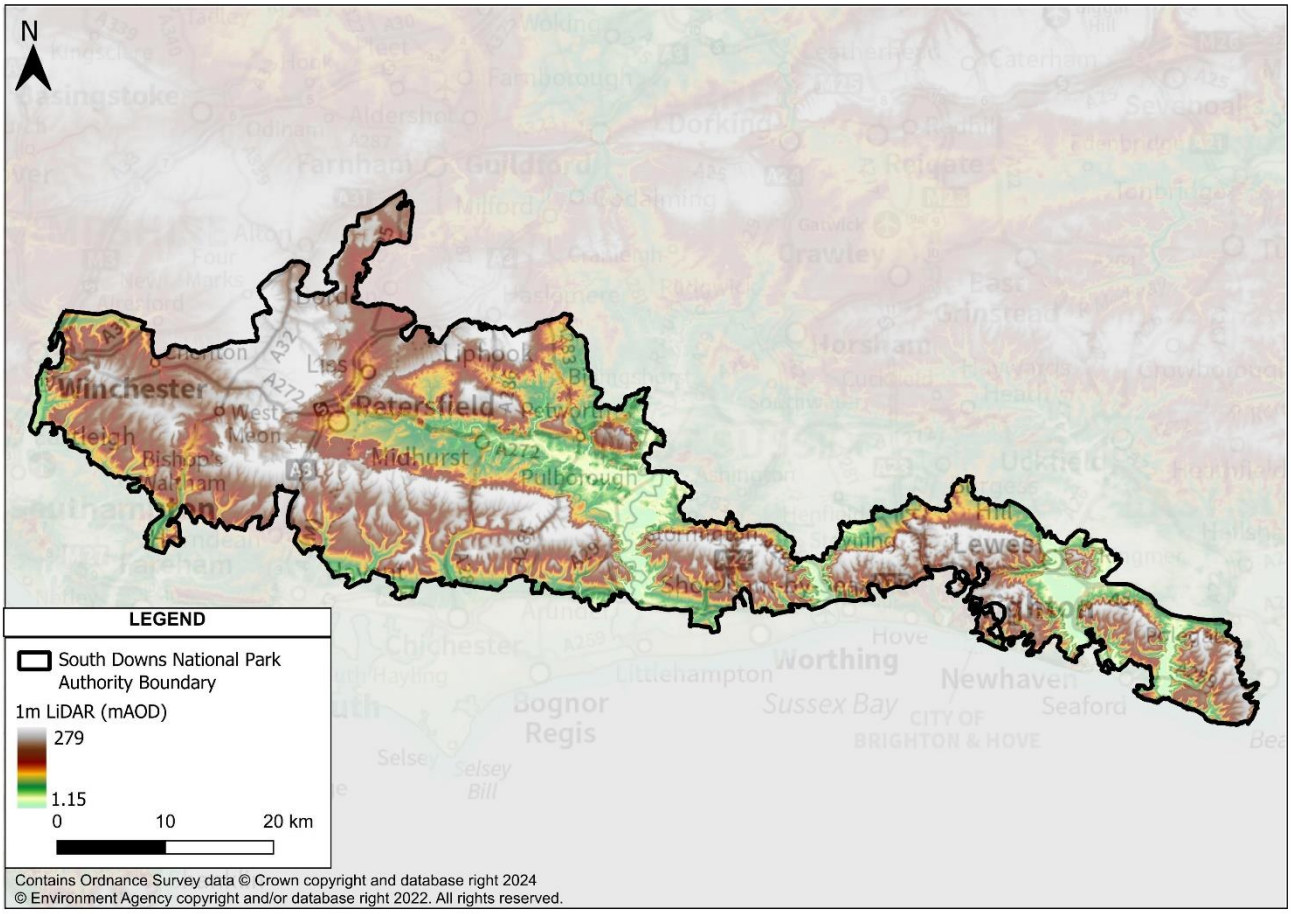


Figure 2-3 LiDAR topography of the SDNPA boundary and surrounding areas

2.4 Geology

British Geological Survey (BGS) data has been used to understand the geological characteristics of the study area The bedrock of the SDNPA area (Figure 2-4) is predominantly comprised of the White Chalk Subgroup underlying the southern extent of the SDNPA area. Within the centre and northern extent of the study area, the geology varies and comprises the Grey Chalk Subgroup, characterised as chalk, the Gault Formation and Upper Greensand Formation comprised of mudstone, siltstone and sandstone, the Lower Greensand Group comprising sandstone and mudstone and the Wealden Group comprising sandstone and siltstone.

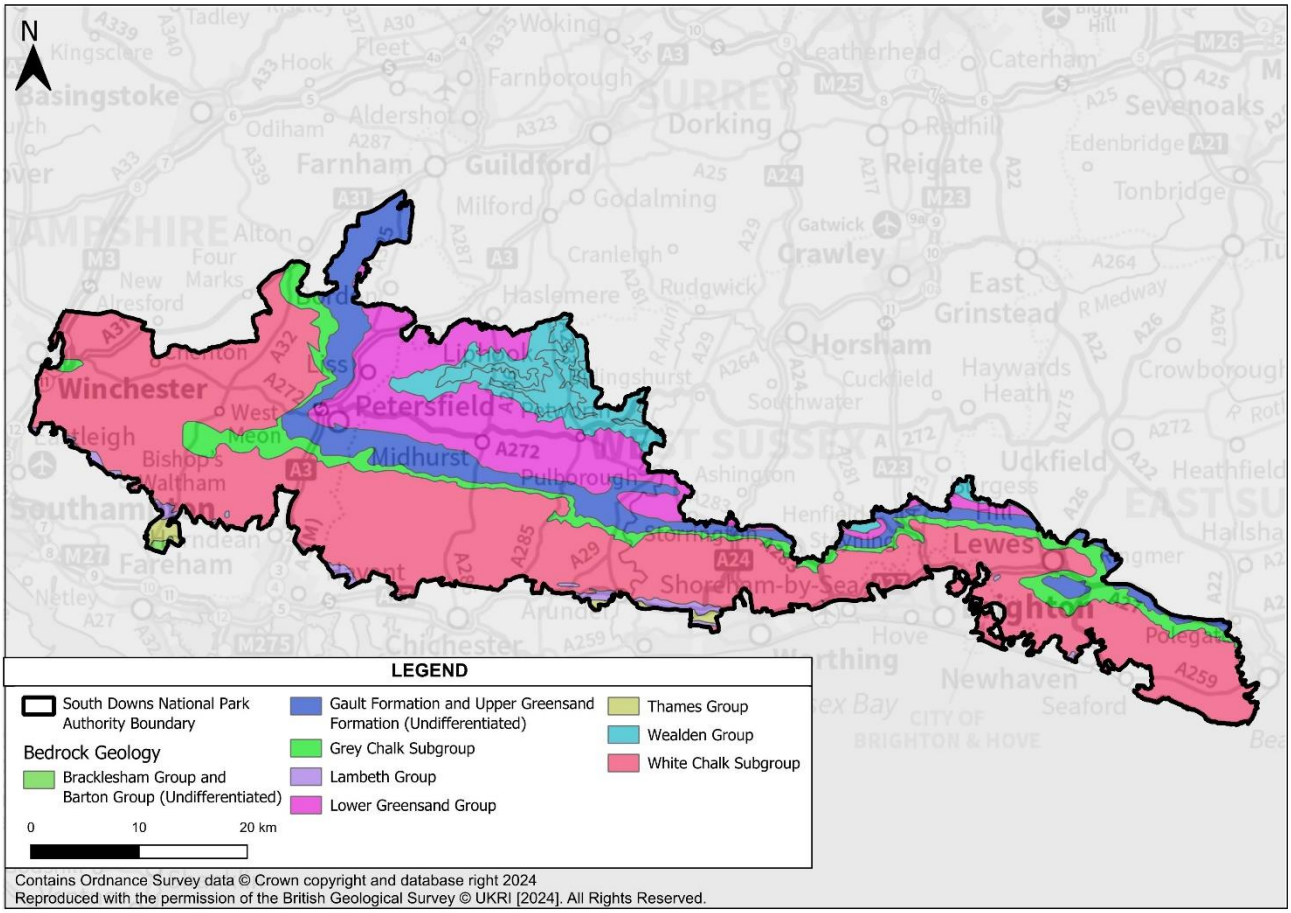


Figure 2-4 Bedrock geology

The superficial geology (Figure 2-5) is younger geological deposits that were formed during the Quaternary Period (2.6 ma) that rests upon the underlying bedrock. The SDNPA area has some superficial geology that consists of five main types, where the two predominant lithologies are alluvium and clay with flints. These are commonly associated with existing watercourses.

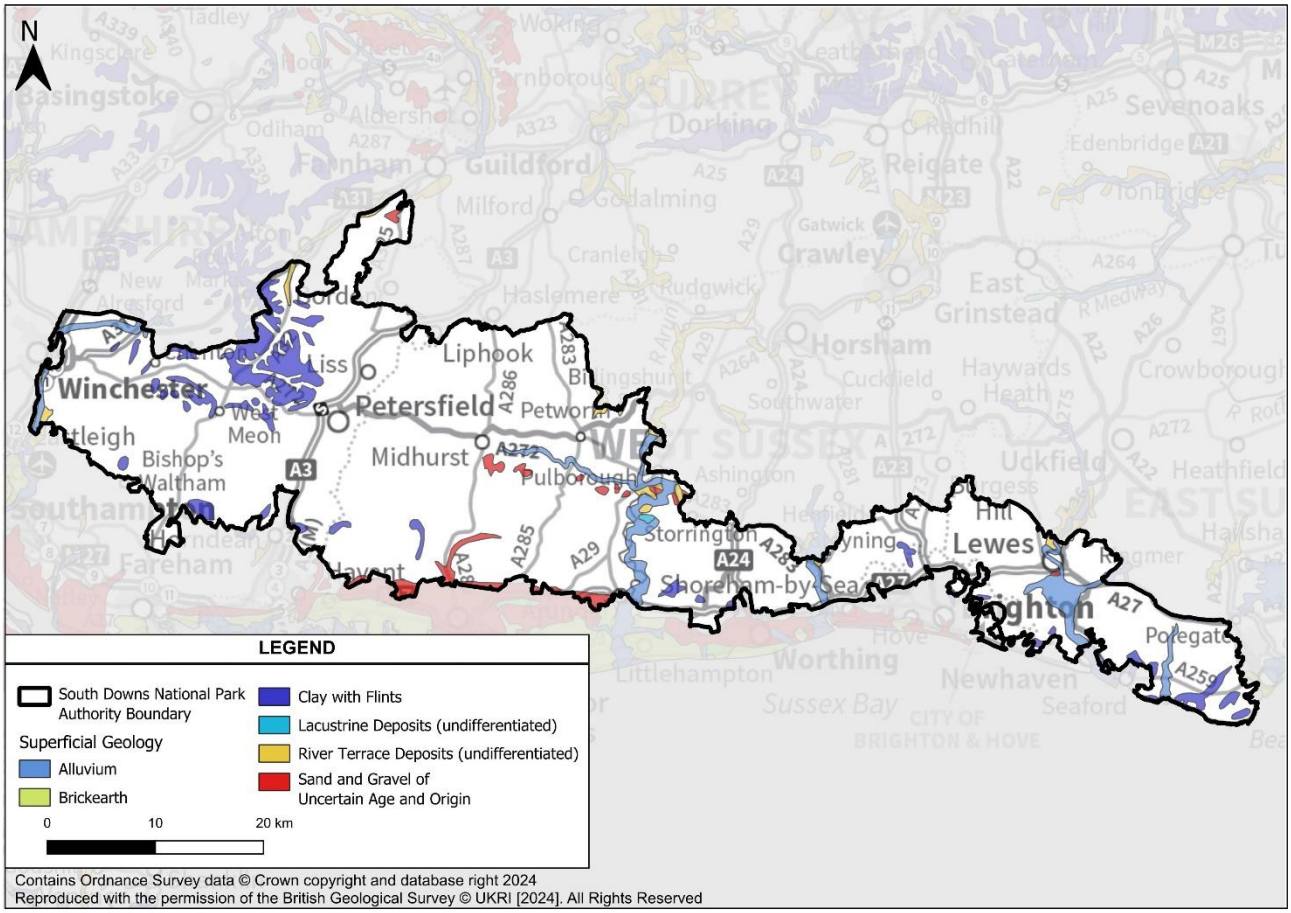


Figure 2-5 Superficial Deposits

2.5 Hydrogeology

Several aquifers underly the study area. Aquifers are defined as layers of rock (which are predominantly permeable) or poorly consolidated material (sand, gravel, silt, etc.) which can store and transport large quantities of water. Understanding the behaviour and location of aquifers is important as they can provide an indication of the potential for groundwater flooding.

The aquifer designation dataset has been created by the Environment Agency and the BGS and classifies aquifers of England and Wales. The maps are split into two different types of aquifer designations:

- superficial: permeable, unconsolidated (loose) deposits, e.g. sands and gravels
- bedrock: solid, permeable formations, e.g. sandstone, chalk and limestone

The White Chalk Subgroup and Lower Greensand Group bedrocks underlie the majority of the study area, as shown in Figure 2-6, are described by the Environment Agency as being Principal Aquifers. The Environment Agency describes Principal Aquifers as:

'layers of rock or drift deposits that have a high intergranular and / or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and / or river base flow on a strategic scale'.

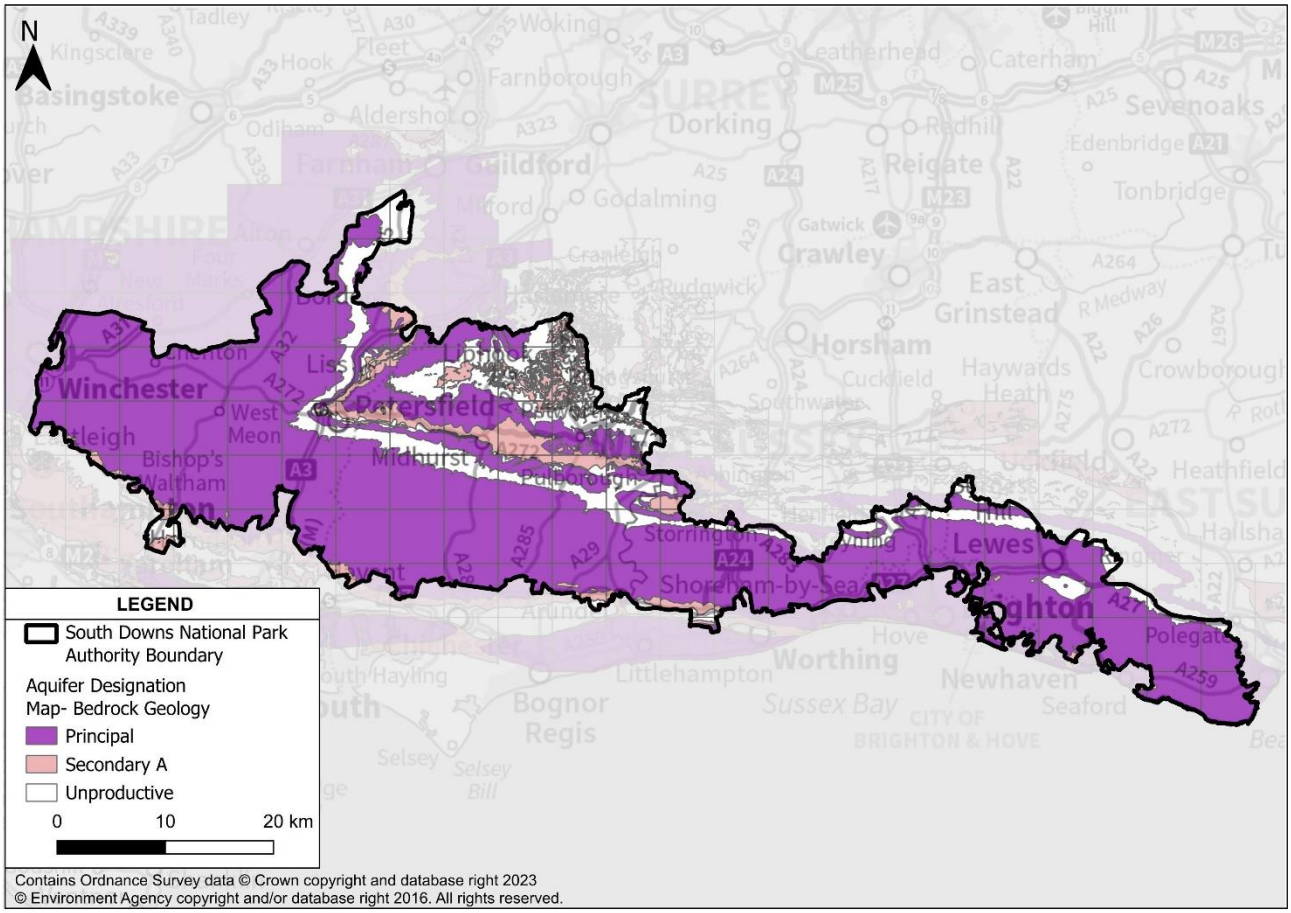


Figure 2-6 Bedrock Aquifers

The chalk is a significant source of potable water in the South East and it estimated that 400,000 people rely on the Brighton Chalk aquifer for drinking water[1].

2.6 Soils

The composition of soils can impact the risk of flooding by affecting the rates water is able to drain and the potential rate of runoff towards a watercourse. The Cranfield Soilscapes tool can be used to identify the different soil types in the SDNPA area. Given size of the South Downs National Park soil types are variable across the authority area and therefore the risk of flooding will be localised.

2.7 Watercourses

The largest Environment Agency Main Rivers whose source lies within the study area are:

- River Rother
- River Meon
- River Itchen
- River Lavant

1 https://wearetap.org.uk/

- River Adur
- River Arun
- River Ouse
- Cuckmere River

These rivers generally flow in a southerly direction through the study area towards the coastline with the exception of the River Rother which flows in an easterly direction towards its confluence with the River Arun.

The sources of the River Arun, River Adur, River Ouse and Cuckmere River are located outside of the study area. These rivers flow south through the SDNPA area and are tidally influenced for part of their extent in the SDNPA area.

Mapping indicating the location of the Main Rivers and Ordinary Watercourses can be found in Figure 2-7.

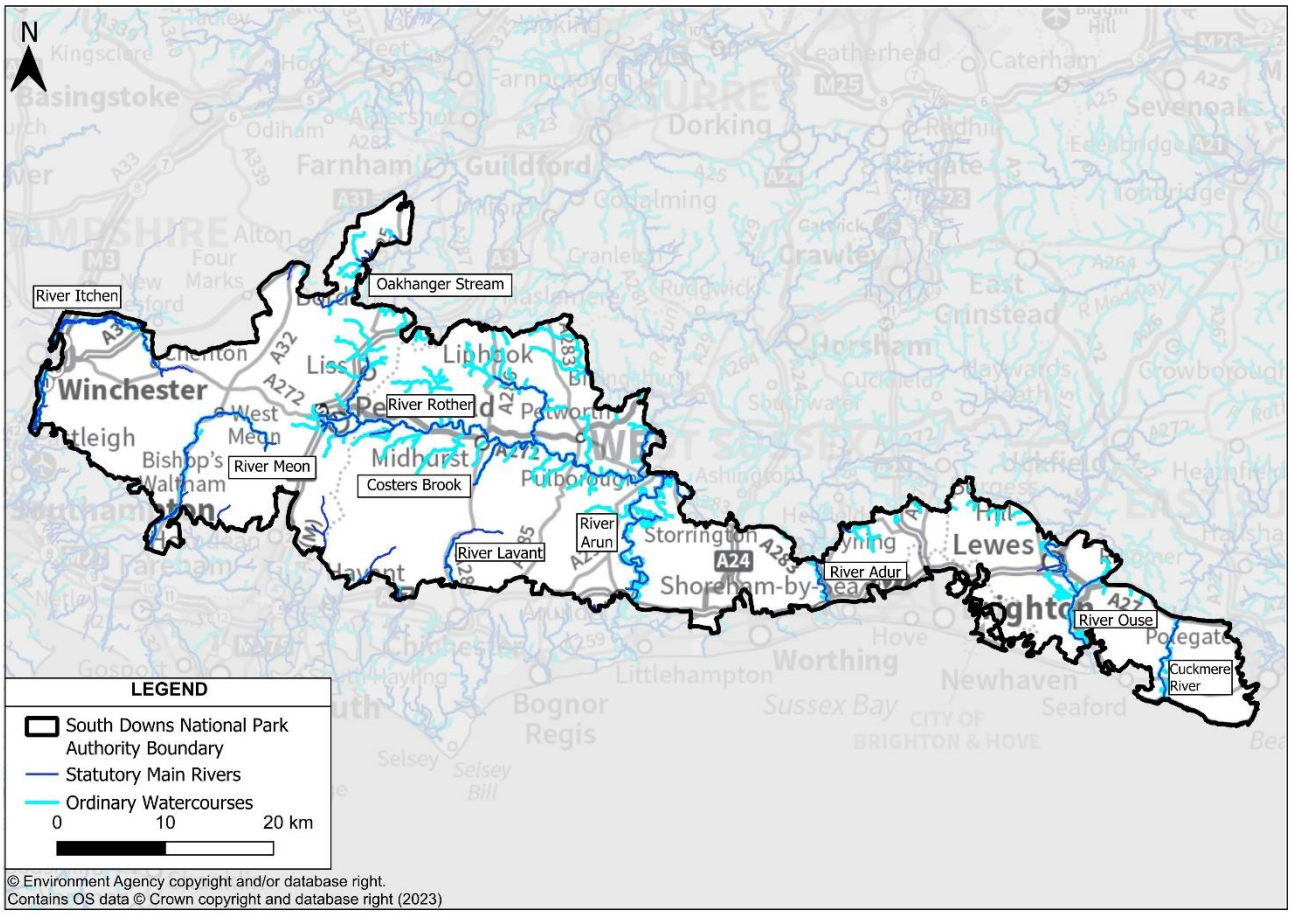


Figure 2-7 Statutory main rivers

3 Flood Risk Policy and Strategy

3.1 Roles and responsibilities for managing flood risk in the South Downs

There are several different Risk Management Authorities (RMAs) within the SDNPA area that have responsibilities for flood risk management. These are displayed in Table 3-1, alongside a summary of their responsibilities.

It is important to note that land and property owners are responsible for the maintenance of watercourses either on or next to their properties (referred to as riparian owners). Property owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/ banks, controlling invasive species and allowing the flow of water to pass without obstruction. More information can be found in the Environment Agency publication 'Owning a Watercourse' (2018).

When undertaking works to reduce flood risk, the Environment Agency and respective Lead Local Flood Authorities (LLFAs) have permissive powers.

Lead Local Flood Authorities (unitary authorities or county councils) are responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets. They also have lead responsibility for managing the risk of flooding from surface water, groundwater and ordinary watercourses.

However, limited resources and funding result in interventions being targeted to where they will deliver the greatest benefit. Permissive powers mean that RMAs are permitted to undertake works but are not obliged to take any action.

Table 3-1 Roles and responsibilities for Risk Management Authorities within the SDNPA's area

Risk Management Authority	Policy and strategy	Flood risk responsibilities	Planning role
Environment Agency	Strategic overview for all sources of flooding National Strategy Reporting and general supervision	Main rivers Coastal flooding Asset management Incident response	Statutory consultee in Flood Zone 3 and for some categories of development located solely in Flood Zone 2 (Essential infrastructure, Highly vulnerable, landfill and hazardous was facilities, camping and caravanning sites, agriculture and forestry, waste treatment and water and sewage treatment works).
Hampshire Country Council (LLFA) East Sussex County Council (LLFA) West Sussex Country Council (LLFA) Brighton and Hove City Council (LLFA)	Local Flood Risk Management Strategy	Surface Water Groundwater Ordinary Watercourses (consenting, enforcement and works) Flood Investigations Preparation of asset registers	Statutory consultee for major developments
South Downs National Park Authority (LPA)	Local Plan Partnership Management Plan	Managing open spaces under Authority ownership	Determination of planning applications
Arun District Council	Shoreline Management Plans	Coastal erosion risk management	

Risk Management Authority	Policy and strategy	Flood risk responsibilities	Planning role
Brighton and Hove City Council Worthing Borough Council as the Coastal Protection authorities (CPA)			
Highway Authorities National Highways (motorways and trunk roads) County Council and Unitary Councils	Highway drainage policy and planning	Highway drainage	Planning consultee for highways design standards and adoptions
Thames Water and Southern Water	Asset Management Plans Drainage and Wastewater management plans	Public sewers Reservoir management	Non-statutory consultee
Districts and Boroughs in the SDNPA area.		Permissive powers to carry out flood risk management works on ordinary watercourses	Planning consultee for drainage

3.2 Key legislation for flood and water management

3.2.1 Flood and Water Management Act (2010)

The Flood and Water Management Act (FWMA) was enacted in April 2010. It aims to improve both flood risk management and the way we manage our water resources. The Act also sets out the aim of requiring all flood and coastal erosion risk management authorities to contribute to the shared goal of sustainable development when managing their local flood issues.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for Local Authorities, as Lead Local Flood Authorities (LLFA), designed to manage local flood risk

(from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

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

The UK Government has stated its intention to enact Schedule 3 of the Flood and Water Management Act, although the timeframe for doing so is unclear. Further information is provided in Section 10.3.

3.2.2 The Land Drainage Act (1991)

This act is responsible for setting out the functions and powers of boards and local authorities in terms of land drainage, as outlined by Sections 23 through 25 of the Act, relating to the control of the flow of watercourses. In the study area, the 'drainage board' is considered to be the Internal Drainage Board where one exists, or the LLFA in other areas.

- Under Section 23, permission is required from the drainage board for the construction of weirs, dams and other like structures.
- Section 24 gives the drainage board permissive powers to serve notice where such structures are constructed or altered without permission.
- Section 25 gives the drainage board permissive power to serve notice for works to maintain the flow of a watercourse. It also gives the drainage board the power to carry out the works and recover expenses from the landowner or occupier.

3.2.3 Town and Country Planning Act (1990)

In most cases, planning permission is required to facilitate new development. This is dependent on the work taking place matching the criteria of development as set out in the Town and Country Planning Act (1990).

The Town and Country Planning Act (1990) regulates the development of land in England and Wales and states the policies and general proposals for land use and development. The act defines 'development' as the "carrying out of building, engineering, mining or any other form of operation above or below the land surface, in addition to the material change in the use of existing buildings or land".

The main legislation that sets out the process for the preparation of Local Plans can be found in Part 2 of the Planning and Compulsory Purchase Act 2004 as amended and The Town and Country Planning (Local Planning) (England) Regulations 2012 as amended.

The main legislation that sets out the neighbourhood planning system can be found in the Localism Act 2011 and The Neighbourhood Planning (General) Regulations 2012. The Localism Act 2011 amended existing planning legislation to introduce neighbourhood

planning. More information can be found within the UK Government's Plain English guide to the Planning System.

3.2.4 Water Industry Act (1991)

This act consolidates legislation previously set out by the Water Act (1989), relating to the water supply and the provision of wastewater services in England and Wales. It sets out the main powers and duties of the water and sewerage companies.

3.2.5 Environmental Permitting Regulations (2018)

This act aims to encourage developers to achieve targets in compliance with environmental regulations. This is primarily achieved through the supplying of permits. A Flood Risk Activity Permit must be acquired from the Environment Agency for any activities which will take place:

- On or within 8 metres of a main river (16 metres if tidal);
- On or within 8 metres of a flood defence structure or culvert (16 metres if tidal);
- On or within 16 metres of a sea defence;
- Involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert; and/or
- In a floodplain more than 8 metres from the river bank, culvert or flood defence structure (16 metres if it is a tidal main river) and you do not already have planning permission.

These regulations must be followed to undertake project work on or in the vicinity of a main river unless the criteria set out by the regulation to be exempt from the legislation are met. The list of permit exemptions include but are not limited to:

- Construction of a footbridge across a main river of <8m in length
- Temporary scaffolding construction over a main river for no longer than 4 weeks
- Repair and reconstruction of bank erosion utilising eroded material
- Removal of fluvial deposits (silt & sand) from arches/culverts
- Maintenance of a raised river/sea defence

The UK Government provides further guidance on environmental permits for flood risk activities.

3.2.6 The Water Environment Regulations (2017)

The Water Environment Regulations (2017) transposed the Water Framework Directive (WFD) into English law. The purpose of the WFD, is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP).

These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches and maintains 'good' status. For watercourses located in England, the

Environment Agency is responsible for the prevention of deterioration of surface and groundwater sources from a status of 'good'.

3.2.7 Environment Act (2021)

The Environment Act 2021 consolidates the UK's plans for maintaining and improving the natural environment following Britain's exit from the European Union (EU).

Part 5 of the Act relates to Water, and supports previous regulation of water companies, in addition to land drainage, set out by the Land Drainage Act 1991, with the addition of valuation calculations of the land.

Each sewerage undertaker must prepare, publish and maintain an annually revised drainage and sewerage plan, to determine how the drainage and sewer systems will be maintained. These plans should address the potential environmental risks posed to the drainage systems, in addition to the measures intended to be completed by the undertaker, as part of efforts to mitigate the issues.

The duties of the undertaker are enforced by the Secretary of State, granting them powers to direct water companies in the processes set out in the undertakers' drainage and sewerage plan.

3.3 Key policies and strategies

3.3.1 The National Flood and Coastal Erosion Risk Management Strategy for England (2020)

The National Flood and Coastal Erosion Risk Management Strategy (NFCERMS) for England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The Strategy looks ahead to 2100 and the action needed to address the challenge of climate change.

The Strategy has been split into 3 high level ambitions:

- climate resilient places;
- today's growth and infrastructure resilient in tomorrow's climate; and
- a nation ready to respond and adapt to flooding and coastal change.

The Strategy was published alongside a National Policy Statement for Flood and Coastal Erosion Risk Management. The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country into the future:

1. Upgrading and expanding flood defences and infrastructure across the country,
2. Managing the flow of water to both reduce flood risk and manage drought,
3. Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. Better preparing communities for when flooding and erosion does occur, and

5. Ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

The Flood and Coastal Erosion Risk Management Strategy Roadmap to 2026 published in 2022 describes how the strategy, its objectives and measures will be translated into practical action over the next 4 years.

3.3.2 River Basin Management Plans (RBMP)

The SDNPA area falls into the catchment of two River Basin Management Plans (RBMP).

The Environment Agency's South East Basin District River Basin Management Plan and Thames River Basin District River Basin Management Plan were originally published in October 2022, and last updated in December 2022.

The RBMP's provides information on the following:

- Current state of the water environment.
- Pressures affecting the water environment.
- Environmental objectives for protecting and improving water.
- A programme of planned measures, alongside actions to achieve the objectives related to these measures.

3.3.3 Catchment Flood Management Plans (CFMP)

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

There are six pre-defined national policies provided in the CFMP guidance and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to cover the full range of long-term flood risk management options that can be applied to different locations in the catchment. The six national policies are:

- No active intervention (including flood warning and maintenance). Continue to monitor and advise.
- Reducing existing flood risk management actions (accepting that flood risk will increase over time).
- Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
- Take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change).
- Take action to reduce flood risk (now and/or in the future)

- Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

The study area encompasses multiple CFMPs, predominantly for the main statutory rivers mentioned in Section 2.7, where the Primary policies that include the South Down National Park are:

- River Adur CMPF
- River Arun and Western Streams CMPF -Sub section 5
- Cuckmere and Sussex Havens CMPF – Sub Section 9
- South East Hampshire CMPF
- Ouse CMPF
- Test and Itchen CMPF
- Rother and Romney CMPF

3.3.4 Local Flood Risk Management Strategies

LLFAs are required to prepare a Local Flood Risk Management Strategy (LFRMS) as a statutory requirement of the Flood and Water Management Act 2010. These strategies aim to highlight flood risk, sources of potential flooding, potential solutions and possible issues regarding them, the strategy being implemented, and related advice, such as that for drainage.

Within the SDNPA boundary, the following LFRMS can be found:

- East Sussex Local Flood Risk Management Strategy
- West Sussex Local Flood Risk Management Strategy 2013 - 2018,
- Hampshire Local Flood and Water Management Strategy
- Brighton and Hove Local Flood Risk Management Strategy

3.3.5 Drainage and Wastewater Management Plans

As the 2021 Environment Act requires, Drainage and Wastewater Management Plans (DWMPs) are strategic documents sewerage undertakers produce. They consider current and future sewerage capacity, sewerage pressures, and risks to sewerage networks, including climate change and population groups. Thames Water and Southern Water published DWMPs in 2023 and can be found:

- Thames Water Drainage and Wastewater Management Plan
- Southern Water Drainage and Wastewater Management Plan

3.3.6 Surface Water Management Plans

A Surface Water Management Plan (SWMP) is a study to understand the flood risks that arise from local flooding, defined by the Flood and Water Management Act 2010 as flooding from the risk of surface runoff, groundwater, and ordinary watercourses. SWMPs are led by

a partnership of flood risk management authorities responsible for aspects of local flooding, including the LLFAs, Local Authority, Sewerage Undertaker and other relevant authorities. A SWMP aims to identify the local flood risk issues, what options there may be to prevent them or the damage they cause, and who should take these options forward. This is then presented in an Action Plan that the stakeholders and partners agree on.

Within the SDNPA boundary, the following SWMPs can be found:.

- Hampshire County Council utilises catchment-specific approaches with SWMPs, which can be accessed on their Catchment Approach to Flood Risk webpage
- East Sussex County Council's SWMPs
- West Sussex County Council's SWMPs
- Brighton and Hove City Council's SWMPs

The SWMPS should identify Critical Drainage Areas and recommend measures to address issues. The outcomes and actions from these SWMPs should be considered in the context of development proposals within the SDNPA area.

3.3.7 Groundwater Management Plans

Hampshire County Council has prepared a Groundwater Management Plan (GWMP) for its county, which can be found here. A GWMP differs from a SWMP as it specifically addresses groundwater flooding across the entire county, with a focus in groundwater flooding in the central Hampshire chalk catchments. The GWMP builds on work undertaken on the LFRMS for Hampshire.

Within the following GWMP action plans for settlements within the SDNPA area can be found:

- Finchdean and Deanlane End Settlement specific action plan
- Hambledon Settlement specific action plan
- West Meon Settlement specific action plan

4 Planning Policy for Flood Risk Management

4.1 National Planning Policy Framework and Guidance

The National Planning Policy Framework (NPPF) was first published in March 2012 and last updated in December 2023. The NPPF details the UK Government's planning policies for England. The NPPF must be taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF (paragraph 166) states that:

"Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."

The Planning Practice Guidance (PPG) for Flood Risk and Coastal Change was first published in March 2014 and last updated in August 2022. The guidance sets out how the policy should be implemented. Diagram 1 of the PPG sets out how flood risk should be considered in the preparation of Local Plans.

4.2 The sequential risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas. Since July 2021 the approach has modified the requirement for carrying out the Sequential Test (as defined in Paragraph 167 of the NPPF) so that all sources of flood risk are now considered, both now and in the future.

At the time of preparation of the 2024 SFRA, the PPG describes a revised approach to carrying out the Sequential Test. The requirement for the revised Sequential Test has been addressed by adopting the following approach:

- The test will cease to be based solely on the use of the Flood Zones describing river and sea flood risk and instead be based on whether development can be located in the future.
- The understanding of flood risk to sites will be based on the incompatibility of the posed risk and the vulnerability of the proposed use, as opposed to whether development is defined as "appropriate".
- It is important that the potential implications of all sources of flooding are assessed in performing the Sequential Test. The potential impact of fluvial, tidal, surface water, reservoir, groundwater and sewer flood risk should beaddressed during the process of finalising the selection of allocated sites (using the best available mapping as can appropriately be used in an assessment of comparative risk).

The suitability of the available mapping for each flood risk source may vary and may not allow a comparable assessment of risk. Therefore a more detailed assessment for some sources of flood risk may be required. Flood risk sources include reservoir, sewer, and groundwater.

- Using the available data to complete the Sequential Test, all sources of flood risk can be considered. Decisions on the selection of preferred sites for allocation should consider the ways to address the potential implications of groundwater, reservoir, and sewer flooding and, where necessary, identify sites where consideration should be given to satisfying the requirements of the Exception Test.

4.2.1 Flood Zones

The August 2022 update of the PPG modified the previous definition of Flood Zone 3b (the functional floodplain). Table 4-1 outlines the definition of Flood Zones in the PPG as are now set out.

Table 4-1 Definition of the Flood Zones as per the Planning Practice Guidance

Flood Zone	Definition
Zone 1 – Low probability	Land having a less than 0.1% annual probability of river or sea flooding.
Zone 2 – Medium probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.
Zone 3a – High probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea.
Zone 3b – The functional floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise of: land having a 3.3% or greater annual probability of flooding, 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). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

Important note on Flood Zone information in this SFRA

The SFRA Flood Zone maps for the study area are provided in Appendix A- Maps.

Flood Zones 2 and 3a within this SFRA are derived from the same extent as the online EA's Flood Map for Planning (FMfP) Flood Zones 2 and 3, which incorporates the latest modelled data and is considered the 'best available data'. However, this SFRA has used detailed hydraulic model outputs to identify the extent of Flood Zone 3b where data is available and has considered a precautionary approach in other areas.

The EA Flood Zones do not cover all catchments or ordinary watercourses with areas <3km^2. As a result, whilst the EA Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from a smaller watercourse(s) not shown in the Flood Zones.

Flood defences should be considered when delineating the functional floodplain. The 3.3% AEP defended modelled flood extents have been used to represent Flood Zone 3b, where available from the EA. Further details on the specific model extents used are provided in Appendix B. There are no EA designated Flood Storage Areas within the SDNPA area.

For areas outside of the detailed model coverage, Flood Zone 3a has been used as a conservative proxy for Flood Zone 3b. Further work should be undertaken as part of a detailed site-specific FRA to define and refine the extent of Flood Zone 3b where no detailed modelling exists. Caution should also be applied where the conservative Flood Zone 3b extent encompasses existing urban areas which would not otherwise be "designed to flood". Proposed major development within the urban FZ3b should be accompanied by a full Flood Risk Assessment backed up with site specific hydraulic modelling.

4.2.2 The Sequential Test

Firstly, land at the lowest risk of flooding from all sources, should be considered for development i.e. land in Flood Zone 1 with no surface water or other sources of flood risk. In line with the NPPF, the impacts of climate change over the development's lifetime should be considered when considering actual and residual flood risk. A test called the 'Sequential Test' is applied to ensure that land at the lowest risk of flooding is considered first.

The LPA will apply the Sequential Test to determine their spatial strategy and potential site allocations as well as any strategic allocations within their Local Plan. For all other developments, in Flood Zones 2 and 3 (or in Flood Zone 1 on land with other flooding/drainage issues), developers must supply evidence to the LPA, with a Planning Application, that the development has passed the Sequential Test.

This SFRA has considered the July 2021 NPPF changes to the Sequential Test, which require a sequential approach for all sources of flood risk.

Figure 4-1 describes how the guidance recommends the Sequential Test should be applied when preparing a Local Plan preparation as is shown in Diagram 2 of the PPG.

This stepwise process should be documented, and evidence used to support decisions recorded. The guidance recommends that the process be coordinated with the preparation of the Sustainability Appraisal.

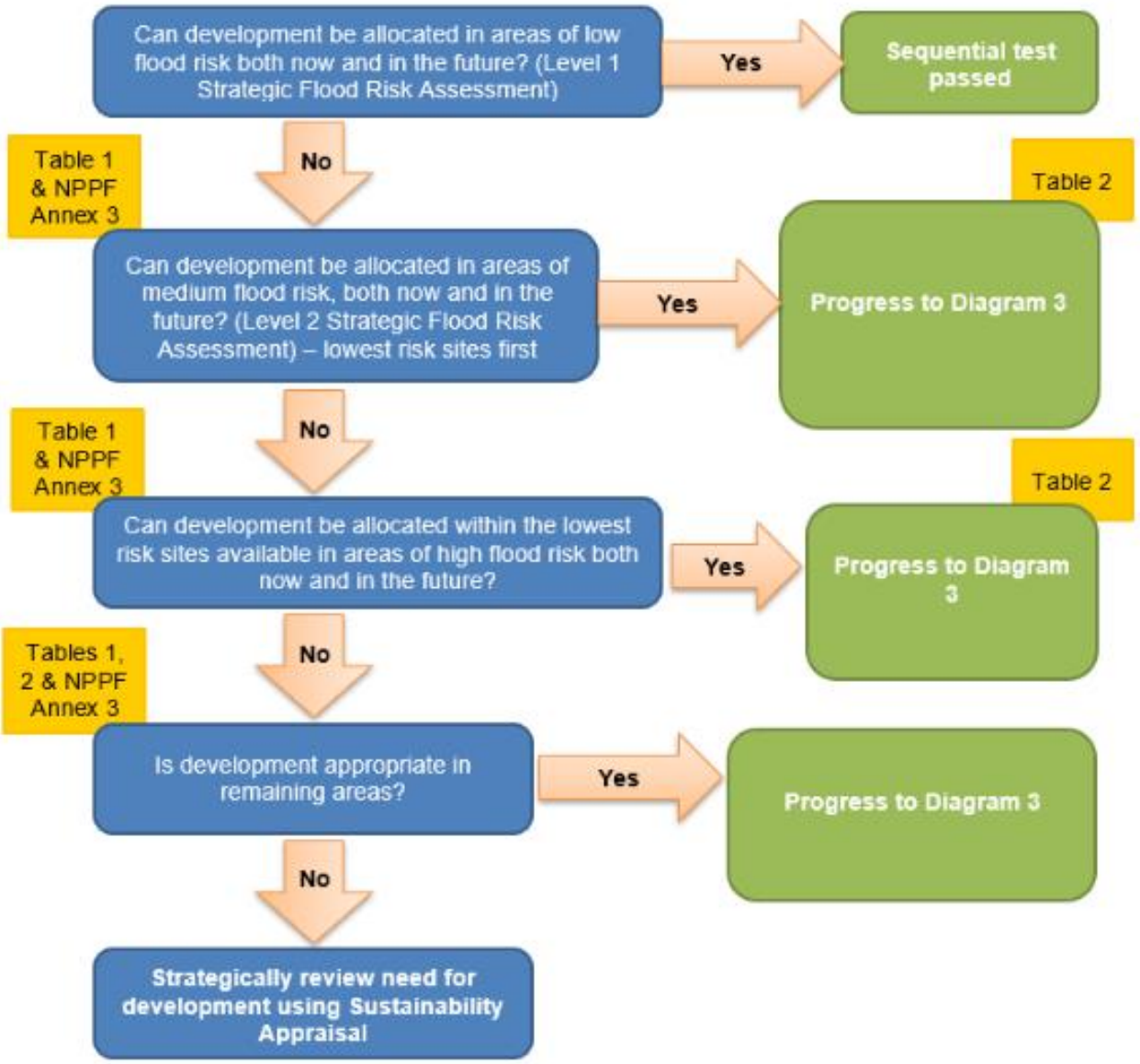


Figure 4-1 Application of the Sequential Test for plan preparation

4.2.3 The Exception Test

In circumstances where allocated development is at locations affected by flood risk, a greater understanding of the scale and nature of the flood risks is required to understand that the principle of development can be supported. In these instances, the requirements of the Exception Test should be addressed.

The Exception Test should only be applied following the application of the Sequential Test.

Figure 4-2 summarises the Exception Test and how it should be performed, as also described in Diagram 3 of the PPG. SDNPA as the LPA should apply the Exception Test to strategic allocations where appropriate. Where appropriate, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test.

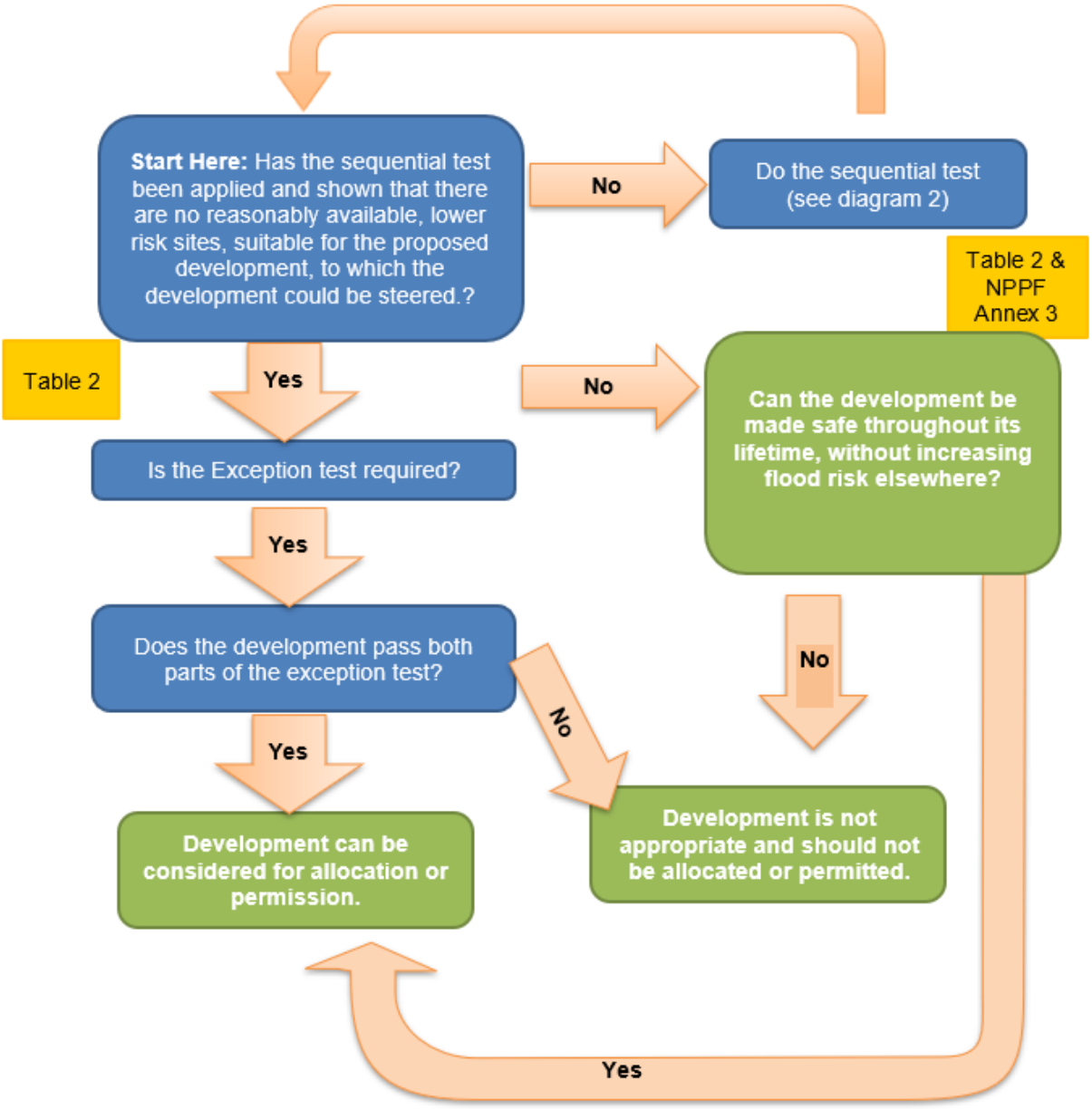


Figure 4-2 Application of the Exception Test for plan preparation

There are two parts to demonstrating a development passes the Exception Test:

1. *Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.*

Local planning authorities should consider what criteria will be used to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed.

2. *Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

A Level 2 SFRA is likely to be needed to address the requirements of the Exception Test in the local plan. At the Planning Application stage, a site-specific Flood Risk assessment will be needed. Both would need to consider the actual and residual flood risk from all sources and how this will be managed over the development's lifetime.

4.3 Applying the Sequential Test and Exception Test to individual planning applications

4.3.1 The Sequential Test

The SDNPA, taking account of views from other relevant parties, is responsible for considering whether the Sequential Test has been passed.

When appropriate, developers are required to apply the Sequential Test to development sites unless the site is either:

- a strategic allocation and the test has already been carried out by the LPA
- a change of use (except to a caravan, camping or chalet site, or to a mobile home or park home site)
- a minor development (householder development, small non-residential extensions with a footprint of less than 250m^2); or
- a development in Flood Zone 1 unless there are other flooding issues in the area of the development (e.g., surface water, groundwater, sewer flooding).

The SFRA contains information on all sources of flooding and takes into account the impact of climate change. This should be considered when a developer is preparing the Sequential Test, including the consideration of reasonably available sites at lower flood risk now and in the future, but more detailed site-specific information should also be prepared where appropriate.

The SDNPA, as the LPA, must use local knowledge to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites, this may be clear, e.g., school catchments; in other cases, it may be identified by other Local Plan policies. For some sites e.g., regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include:

- Site allocations in Local Plans
- Sites with Planning Permission but not yet built out
- Housing and Economic Land Availability Assessments (HELAAs)/ five-year land supply/ annual monitoring reports
- Locally listed sites for sale

It may be that several smaller sites or part of a larger site at lower flood risk form a suitable alternative to a development site at high flood risk.

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternative sites.

The SFRA User Guide to using technical data in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

4.3.2 The Exception Test

If, following the application of the Sequential Test, it is not possible for the development to be located in areas with a lower probability of flooding, the Exception Test must then be applied if required (as set out in Diagram 3 of the PPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations).

The applicant will need to provide information that the application can pass both parts of the Exception Test:

- *Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk using a method agreed with the SDNPA*
- *Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

The site-specific Flood Risk Assessment should demonstrate that the site will be safe and that the people will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:

  - the design, operation and maintenance of any flood defence infrastructure.
  - access and egress.
  - design of the development to manage and reduce flood risk wherever possible;
  - resident awareness;
  - flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and

- any funding arrangements required for implementing measures.

4.4 Cumulative impacts

When allocating land for development, consideration must be given to the potential cumulative impact of development on flood risk. The increase in impermeable surfaces and the resulting rise in runoff increases the chances of surface water flooding if suitable mitigation measures, such as SuDS, are not put in place. Additionally, the increase in runoff may result in additional flows entering watercourses, increasing the risk of fluvial flooding at locations further downstream that are potentially sensitive to increases in the volume or flow of flood water.

Consideration must also be given to the potential cumulative impact of the loss of floodplain as a result of development. The effect of the loss of floodplain storage should be assessed at both the development and elsewhere within the catchment and, if required, the scale and scope of appropriate mitigation should be identified.

Whilst the increase in runoff or loss in floodplain storage from individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe without appropriate mitigation. Any proposed floodplain compensation should be on a level for level volume for volume basis. Proposed mitigation must be hydraulically and hydrologically connected to the floodplain.

For windfall sites which have not yet been allocated, the NPPF requires that the cumulative impact of development should be considered at the application stage and the appropriate mitigation measures undertaken to ensure flood risk is not exacerbated. Where possible the development should also be used to improve the flood risk. The Cumulative Impact Assessment (CIA) for this SFRA is available as Appendix E.

4.5 Cross boundary considerations

Situations may occur where a development site is situated across Local Authority boundaries or where the development in one district or borough may impact flood risk elsewhere. The SDNPA should consider the impacts of development on flood risk elsewhere, even if the impact is not within their area. In situations where cross-boundary developments are proposed, the SDNPA should work closely with other Local Planning Authorities to satisfy the requirements of policies in their respective Local Plans and in consultation with statutory consultees such as the Environment Agency and LLFAs.

5 Understanding Flood Risk in the South Downs National Park

The following sections outline the risk of flooding to the SDNPA area from all sources.

5.1 Historic flooding

The historic flood risk has been assessed using information on recorded incidents provided by Hampshire County Council and East Sussex County Council, the Environment Agency's recorded flood outline dataset and Thames Water and Southern Water's recorded sewer flooding incidents, the LFRMS, and flood investigation reports.

Where the source of the flood risk has been identified, the location and details of the historic flood incidents have been identified in the corresponding flood risk source section below. These have only been noted for settlements and not for smaller areas outside of settlements. There are a large number of incidents where the source of flooding is unknown; therefore, these have not been discussed in the section below.

For all the other datasets provided in GIS format, these incidents have been displayed in the corresponding mapping in Appendix A.

5.2 Fluvial flood risk

One of the main sources of flooding across the SDNPA area is fluvial flooding. This often occurs concurrently with surface water and sewer flooding as a response to extreme rainfall events and constrictions within the drainage systems.

A proportion of the SDNPA area is in areas that have a 'medium' and 'high' probability of flooding from rivers (Flood Zones 2 and 3), as shown in Appendix A.

Flood risk management measures (defences) are in place within the SDNPA area, which act to reduce the risk of flooding. Certain types of defences potentially inhibit the function of the river floodplain, as during flood events, they can prevent water from being stored on the land adjacent to the river channel. This may be particularly important when considering the functional floodplain (Flood Zone 3b) for development, but the presence of such defences could also be evidence that measures must be in place to make existing development and infrastructure safe. Further information is provided on the flood defences within the SDNPA area in Section 7.4.

As well as the flood risk shown by flood risk mapping, there are numerous ordinary watercourses, such as ditches and smaller watercourses where the risk may not have been modelled. Generalised Flood Zone mapping (where more detailed modelling investigations are not available) has only been prepared for watercourses with a catchment greater than 3km^2. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. Sites

located in proximity to these watercourses may be shown to be inaccurately located in Flood Zone 1. This is as a result of smaller ordinary watercourses not having detailed modelling associated with them. The Risk of Flooding from Surface Water map provides an indicative indication of the areas which could be at risk of small watercourse flooding.

5.2.1 Historic Flood Events

A summary of historical fluvial flooding events is provided below in Table 5-1. No historic records of fluvial flooding were provided by Hampshire Country Council, West Sussex Country Council or Brighton and Hove City Council.

Table 5-1 Historic Fluvial flooding incidents

Date	Location	Cause of flooding	Source of flood incident data
November 1960	Lewes	Channel capacity being exceeded (with no raised defences)	Environment Agency Recorded Flood Outlines
1974	Singleton	Channel capacity being exceeded (with no raised defences)	Environment Agency Recorded Flood Outlines
November 1974	Alfriston	Overtopping of flood defences	Environment Agency Recorded Flood Outlines
October 2000	Lewes	Channel capacity being exceeded (with no raised defences)	Environment Agency Recorded Flood Outlines
October 2000	Amberley	Channel capacity being exceeded (with no raised defences)	Environment Agency Recorded Flood Outlines
November 2000	East Meon, West Meon, Warnford, Exton, Corhampton, Meonstoke, Droxford	Channel capacity being exceeded (with no raised defences)	Environment Agency Recorded Flood Outlines
January 2009	Alfriston	Overtopping of flood defences	Environment Agency

Date	Location	Cause of flooding	Source of flood incident data
			Recorded Flood Outlines
2013	Lewes	Overtopping of flood defences	East Sussex LLFA records of flooding
2014	Exceat,	Fluvial flooding from the River Ouse	East Sussex LLFA records of flooding
2014	Lewes	Overtopping of flood defences	East Sussex LLFA records of flooding
2014	Polegate	Fluvial flooding- source not provided	East Sussex LLFA records of flooding
2014	Liss, Tichborne, Frithend,	Fluvial flooding	Hampshire County Council LLFA records of flooding

5.3 Coastal and Tidal flood risk

Tidal flooding occurs when extreme tide levels exceed ground and/or defence level. There are four major rivers across the SDNP which are tidally influenced. From east to west these are:

- River Cuckmere
- River Ouse
- River Adur
- River Arun

The areas most at risk of tidal flooding across the SDNP include Alfriston, Lewes, Upper Beading and Arundel (as listed in the same order as their respective rivers). Crucially in some places within the SDNP, tidal flood risk can occur in combination with fluvial and surface water sources, causing a greater flood risk.

No settlements within the SDNP are predicted to be at coastal flood risk.

5.3.1 Historic Flood Events

No records of historic tidal flooding have been recorded in any settlements within the SDNPA area.

5.4 Surface water flood risk

Flooding from surface water ('pluvial' flooding) is caused by intense short periods of rainfall. Usually, it impacts lower-lying areas, often where the natural (or artificial) drainage system cannot cope with the volume of water intake. Surface water flooding is normally localised in nature and are inextricably linked to issues of poor drainage in both natural and manmade conditions, permeability of soils, groundwater levels or drainage blockage by debris, and sewer flooding.

Lewes has been identified as one of the fourteen highest flood risk hotspots in East Sussex, in the Local Flood Risk Management Strategy (LFRMS). The steep topography of the South Downs, which surround Lewes, encourages the overland flow of surface water, which is directed into the town through existing dry valleys, or coombes, towards the River Ouse. This is most apparent in the dry valley in the west of Lewes, which originates on the Downs behind the Nevill Estate and continues down to The Paddock. The Environment Agency Risk of Surface Water mapping suggests that this valley has the potential to act as a flowpath for surface water. Ponding of surface water occurs on the flatter topography floodplain of the Ouse, affecting areas of Cliffe High Street, the North Street Quarter and Malling.

Surface water flood risk can increase in areas where there are increased development pressures, which lead to an increase in impermeable surfaces. This has been identified as a potential issue in the Itchen CFMP[2].

5.4.1 Historic Flood Events

A summary of historical surface water flooding events is provided below in Table 5-2.

2 https://assets.publishing.service.gov.uk/media/5a7c53afed915d3d0e87ba1f/Test_and_Itchen_Catchment_Flood_Management_Plan.pdf

Table 5-2 Historic surface water flooding incidents

Date	Location	Cause of flooding	Source of flood incident data
1960	West Marden	Drainage	Environment Agency Recorded Flood Outlines
1974	West Burton and Fittleworth	Local drainage/surface water and other	Environment Agency Recorded Flood Outlines
1981	Fittlework	Drainage	Environment Agency Recorded Flood Outlines
1993	Lewes	Surface Water	East Sussex LLFA records of flooding
2011	Lewes and Offham	Surface Water- highway drainage	East Sussex LLFA records of flooding
2012	Lewes, Firle, Ditchling, Alfriston, Hamsey	Surface Water- highway drainage Surface Water- pluvial runoff	East Sussex LLFA records of flooding
2013	Kingston, Lewes, East Chiltington, Ditchling, Southease, Alfriston, Seaford, Streat	Surface Water- highway drainage Surface Water- pluvial runoff	East Sussex LLFA records of flooding

Date	Location	Cause of flooding	Source of flood incident data
2014	Offham, Ditchling, Wannock, Lewes, Kingston, Newhaven, Alfriston, Five Ashes, Forest Row	Surface Water- highway drainage Surface Water- pluvial runoff Surface Water- private drainage	East Sussex LLFA records of flooding
2014	Soberton Heath and Petersfield	Surface Water Flooding	Hampshire County Council LLFA records of flooding
2017	Lewes and Jevington	Surface Water- highway drainage	East Sussex LLFA records of flooding

5.5 Groundwater flood risk

Groundwater flooding occurs when the water levels within the underlying rock and soils (known as the water table) rise and exceed the existing ground level, causing water to emerge onto the surface. It occurs in areas with permeable bedrock, predominantly within areas underlain by permeable geology such as chalk, sand and gravel.

Areas with a chalk geology are at risk of groundwater flooding due to the high permeability of the chalk, which is also a Principal Aquifer. The high degree of fracture permeability in the chalk results in groundwater flood risk being prevalent throughout much of the study area. Additional factors that may contribute to these differences include topography, catchment shape, land use, soil, and superficial deposit cover. As a result, even given similar conditions of rainfall and antecedent groundwater levels, there will be different timing to both the onset and duration of groundwater flooding.

Perched groundwater occur when there are areas of impermeable material within a rock that is otherwise permeable. The areas of impermeable rock allow small, localised water tables to develop, which can overlay a regional water table in the surrounding permeable rock.

Groundwater flooding is much slower than river and surface water flooding and can have a long duration and can last for days, weeks or even months after heavy or prolonged rainfall, as the water table needs to lower before the flooding can recede.

Groundwater flooding can cause a multitude of damages, including:

- Damage to buried utilities
- Ground stability, including subsidence, slope failure and sinkholes
- Basement flooding
- Sewer flooding due to overloaded sewers from groundwater draining into drainage systems.
- Flooding of agricultural land and other greenfield and amenity areas
- Flooding of buildings and areas of hard standing

Groundwater flooding interacts with several other flood risk sources and can often be mistaken for these flood risk types.

- Fluvial flooding: Increased levels in rivers and smaller watercourses can cause river levels to increase, leading to fluvial flooding.
- Surface Water: An increase in groundwater levels can cause emergence in topographical depressions, known as 'dry valleys'. The Environment Agency's RoFfSW map gives an approximate indication of low-lying areas where groundwater could emerge when levels are high.
- Sewer flooding: As noted above, groundwater flooding can overwhelm the drainage network and result in sewer flooding.

5.5.1 Historic Flood Events

A summary of historical groundwater flooding events is provided below in Table 5-3.

Table 5-3 Historic groundwater and drainage flooding incidents

Date	Location	Cause of flooding	Source of flood incident data
2014	Lewes	Groundwater	East Sussex LLFA records of flooding
2014	Finchdean	Groundwater	Hampshire County Council LLFA records of flooding

West Sussex County Council has noted that the Chilgrove area has had significant periods of groundwater flooding.

Groundwater flooding often interacts with several other flood risk sources and can often be mistaken for these flood risk types. Therefore, records attributed to groundwater flooding are often limited.

Local news articles[3] have indicated that groundwater is a problem in Patcham and has been the cause of flooding, as a result of combined effects of surface water and sewer flooding.

5.6 Sewer flood risk

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and / or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems like blockages, collapses or equipment (such as pumps) failure occur in the sewerage system. Surface water inundation of manhole openings and entry of groundwater may cause high flows for prolonged periods of time. Since 1980, the Sewers for adoption guidelines (since replaced by the Design Construction Guidance) have meant that most new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year (3.33% AEP), although until recently this did not apply to smaller private systems.

Consequently, even when sewers are built to current specifications, they can still be overwhelmed by larger events of the magnitude often considered when looking at river or surface water flooding (e.g., a 1 in 100 chance of occurring in any given year (1% AEP)). Existing sewers can also become overloaded as new development adds to their catchment, even with restrictions in place on permitted discharge, or due to incremental increases in roofed and paved surface at the individual property scale (urban creep), resulting in a reduction in permeable surfaces. Sewer flooding is, therefore, an issue that could occur in many locations across the SDNP.

The Lewes SWMP recorded that despite major sewage works in the town in March 2005, issues still arise with groundwater infiltration, particularly during the winter months. The network consists of foul sewers, which are the responsibility of Southern Water, and surface water sewers. Combined sewer networks serve the main town, the performance of which relates to the proportion of rainfall which forms pluvial runoff and the inflow into ordinary watercourses from the surface water drainage network.

5.6.1 Historic Flood Events

A summary of historical sewer flooding events from Southern Water is provided below in Table 5-4. This is grouped by settlement. It should be noted that no incidents were noted as having occurred by Thames Water.

Table 5-4 Historic sewer and drainage flooding incidents

3 https://www.brightonandhovenews.org/2024/01/03/patcham-residents-told-to-prepare-for-flooding/https://www.brightonandhovenews.org/2024/01/03/patcham-residents-told-to-prepare-for-flooding/ https://www.brightonandhovenews.org/2024/01/26/patcham-residents-call-for-report-into-flooding-and-sewage-in-streets/ https://www.bbc.co.uk/news/uk-england-sussex-68216606

Location	Number of incidents
Abbots Worthy	2
Alfriston	42
Amberley	2
Ashton	1
Avington	1
Buriton	4
Bury	8
Castletown	6
Charlton	25
Clapham and Patching	24
Clayton	6
Cocking	7
Coldwaltham	12
Compton	2
Cross Bush	13
Cross Gate	5
Ditchling	31
Droxford	2
Easebourne	21
East Meon	42
Easton	8
Fenhurst	39
Filching	11
Findon	20
Fittleworth	16
Friston	23
Fulking	2
Funtington	14
Graffham	2

Location	Number of incidents
Greatham	8
Habin	10
Hambledon	16
Heyshot	1
Hill Grove	1
Kingston near Lewes	31
Lewes	372
Liss	124
Lodsworth and Smithbrook	5
Mid and East Lavant	45
Midhurst	132
Milland	6
Northfields	2
Nyewood	5
Petersfield	360
Petworth	42
Poynings	23
Pyecome	7
Redford Hill	5
Rodmell	12
Rogate	9
Shawford	2
Singleton	22
Slindon	5
South Ambersham	4
South Harting	33
Stedham	9
Steep	21
Stroud	7

Location	Number of incidents
Terwick Common	3
Twyford	70
Upper Norwood	13
Washington	5
Wepham	3
West Ashling	14
West Dean	15
West Lavington	8
Wilmington	6

5.7 Reservoir flood risk

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low and considered a 'residual risk'. Legislation under the Flood and Water Management Act requires the Environment Agency to designate the risk of flooding from these reservoirs. The Environment Agency is currently progressing in a 'Risk Designation' process so that the risk can be formally determined.

Appendix A shows the Risk of Flooding from Reservoirs dataset, which provides an overview of how an impounding reservoir will modify flood risk in the catchment and includes indicative depths and velocities associated with this flooding. This generally results in increased fluvial flood extents as significant volumes of water would be released into existing watercourses.

The risks posed by reservoir flooding constitute a residual risk and, in most cases, are unlikely to be prohibitive to development. The SDNPA should use the mapping in Appendix A to understand the potential damage to buildings and loss of life in the unlikely event of reservoir failure when considering developments downstream of reservoirs. Development may not be appropriate where indicative depths and velocities are especially high. It is advised that the owners/ operators of raised reservoirs are contacted regarding developments that may be at risk of flooding from reservoirs.

The settlements most at risk of reservoir flooding are Liss, Habin, Trotton, Iping, Hardham, Southease and Lewes.

A list of reservoirs posing a flood risk to the SDNPA area is shown below in Table 5-5.

The risks posed by reservoir flooding constitute a residual risk and, in most cases, are unlikely to be prohibitive to development. It is advised that the owners/operators of raised

reservoirs are contacted concerning development that may be at risk of flooding from reservoirs.

Table 5-5 Reservoirs affecting the Local Plan area

Reservoir	Location (grid reference)	Reservoir Owner	LLFA Name
Ardingly	TQ3348528825	South East Water Ltd	West Sussex
Arlington	TQ5335207419	South East Water Ltd	East Sussex
Balcombe Lake	TQ3166231003	Mr J S Greenwood	West Sussex
Barcombe	TQ4405015050	South East Water Ltd	East Sussex
Burton Mill Pond	SU9790018000	West Sussex County Council	West Sussex
Camoys Farm (formerly Camois Farm)	TQ4264015890	Mr and Mrs Nicholas Addyman	East Sussex
Chingford Pond	SU9725017350	Petworth Management Company Limited	West Sussex
Cooks Pond	SU8320026300	Mrs Irina Abramovich	West Sussex
Folkington	TQ5641603561	South East Water Ltd	East Sussex
Framfield Upper (Newplace Estate) (ID95)	TQ5136719501	Mr Raymond H Edmundson	East Sussex
Frog Farm Reservoir	SU9585020870	Langmead Farms Ltd	West Sussex
Hardham Reservoir	TQ0414216753	Southern Water Services Ltd	West Sussex
Kneppmill Pond	TQ1571421243	Knepp Castle Estate	West Sussex
Michelham Priory Moat	TQ5580909228	Sussex Archaeological Society	East Sussex
Mill Pond, Lurgashall	SU9400025900	Leconfield Estate	West Sussex
Old Alresford Pond	SU590331	Mrs Alison Flood	Hampshire
Park Mill Pond	SU9710030800	Haslemere Angling Society	West Sussex
Petworth Lower Pond	SU9690023200	The National Trust	West Sussex
Petworth	SU9716022000	The National Trust	West Sussex

Reservoir	Location (grid reference)	Reservoir Owner	LLFA Name
Upper Pond			
Plashett Park, Upper Lake	TQ4670016500	The Ian Askew Charitable Trust	East Sussex
Pond Lye	TQ2900021400	Sussex Piscatorial Society Limited	West Sussex
River Farm Reservoir	SU9370022100	Langmead Farms Ltd	West Sussex
River Park Pond	SU9420025000	Leconfield Estate	West Sussex
Swanbourne Lake	TQ0160008000	Norfolk Estates	West Sussex
Upper North Pond	SU9620032200	Mr Martin Wakefield	West Sussex
Wylds Lake	SU7938929012	Mr Xuejun Sun	Hampshire

5.8 Canal flood risk

There are no canals within the SDNP, therefore there is no risk of a canal breach in this study area.

5.9 Summary of flood risk to key settlements

Flood risk to key settlements in the SDNP has been summarised in Appendix D.

6 Impacts of Climate Change

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often.

The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

6.1 National guidance

The updated NPPF (last updated December 2023) sets out how the planning system should help minimise vulnerability and provide resilience to climate change impacts. The NPPF and Planning Practice Guidance (PPG) describe how Flood Risk Assessments (FRAs) should demonstrate how flood risk will be managed over the lifetime of the development, accounting for potential impacts of climate change, both now and in the future.

The updated 2023 NPPF also states that 'All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

(a) applying the sequential test and then, if necessary, the exception test as set out below;

' (para 167).

The Environment Agency published updated climate change guidance on 19th February 2016 (last updated in May 2022), which supports the NPPF and must now be considered in all new developments and planning applications. The document contains guidance on how climate change should be accounted for when considering development, specifically how allowances for climate change should be included in FRAs. The Environment Agency can give a free preliminary opinion to applicants on their proposals at the pre-application stage. There is a charge for more detailed pre-application planning advice.

6.2 Climate Change Strategy and Action Plan

The SDNPA committed to an updated Climate Change Strategy and Action Plan in March 2020. This includes a commitment to working with local authorities, communities, and landowners to deliver actions that will aid adaptation to the climate emergency. Such commitments and proposed actions include the following:

- Tackling climate change through the role of the SDNPA's Planning Function:
- Promoting green corridors, high quality green spaces and street trees within the urban environment to manage climate impacts on a local scale.

- Helping to develop resilient communities:
- Encouraging local action within parishes and other community groups that supports the delivery of wider climate change targets.

6.3 Revised Climate Change Guidance

The UK Climate Predictions 2018 (UKCP18) were published on 26 November 2018. These projections replace the UKCP09 projections and are the official source of information on how the UK climate may change over the rest of this century. The Environment Agency has updated the climate change allowances for sea level rise, considering the UKCP18 projections and further updates for peak river levels and rainfall intensity were issued on 27th May 2022.

Allowing for climate change impacts helps reduce a development's vulnerability and provides resilience to future flood risk. The 2022 climate change guidance includes climate change predictions of anticipated change for peak river flow and peak rainfall intensity. These allowances are based on climate change projections for different carbon dioxide emissions scenarios to the atmosphere.

Due to the complexity of projecting the effects of climate change, uncertainties are attributed to these climate change allowances. Therefore, the guidance presents a range of possibilities to reflect the potential variation in the impact of climate change over three periods.

6.4 Relevant allowances for the study area

The relevant climate change allowances for the peak river flow, peak rainfall intensity and sea level rise for the SDNPA area are summarised below. These allowances should be checked for further updates on the Environment Agency's website[4] prior to use in a flood risk assessment.

6.4.1 Peak river flow allowances

The peak river flow allowances have been divided into the management catchments within the SDNPA area, as illustrated by the table headings. For each catchment, guidance on uplift in peak flows are provided for three allowance categories: Central, Higher end and Upper end, which are based on the 50th, 70th and 95th percentiles, respectively. The allowance category to be used is dependent on the vulnerability classification of the development and the Flood Zones within which it is located.

These allowances (increases) are provided, in the form of figures for the total potential change anticipated, for three climate change epochs:

- The '2020s' (2015 to 2039)
- The '2050s' (2040 to 2069)

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

- The ‘2080s’ (2070 to 2125)

The time period used in the assessment depends on the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years. The lifetime of a non-residential development depends on its characteristics. The NPPG provides further information on what is considered to be the lifetime of development[5].

Table 6-1 Peak river flow allowances

Region	Allowance Category	Total potential change anticipated for ‘2020s’ (2015 to 2039)	Total potential change anticipated for ‘2050s’ (2040 to 2069)	Total potential change anticipated for ‘2080s’ (2070 to 2125)
Cuckmere and Pevensey Levels	Upper end	35%	44%	76%
	Higher end	24%	26%	43%
	Central	18%	19%	32%
Adur and Ouse	Upper end	40%	57%	107%
	Higher end	23%	28%	55%
	Central	16%	18%	37%
Arun and Western Streams	Upper end	27%	36%	64%
	Higher end	16%	18%	36%
	Central	11%	13%	25%
Wey and tributaries	Upper end	28%	36%	71%
	Higher end	15%	17%	36%
	Central	10%	9%	24%
East Hampshire	Upper end	37%	51%	88%
	Higher end	24%	30%	51%
	Central	19%	22%	37%
Test and Itchen	Upper end	45%	61%	127%
	Higher end	24%	28%	56%
	Central	16%	17%	35%

5 Paragraph: 006 Reference ID: 7-006-20220825

6.4.2 Peak rainfall intensity allowances

Climate change is predicted to result in increased winter rainfall, as well as increased summer storm intensity in the future. This increased rainfall intensity and quantity will impact land and urban drainage systems, leading to surface water flooding due to the increased volume of water entering the systems. The Environment Agency has developed a peak rainfall allowances map, which shows anticipated changes in peak rainfall intensity, which can be used for site-scale applications (like urban drainage design) and surface water flood mapping in small catchments (<5km^2).

As per the peak river flow allowances, the peak rainfall allowances are shown for all management catchments in which the SDNPA area lies. For each catchment, guidance for increases in rainfall are provided for two allowance categories, Central and Upper end. This has been done for both the 3.3% and 1% annual exceedance probability (AEP) events for the 2050s epoch (2022 to 2060) and 2070s epoch (2061 to 2125).

Table 6-2 Peak rainfall allowances

Region	Allowance Category	3.3% AEP event		1% AEP event	
		2050s epoch	2070s epoch	2050s epoch	2070s epoch
Cuckmere and Pevensey levels	Central	20%	20%	20%	25%
	Upper end	40%	40%	45%	45%
Adur and Ouse	Central	20%	20%	20%	25%
	Upper end	35%	40%	45%	45%
Arun and Western Streams	Central	20%	25%	20%	25%
	Upper end	35%	40%	45%	45%
Wey and tributaries	Central	20%	25%	20%	25%
	Upper end	35%	35%	40%	45%
East Hampshire	Central	20%	25%	20%	25%
	Upper end	35%	40%	40%	45%
Test and Itchen	Central	20%	25%	20%	25%
	Upper end	35%	40%	40%	45%

6.4.3 Sea level rise allowances

For the purposes of the 2024 Level 1 SFRA, the 2020 tidal allowances have been considered along with the 2022 fluvial climate change allowances.

Climate change is predicted to cause higher sea levels due to melting ice sheets and more extreme storm events, which will create higher storm surges.

The Environment Agency's 2020 sea level allowances, based on coastal regions and the SDNPA area within the Southeast region, have been used in the preparation for this report, as confirmed by the Environment Agency.

Table 6-3 Sea level rise allowances for the South East

Allowance Category	Annual sea level rise allowance 2000 to 2035	Annual sea level rise allowance 2036 to 2065	Annual sea level rise allowance 2066 to 2095	Annual sea level rise allowance 2096 to 2125	Cumulative rise 2000 to 2125
Upper end	242mm	339mm	474mm	546mm	1.60m
Higher central	200mm	261mm	348mm	393mm	1.20m

6.5 Representing climate change in the Level 1 SFRA

6.5.1 Fluvial and tidal flood risk

12 fluvial hydraulic models were received from the EA. These models were reviewed to determine their age, type of model, and the outputs available. A pragmatic approach was then taken to determine a methodology which aims to make best use of the available model data whilst balancing the LPR timescales and budgets as well as considering the location of strategic sites. More detailed modelling of different climate change scenarios may need to be considered further if and when a Level 2 assessment is required or during a site-specific Flood Risk Assessment.

The sections below detail the approaches taken to consider climate change for fluvial, and surface water flooding within this SFRA. Further details on the available modelling are set out in Appendix B.

6.5.1.1 3.3% AEP (Flood Zone 3b)

The existing 3.3% AEP plus climate change outputs have been used for the modelled watercourses where the correct climate change allowances within their corresponding management catchments are available. No further modelling has been undertaken as part of this SFRA.

For areas where no appropriate model outputs exist, a precautionary approach has been taken by using the extent of Flood Zone 3a to define the future extent of Flood Zone 3b. This is appropriate given the Upper End climate change estimates are often similar to the 1% AEP/ Flood Zone 3a extents; therefore, the differences in the effects of climate change are anticipated to be minimal.

Any proposed major development within the urban FZ3b should be accompanied by a full Flood Risk Assessment backed up with site specific hydraulic modelling.

6.5.1.2 1% AEP (Flood Zone 3a)

The existing 1% AEP (or 0.5% AEP for tidal) plus climate change outputs have been used for the modelled watercourses where the correct climate change allowances within their corresponding management catchments are available. No further modelling has been undertaken as part of this SFRA.

For areas where there are no appropriate model outputs, the Flood Zone 2 extent is used as a precautionary and indicative approach. This is appropriate given the Upper End climate change estimates are often similar to the 0.1% AEP/ Flood Zone 2 extents; therefore, the differences in the effects of climate change are anticipated to be minimal.

6.5.1.3 0.1% AEP (Flood Zone 2)

The 2021 update to NPPF and subsequent update to PPG in 2022 requires the consider all forms of flood risk in the sequential test ‘both now and in the future’. Therefore the 0.1% AEP plus Climate Change event is required to be considered.

The majority of the flood extents within the SDNPA area have been derived from generalised national scale flood modelling and therefore do not have a detailed flood model associated with them. None of the EA hydraulic models provided currently have appropriate or available outputs for 0.1% AEP plus climate change events. Uplifting existing models with climate change allowances for the 0.1% AEP event presents significant time and cost implications due to practical issues as most models are not built to run events of this magnitude, and often present instabilities and an inability to run. As such, the impacts of climate change on the 0.1% AEP event have been assessed through an alternative approach within this Level 1 SFRA.

To identify areas which may be affected by climate change in the 0.1% AEP event, a 100m buffer has been applied to Flood Zone 2 and has been defined as the 'Climate Change Impact Zone'. If development is proposed within this area, the risk should be considered further in a site-specific Flood Risk Assessment. The use of 100m is considered extremely precautionary and has been applied considering the topography of the SDNPA area. This area does not definitively identify areas at risk of flooding but acts as an indicator for where more detailed studies may be appropriate in support of site-specific work. Further to this, the Environment Agency is hoping to publish its new National Flood Risk Assessment

(NaFRA2) in early 2025 and this will provide national scale mapping which will include allowances for climate change.

6.5.2 Surface water climate change

The national scale Risk of Flooding from Surface Water (RoFSW) mapping was re-run as part of this SFRA, the outputs of this are presented in Appendix A for each of their corresponding management catchments:

- 3.3% AEP with +20% uplift (2050s Central allowance)
- 3.3% AEP with +25% uplift (2050s Central allowance)
- 3.3% AEP with +35% uplift (2070s Upper End allowance)
- 3.3% AEP with +40% uplift (2070s Upper End allowance)
- 1% AEP with +25% uplift (2050s Central allowance)
- 1% AEP with +45% uplift (2070s Upper End allowance)

As the EA has not published peak rainfall intensity allowances for the 0.1% AEP event, it has not been possible to prepare climate change mapping showing the increase in the 0.1% AEP extent. The EA do not intend on publishing the 0.1% AEP peak rainfall intensity's.

6.5.3 Impacts on Groundwater

The effect of climate change on groundwater flooding problems and those watercourses where groundwater significantly influences winter flood flows is much more uncertain. Milder, wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible. However, warmer, drier winters may counteract this response by reducing groundwater levels to a greater extent during the summer months, which is also likely to be exacerbated by development pressures on groundwater resources.

There is no modelling data available to assess climate change impacts on groundwater. The assessment would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

The effect of climate change on groundwater levels for sites in areas where groundwater is known to be an issue should be considered at the planning application stage.

6.6 Impacts of climate change across the study area

It should be noted that areas that are already at high risk of flooding will be at increased risk in the future as a result of changes in magnitude of rainfall, flows and sea level along with

the relatively frequency of flooding. Areas at risk of flooding during the fluvial and surface water climate change scenarios are shown in the mapping in Appendix A

It is recommended that the Authority works with other RMAs to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the study area.

6.7 Adapting to climate change

The PPG Climate Change guidance contains information on how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering the future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting appropriate development design that will be resilient to flood and coastal change throughout its lifetime.
- Considering availability of water and wastewater infrastructure over the lifetime of the development and promoting appropriate development design, considering both impact on water resources and water quality.
- Promoting adaptation approaches through planning policy for developments and the public realm, for example by considering flexible, adaptive approaches that allow for the impacts of climate change over the lifetime of development, for example setting new development back from watercourses to allow for not increased flows in the future.

The SDNPA plays a key role in meeting both the challenges and opportunities that climate change may present. On developing the adaptation approach, undertaking a risk assessment was a major requirement to identify the climate impacts on the key assets of the National Park, including farming, forestry and other principal land uses.

7 Flood Alleviation Schemes, Defences and Assets

A high-level review of flood defences was carried out for this SFRA, involving an interrogation of existing information on asset condition and standard of protection.

Defences are any assets that provide flood defences or coastal protection functions. An assessment of the Environment Agency Spatial Flood Defence dataset has been carried out. Flood defences that potentially provide a standard of protection from a 50% AEP event or more have been considered. The datasets include manmade and natural defences which may arise for instance due to the presence of naturally high ground adjacent to a settlement have been considered. The defences and their locations are summarised in the following sections.

7.1 Standards of Protection

Flood defences are designed to give a specific standard of protection, reducing the risk of flooding to people and properties in areas with high levels of risk. For example, a flood defence with a 1% AEP standard of protection means that the flood risk in the defended area is reduced to a 1% chance of flooding in any given year. Whilst flood defences are designed to a standard protection, it should be noted that, over time, the actual standard of protection provided by the flood defence may decrease. This can be due to deterioration in condition or increases in flood risk due to the increased magnitude of the flood hazard as a result of climate change (e.g., rise in frequency and intensity of extreme weather over time). For raised flood defences (bunds or banks), a standard of protection can be straightforward to define. However, sometimes it is not possible to define the standard of protection for Flood Storage Areas as there are several factors that determine the protection that they can provide e.g., outflow rates, number of watercourses that flow into the Flood Storage Area.

For this study, the standard of protection has been derived from the Environment Agency Spatial Flood Defence Dataset.

7.2 Defence condition

Formal structural defences are given a rating by the Environment Agency based on a grading system for their condition. A summary of the grading system used by the Environment Agency for the condition is provided in Table 7-1.

Table 7-1 Defence asset condition rating

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very Poor	Severe defects resulting in complete performance failure.

7.3 Maintenance

The condition of existing flood defences and whether they are planned to be maintained and/or improved in the future must be considered with respect to the safety and sustainability of development over its intended life and for the financial and economic commitment to the long-term provision of appropriate standards of protection. In some cases, the relevant strategy may suggest that it is not appropriate to maintain the condition of the assets, which may prove influential for the development over its intended life. Additionally, detailed FRAs undertaken by developers (if a defence is influential to the proposed development) will need to demonstrate a wide variation of condition grades thoroughly. It is important that all these assets are maintained to a good condition and that their function remains unimpaired in accordance with the policy and strategy for Flood Risk Management.

7.4 Flood defences within the South Downs

7.4.1 Fluvial flood defences

Many main rivers in the SDNPA area have flood defences along some of their lengths; the location of these defences are shown in Appendix A. These defences typically consist of embankments and high ground, with some sections of engineered high ground.

According to data from the Environment Agency, most fluvial defences within the SDNPA area are classified 1-3, signalling ‘very good’ to ‘fair’ conditions. However, 49 instances of a section of defences being classed 4 or 5, signalling ‘poor’ to ‘very poor’ conditions, and where a significant reduction in performance may occur. These sections are spread throughout the study area and are predominantly outside of urban areas. Most of these areas are outside of the urban areas within the study area. Fluvial flood defences in the SDNPA area offer a standard of protection varying from 100% AEP (1-year flood) to 0.1% AEP (1000-year flood).

7.4.2 Tidal defences

The Environment Agency maintains fluvial-tidal defences along the River Arun, River Adur, River Ouse and River Cuckmere. These defences consist of embankments, wall, engineered high ground, natural high ground, flood gates and demountable defences.

According to the Environment Agency, most defences' conditions are classified 1-3, signalling 'very good' to 'fair' conditions. 27 sections are classified as 4 or in 'poor' condition. This signifies these sections have defects that could significantly decrease their performance and increase flood risk and warrant further investigation. Tidal defences in the SDNPA area offer a standard protection varying from 50% AEP (2-year flood) to 0.1% AEP (1000-year flood).

7.5 Existing and Future Flood Alleviation Schemes

7.5.1 Existing schemes

The A32 Farringdon-Chawton flood alleviation scheme is currently being delivered within the SDNPA area by Hampshire County Council LLFA. The flood alleviation scheme aims to improve the management of both surface and groundwater conveyed by ordinary watercourses adjacent to or near the A32 highway through the village of Lower Farringdon and by a main river to Chawton village. The works include:

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

The improvements will reduce the risk of flooding to houses, businesses (22 properties) and the A32.

7.6 Residual flood risk

7.6.1 Residual risk

Residual risks are those remaining after applying the sequential approach and taking mitigating actions. The residual risks can be:

- The effects of a flood with a magnitude greater than that for which the defences or management measures have been designed to alleviate (the 'design flood'). This can result in overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming discharges, and/or:
- Failure of defences or flood risk management measures to perform their intended duty. This could be a breach or failure of flood embankments, failure of flood gates to operate in the intended manner, or failure of pumping stations.

- There are numerous rivers within the South Downs National Park area where breaching or overtopping upstream can result in significant flooding due to ponding behind defences downstream.

In circumstances where measures are put in place to manage flood risk, there remains a possibility of flooding being experienced, either as a consequence of the flood event exceeding the design capacity or the failure of the asset providing the appropriate standard of protection. Significant changes to sea level protection over the lifetime of a development will also result in residual risk. It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

This SFRA does not assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and properties could be high. Developers should be aware that any site that is at or below defence level may be subject to flooding if an event occurs that exceeds the design capacity of the defences, or the defences fail, and this should be considered in a detailed Flood Risk Assessment. The assessment of residual risk should consider:

- The flood hazard, depth and velocity that would result from overtopping or breach of defences. Flood gate or pumping station failure and/or culvert blockage (as appropriate). The Environment Agency can provide advice at site-specific development level for advice on breach/overtopping parameters for flood models.
- The design of the development to take account of the highest risk parts of the site e.g., allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g., sleeping accommodation above the floor level.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.

If appropriate, these risks can be considered as part of a Level 2 SFRA which considers ‘actual’ flood risk to specific sites.

7.6.2 Defence breach

A breach of a defence occurs when there is a failure in the structure and a subsequent ingress of flood water.

Where defences are present, the risk of breach events should be considered as part of the site-specific flood risk assessment. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach location and so FRAs must include an assessment of the hazards that might be present so that the safety of people and structural stability of properties and infrastructure can be appropriately considered. Whilst the area in the immediate vicinity of a breach can be subject to high flows, the whole flood risk area associated with a breach must also be considered as there

may be areas remote from the breach that might, due to topography, involve increased depth hazards. There are numerous rivers within the South Downs National Park area where breaching or overtopping upstream can result in significant flooding due to ponding behind defences downstream therefore this should also be considered within an assessment.

8 Cumulative Impacts and Strategic Flood Risk Solutions

8.1 Cumulative Impact Assessment

When allocating land for development, consideration must be given to the potential cumulative impact of development on flood risk. The increase in impermeable surfaces and resulting rise in runoff increases the risk of surface water flooding if suitable mitigation measures, such as SuDS, are not implemented. Furthermore, the increase in runoff may result in additional flow entering watercourses, increasing the risk of fluvial flooding at locations further downstream that are potentially sensitive to increases in the volume or flow of flood water.

Consideration must also be given to the impacts resulting from a loss of floodplain storage that can arise cumulatively from development. These impacts should be assessed at both the development and elsewhere within the catchment, and, if required, the scale and scope of appropriate mitigation should be identified.

Whilst the increase in runoff, or loss in floodplain storage, from individual developments, may only have a minimal impact on flood risk, the cumulative effect of multiple developments over time may be more significant without appropriate mitigation measures.

For windfall sites which have not yet been allocated, the NPPF requires that the cumulative impact of development should be considered at the planning application stage and the appropriate mitigation measures are undertaken so that flood risk does not increase on or off site and recognising that development can result in opportunities to improve flood risk.

8.2 Strategic flood risk solutions

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the study area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies. It is important that the ability to deliver strategic solutions in the future is not compromised by the location of proposed development. When assessing the extent and location of proposed development, consideration should be given to the requirement to secure land for flood risk management measures that provide wider benefits.

Not all measurements will be appropriate for all development sites, however this is intended as a guide to identify some of the more common solutions. Discussions should be held with the relevant Lead Local Flood Authority (Brighton & Hove City Council, Hampshire County Council, West Sussex County Council or East Sussex County Council) and the Environment Agency, where strategic solutions are being considered to confirm their appropriateness. Design guides for many of these solutions are published by CIRIA.

8.3 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this extra runoff, releasing it downstream at a slower rate, avoiding any increases in flood depths and/or frequency downstream. These methods of storing flood water are independent of a developments surface water drainage design.

According to the Environment Agency's Fluvial Design Guide, methods to provide these schemes include:

- Enlarging the river channel;
- Raising the riverbanks; and/or
- Constructing flood banks set back from the river.

Flood storage schemes have the advantage that they generally benefit areas downstream, not just the local area.

8.4 Nature Based Solutions

Developments provide opportunities to work with natural processes of catchments, floodplains, rivers and the coast to reduce flood and erosion risk, benefit the natural environment and reduce the costs of schemes. Nature-based solutions such as Natural Flood Management Techniques (NFM) can be used to retain water and attenuate flows that can otherwise contribute to flooding, Installation of temporary detention features such as leaky dams and large woody debris in watercourses across a catchment can help mitigate flood risk and improve the capability of the catchment to manage more extreme events. The Environment Agency has developed NFM mapping**,** which displays opportunities for NFM.

Conventional flood prevention schemes may be preferred, but consideration of 're-wilding' rivers upstream could provide cost efficiencies as well as considering multiple sources of flood risk; for example, reducing peak flows upstream**,** such as through felling trees into streams or building earth banks to capture runoff, could be cheaper and smaller scale measures than implementing flood walls, for instance. With flood prevention schemes, consideration needs to be given to the impact that flood prevention has on the WFD status of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

A number of the different NFM approaches and techniques are summarised in the following sections.

8.4.1 Catchment and floodplain restoration

Compared to flood defences and flood storage, floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a

more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain.
- Removal of redundant structures to reconnect the river and the floodplain
- Apply the Sequential Approach to avoid new development within the floodplain.

For those sites considered within the Local Plan Review and/or put forward by developers, that also have watercourses flowing through or past them, the sequential approach should be used to locate development away from these watercourses. This will ensure the watercourses retain their connectivity to the floodplain. Loss of floodplain connectivity could potentially increase flooding.

8.4.2 Re-naturalisation

There is potential to re-naturalise a watercourse by re-profiling the channel, removing hard defences, re-connecting the channel with its floodplain and introducing a more natural morphology (particularly in instances where a watercourse has historically been modified through hard bed modification). Detailed assessments and planning would need to be undertaken to gain a greater understanding of the response to any proposed channel modification.

8.5 Structure removal and/ or modification

Structures, both within watercourses and adjacent to them can have significant impacts upon rivers including alterations to the geomorphology and hydraulics of the channel through water impoundment and altering sediment transfer regime, which over time can significantly impact the channel profile including bed and bank levels, alterations to flow regime and interruption of biological connectivity, including the passage of fish and invertebrates.

Many artificial in-channel structures (examples include weirs and culverts) are often redundant and/or serve little purpose and opportunities exist to remove them where feasible. The need to do this is heightened by climate change, for which restoring natural river processes, habitats and connectivity are vital adaptation measures. However, it also must be recognised that some artificial structures may have important functions or historical/cultural associations, which need to be considered carefully when planning and designing restoration work.

While weir removal should be investigated in the first instance, in some cases, it may be necessary to modify a weir rather than remove it. For example, lowering the weir crest level

or adding a fish pass will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

8.6 Bank stabilisation

Bank erosion should be avoided, and landowners encouraged to avoid using machinery and vehicles close to or within the watercourse except where required for maintenance.

There are several techniques that can be employed to restrict the erosion of the banks of a watercourse. In an area where bankside erosion is particularly bad and/or vegetation is unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spiling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils.

8.7 Green Infrastructure

Green Infrastructure (GI) is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe and consist of:

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

The identification and planning of GI is critical to sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development. GI is also central to climate change action and is a recurring theme in planning policy. With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. GI can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

8.8 Engaging with key stakeholders

Flood risk to an area or development can often be attributed to several sources such as fluvial, surface water and/or groundwater. In rural areas, the definitions between each type of flood risk is more distinguished. However, within urban areas flooding from multiple sources can become intertwined. Where complex flood risk issues are highlighted, it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

Engagement with riparian owners is also important to ensure they understand they understand their rights and responsibilities, including:

- Maintaining riverbeds and banks
- Allowing the flow of water to pass without obstruction; and
- Controlling invasive alien species e.g., Japanese knotweed.

More information about riparian owner responsibilities can be found in the Environment Agency's guidance on **Owning a Watercourse (2024)[6].**

6 https://www.gov.uk/guidance/owning-a-watercourse

9 Flood Risk Assessment Requirements for Developers

9.1 Principles of new developments

This SFRA provides a strategic assessment of flood risk within the SDNPA area. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and the actual and residual risk and standard of protection and safety at a site are considered in more detail.

Developers should, where required, undertake more detailed hydrological and hydraulic studies to verify flood extents (including the latest climate change allowances), inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed FRA may show that a site and its proposed use is not appropriate for development of a particular vulnerability, or even at all. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not been seen as an alternative to proving these tests have been met.

9.1.1 Applying the Sequential and Exception Test

Developers should refer to the NPPF for more information on how to consider the Sequential and Exception Tests. For allocated sites, the SDNPA area should use the information in this SFRA as the basis for applying the Sequential Test (although it might be appropriate to collect additional data and perform supplementary assessments).

For windfall sites a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk from all sources now and in the future. Only if the site passes the Sequential Test should the Exception Test then be applied, if required. A detailed FRA may show that a site, is not appropriate for development of a particular vulnerability or even at all.

Developers should also apply the sequential approach to locating development within the site. The following questions should be considered:

- Can risk be avoided through substituting less vulnerable uses or by amending the site layout?
- Can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted?
- Can the site layout be varied to reduce the number of people, the flood risk vulnerability or the building units located in higher risk parts of the site?

9.1.2 Consult at an early stage to understand consultee requirements

Developers should consult with SDNPA (as LPA), the LLFAs mentioned in Section 2.1 and Table 3-1, the Environment Agency, and relevant water and sewerage undertaker at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.

9.1.3 Consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific Flood Risk Assessment. At a site level, developers will need to check before commencing a more detailed Flood Risk Assessment that they are using the latest available datasets. In some circumstances for larger developments, developers may need to undertake detailed modelling at their own cost.

Developers should apply the most up-to-date Environment Agency climate change guidance and ensure the development has taken into account climate change adaptation measures.

9.1.4 Ensure the development is safe for future uses

Consideration should first be given to minimising risk by planning sequentially across a site. Only once the risk has been minimised as much as possible should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site. This may include improving or rebuilding existing defences or building new defences at the developers own cost and maintaining such defences for the future.

Further flood mitigation measures may be needed for any developments in an area protected by flood defences, where the condition of those defences is ‘fair’ or ‘poor’, and where the standard of protection is not of the required standard.

9.1.5 Enhance the natural river corridor and floodplain environment through new development

Developments should realise opportunities to create, enhance and link green assets. This can provide multiple benefits, including flood risk management and biodiversity/ ecology improvements, and may provide opportunities to use the land for amenity and recreational purposes.

Development that may adversely affect green infrastructure assets should not be permitted. Where possible, developers should identify and work with partners to explore all avenues for improving the wider river corridor environment.

Developers should aim to open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

9.1.6 Consider and contribute to wider flood mitigation strategy and measures in the authority area and apply the relevant local planning policy

Wherever possible, developments should reduce flood risk in the wider area e.g., by contributing to a wider community scheme or strategy for strategic measures, such as defences or NFM or by contributing in kind by mitigating wider flood risk on a development site. Developers must demonstrate in an FRA how they are contributing towards this vision.

More information on the contribution developers are expected to make towards achieving the wider vision for FRM and sustainable drainage can be obtained by consulting with the SDNPA.

9.2 Requirements for site-specific Flood Risk Assessments

9.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals of 1 hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.
- At locations where it is proposed to locate development in a high-risk surface water flood zone or is potentially materially affected by another source of flooding.
- Proposals of less than one hectare in Flood Zone 1 where they could be affected by sources of flooding other than rivers and the sea (e.g., surface water). An FRA may also be required for some specific situations:
    - If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1).
    - Where evidence of historical or recent flood events have been passed to the LPA
    - Land identified in an SFRA as being at increased risk in the future, including development that would fall in the Climate Change Impact Zone.

Development which falls within the Climate Change Impact Zone (as discussed in Section 6.5.1.3) identified within this SFRA will require a site-specific FRA.

9.2.2 Objectives of site-specific FRA

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature and location of the development. Site-specific FRAs should establish:

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

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and the SDNPA. Guidance and advice for developers on the preparation of site-specific FRAs include:

- The site specific LLFA expectations for the flood risk assessments
- Standing Advice on Flood Risk (Environment Agency)
- Flood Risk Assessment for Planning Applications (Environment Agency);
- Site-specific Flood Risk Assessment: Checklist (NPPF PPG, Defra); and
- Using Modelling for Flood Risk Assessments (Defra and Environment Agency)

9.2.3 Reviewing of FRAs

Guidance for local planning authorities for reviewing Flood Risk Assessments, submitted as part of planning applications was published by Defra in 2015 – Flood Risk Assessment: Local Planning Authorities.

9.2.3.1 Guidance for developers

Developers should consider flood risk at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

In general, all future developments should demonstrate:

- That the probability and consequences of flooding will be reduced.
- How actual and residual flood risk to the development and flood risk to others from all sources will be managed over the lifetime of the development, taking into account climate change.
- That development will be safe through the layout, form and floor levels of the development and mitigation measures.
- That surface water runoff is being managed.
- A development will have certain requirements to fulfil, dependent upon the level of flood risk, from different sources to the site.

The following subsections contain information to assist developers where flood risk to and from a development is identified which should be read alongside the guidance documents listed in Section 9.3.

9.2.4 Climate change projections

When undertaking an FRA, developers should refer to the most up to date climate change allowances as provided by the Environment Agency. More information on the updated climate change allowances, based on the UKCP18 projections, is available in Section 6.

By making an allowance for climate change it will help reduce the vulnerability of the development and provide resilience to flooding in the future.

Due to the complexity of projecting the effects of climate change, there are uncertainties attributed to climate change allowances. As a result, the guidance presents a range of possibilities to reflect the potential variation in the impact of climate change over three periods.

9.2.5 Smaller watercourses

The Environment Agency's Flood Maps may suggest that there is not a flood risk along small watercourses (watercourses with a catchment less than 3km^2). As part of a site-specific flood risk assessment the potential fluvial flood risk should be determined for these smaller watercourses and this information used as appropriate to perform the Sequential and Exception tests. This may require a developer to commission detailed flood modelling studies to quantify the risk.

9.3 Reducing flood risk

9.3.1 Site layout and design

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.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from areas of flood risk, while more flood-compatible development (e.g., vehicular parking, recreational space) can be located in higher risk areas. Whether lower vulnerability development in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning.

Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe

access to higher ground from these areas and avoid the creation of isolated islands (or 'dry islands') as water levels rise.

9.3.2 Modification of ground levels

Any proposal for modification of ground levels will need to be assessed as part of a detailed FRA.

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance or storage for flood waters. However, care must be taken as raising land above the floodplain could reduce conveyance or flood storage in the floodplain and could displace flood water downstream or onto neighbouring land. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

Compensatory flood storage should be provided and would normally be on both a level for level, volume for volume basis on land that does not currently flood but is adjacent and hydraulically and hydrologically connected to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624. Compensatory floodplain storage would not be expected for areas at risk only from tidal flooding.

Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment. Redevelopment of existing buildings within the floodplain (Flood Zone 3b) should not increase the footprint of the existing building.

Raising ground levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should consider the potential risks of increased ponding or build-up of surface runoff both to the site and on third party land.

9.3.3 Raised floor levels

The raising of internal floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The Environment Agency advises that minimum finished floor levels should be set at least 600mm above the 100-year plus climate change peak flood level, where the new climate change allowances have been used. It may be possible to reduce this to 300mm if there is a high level of certainty about the estimated flood level. If it is not possible to raise the floor levels, extra flood resistance and resilience measures will need to be included. These measures should protect the property to at least 600mm above the estimated flood level.

An additional allowance may be required to address residual risks such as blockages to a channel, culvert or bridge or risk posed by breach of existing defences. Residual risk must be considered as part of an FRA.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels. Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route.

Similarly, the use of basements should be avoided and are classed as 'highly vulnerable' development by PPG. Basement dwellings within Flood Zone 3b and 3a should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

9.3.4 Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered.

9.3.5 Developer contributions

In some cases, and following the application of the Sequential Test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS). For further information consult with the SDNPA and site specific LLFA. In addition, more information can be found within the SDNPA's **Infrastructure Delivery Plan**.

9.3.6 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and ensure access to the watercourse, structures and defences is maintained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection. At a minimum, a buffer strip of 8m is required from any Main River (16m if tidally influenced) as per Environment Agency flood risk activities guidance and regional flood defence and land drainage byelaws. Where flood defences are present, these distances should be taken from the landward toe of the defence.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult. Any development in these areas will likely require a Flood Risk Activities Permit from the Environment Agency or Land Drainage Consent from the LLFA, alongside any permission. There should be no built development within these distances from main rivers / flood defences (where present).

9.3.7 Making space for water

The PPG sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality, and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

9.3.8 Resistance and resilience measures

Developments within Flood Zones 2 and 3 or where detailed up-to-date modelling shows it will be at increased risk of flooding due to climate change should be designed and constructed to be flood resilient. Flood resistance measures include methods to prevent floodwater reaching or entering properties, such as demountable barriers. Flood resilience measures, such as installing plug sockets at a high level above the floor (above 600mm) and replacing ordinary plaster with ‘breathable’ lime-based plaster or cement-based render, aim to reduce the damage caused by flood water which has entered the property.

The consideration of resistance and resilience measures should not be used to justify development in inappropriate locations.

Having applied planning policy, there will be instances where developments, such as those that are water compatible and essential infrastructure are permitted in high flood risk areas. The above measures should be considered before resistance and resilience measures are relied on. The effectiveness of these forms of measures are often dependent on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. Where developments are in areas of surface water risk, passive measures should be favoured over active measures. The proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures are shown in Table 9-1.

Developers should refer to the CIRIA Code of practice for property flood resilience (C790) which specifies the standards which should be achieved when delivering Property Flood Resilience (PFR).

Table 9-1 Types of flood resistance and resilience measures

Measures	Description
Permanent barriers	Permanent barriers can include automatic flood doors, built up doorsteps, rendered brick walls and toughened glass barriers
Temporary barriers	Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
Community resistance measures	These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.
Flood resilience measures	These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls and fixtures.

9.4 Reducing flood risk from other sources

9.4.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised . Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

Underground rooms, such as cellars and basements, are particularly at risk of groundwater flooding due to the rise of water levels, which may lead to the seepage of water through basement floors or walls potentially resulting in large volumes of water ponding in these areas until groundwater levels recede. Basements should be avoided in areas at risk of groundwater flooding. Subsurface developments, including buildings with deep foundations, have the potential to displace groundwater and therefore increasing the risk of emergence elsewhere. This needs to be assessed in a site-specific FRA.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence and ensure that this will not be a significant risk.

The Groundwater Situation Reports are published by the Environment Agency and provide the latest update on monitored groundwater levels and whether there are any groundwater alerts or warnings in force. These are available for Hampshire[7] and Sussex[8]

Options for mitigating groundwater at varying scales have been published by the Environment Agency and are available below:

- Environment Agency Options for Mitigation of Groundwater flooding

Further assessment of the potential risk of groundwater flooding should be undertaken within a site-specific FRA.

9.4.2 Surface water and sewer

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. It is important that a Surface Water Drainage Strategy (often done as part of a Flood Risk Assessment) shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary floodproofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 1% AEP plus climate change storm event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques.

7 https://www.gov.uk/government/publications/hampshire-groundwater
8 https://www.gov.uk/government/publications/sussex-groundwater-situation

9.4.3 Reservoirs

As discussed in Section 5.7, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

- Developers should contact the reservoir owner for information on:
  - the Reservoir Risk Designation
  - reservoir characteristics: type, dam height at outlet, area/volume, overflow location
  - operation: discharge rates / maximum discharge
  - discharge during emergency drawdown; and
  - inspection / maintenance regime.
- The Environment Agency's online Reservoir Flood Maps contain information on the extents of a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975).
- The GOV.UK website on reservoirs: owner and operator requirements provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.

In addition, developers, where possible, should consult the Local Authority's webpages on emergency planning.

Developers should use the above information to:

- Apply the sequential approach to locating development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately downstream of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific emergency plans and/ or off-site plans if necessary and ensure the future users of the development are aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand.

Consideration should also be given to the potential implications of proposed development on the risk designation of the reservoir, as it is a requirement that in particular circumstances where there could be a danger to life that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such potential obligations should be identified and understood so that it can be confirmed that these can be met if proposed new development is permitted.

10 Surface Water Management and SuDS

10.1 Introduction

Sustainable Drainage Systems (SuDS) are management practices which enable surface water to be drained in a more sustainable manner and to mimic the local natural drainage. The inclusion of SuDS within developments is an opportunity to enhance ecological and amenity value, and promote Green Infrastructure, incorporating above ground facilities into the development landscape strategy.

10.2 Role of the LLFA and Local Planning Authority in surface water management

Within the SDNPA area there are multiple LLFAs, which are statutory planning consultees on surface water drainage for major development. Local planning policies and decisions on planning applications relating to major development or major commercial development should make provision for sustainable drainage systems to manage run-off where major developments are defined as:

- residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known; and
- non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres or more or, where the floor area is not yet known, a site area of one hectare or more.

When considering planning applications, local planning authorities should seek advice from the relevant flood risk management bodies, principally the LLFA on the management of surface water (including what sort of SuDS they would consider to be reasonably practicable), satisfy themselves that the proposed minimum standards of operation are appropriate and ensure, through the use of planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the development's lifetime. Judgement on what SuDS system would be reasonably practicable should be through reference to Defra's 'Non-statutory technical standards for SuDS' document and should take into account design and construction costs.

As of July 2023, the current role of the LLFA in this process is to provide technical advice on surface water drainage strategies and designs put forward for major development proposals.

10.3 Schedule 3 of the Flood and Water Management Act

The UK Government are in the process of commencing Schedule 3 of the Flood and Water Act. In January 2023, the UK Government released their report setting out the findings of a review into the implementation of Schedule 3 to The Flood and Water Management Act 2010 which outlined the possibility of LLFAs becoming SuDS Approving Body's (SABs).

This would create a new process for the approval and adoption of SuDS, separate to the planning system. At present, it is unclear when Schedule 3 of the FWMA will come into force in England.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the design brief or master-planning stage. To further inform development proposals at the master-planning stage the following guidance should be considered:

- West Sussex County Council provides the Guide for Master Planning Sustainable Urban Drainage into Developments,
- East Sussex County Council provides a Guide to Sustainable Drainage in East Sussex.
- Brighton and Hove City Council provides their Supplementary Planning Document 16 'Sustainable Drainage
- Hampshire County Council provides the Surface Water Drainage and SuDS document as well as the Surface Water Checklist Guidance document and surface water check list.

10.4 Sustainable Drainage Systems (SuDS) principles

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the design brief or master-planning stage. This will assist with the delivery of well designed, appropriate and effective SuDS. Proposals should also comply with the four pillars of SuDS design (Figure 10-1) enabling solutions that deliver multiple long-term benefits. These principles are:

- Water Quantity: should be able to cope with the quantity of water generated by the development at the agreed greenfield rate and volume with due consideration for climate change via a micro-catchment-based approach. Where frequency of flood risk, steepness of topography or permeability of geology has a significant impact on the volume or rate of surface water being discharged from a site, the LLFA should be contacted, as a review of the greenfield runoff rate to be achieved may be needed.
- Water Quality: should utilise SuDS features in a "treatment train" that will have the effect of treating the water before infiltration or passing it on to a subsequent water body
- Amenity: should integrate greenery or water features to improve the visual characteristics of the area. These can be incorporated within "open space" or "green corridors" within the site and designed with a view to performing a multifunctional purpose.
- Biodiversity: should include a range of natural features such as plants, trees and other vegetation which will provide additional filtration of surface water runoff. These can be designed to complement and improve the ecology of the area.

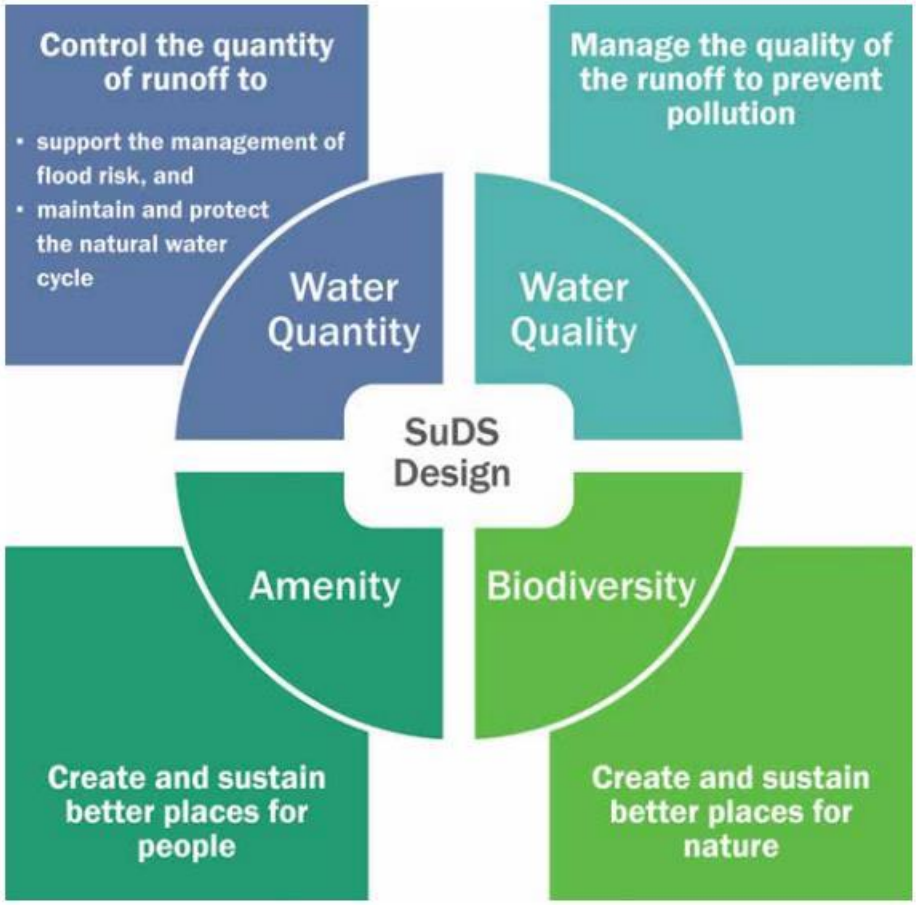


Figure 10-1 The four pillars of SuDS design – water quantity, water quality, amenity and biodiversity

There are several ways in which SuDS can be designed to meet surface water quantity, climate resilience, water quality, biodiversity and amenity goals. Given this flexibility, SuDS are generally capable of overcoming or working alongside various constraints affecting a site, such as restrictions on infiltration, without detriment to achieving these goals.

SuDS must be considered at the outset and during preparation of the initial conceptual site layout to ensure that enough land is given to design spaces that will be an asset to the development as opposed to an ineffective afterthought. For SuDS to work effectively appropriate techniques should be selected based on the objectives for drainage and the site-specific constraints. It is recommended, that on all developments, source control techniques are implemented as the first stage of a management train allowing for improvements in water quality and reducing or eliminating runoff from smaller, more frequent, rainfall events.

All new major development proposals should ensure that sustainable drainage systems for management of run-off are put in place. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme are carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential.

10.5 SuDS techniques

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage (Table 10-1). Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds and wetlands and these do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA) e.g. the CIRIA SuDS Manual C753 (2015).

Table 10-1 Examples of SuDS techniques and their potential benefits

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Living roofs	✓	✓	✓
Basins and ponds Constructed wetlands Balancing ponds Detention basins Retention ponds	✓	✓	✓
Filter strips and swales	✓	✓	✓
Infiltration devices Soakaways Infiltration trenches and basins	✓	✓	✓
Permeable surfaces and filter drains Gravelled areas Solid paving blocks Porous pavements	✓	✓	✓
Tanked systems Over-sized pipes/tanks Storm cells	✓		

10.5.1 SuDS management train

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 10-2). The number of treatment stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the groundwater or receiving waterbody. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered.

SuDS components should be selected based on design criteria and how surface water management is to be integrated within the development and landscaping setting. By using a number of SuDS features in series it is possible to reduce the flow and volume of runoff as it passes through the system as well as capturing pollutants which may be generated by a development.

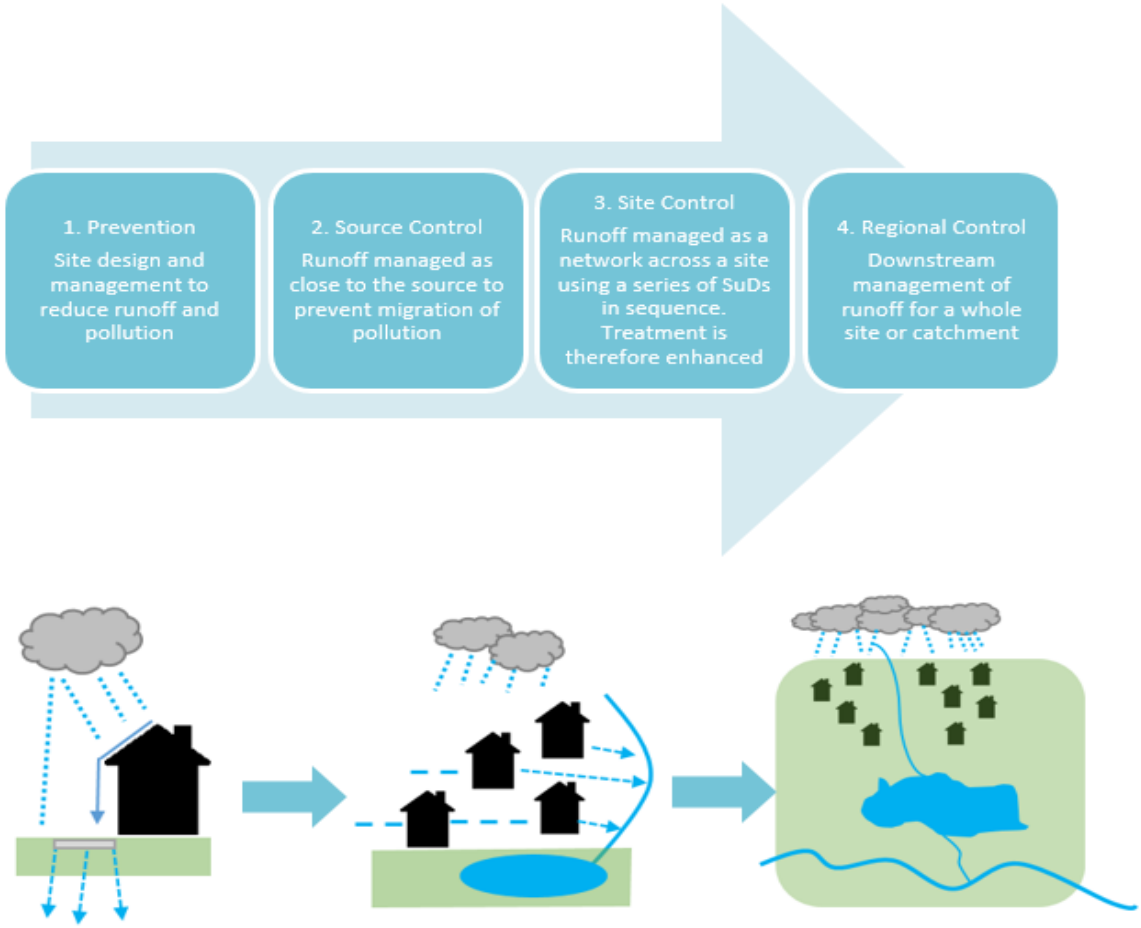


Figure 10-2 Diagram outlining the SuDS management train

10.5.2 Treatment of runoff

A key part of the four pillars of SuDS is to provide the maximum improvement to water quality through the use of the “SuDS Management Train”. To maximise the treatment within SuDS, CIRIA recommends the following good practice is implemented in the treatment process:

- Manage surface water runoff close to source: This makes treatment easier due to the slower velocities and also helps isolate incidents rather than transport pollutants over a large area.
- Treat surface water runoff on the surface: This allows treatment performance to be more easily inspected and managed. Sources of pollution and potential flood risk is also more easily identified. It also helps with future maintenance work and identifying damaged or failed components.
- Treat a range of contaminants: SuDS should be chosen and designed to deal with the likely contaminants from a development and be able to reduce them to acceptably low levels.
- Minimise the risk of sediment remobilisation: SuDS should be designed to prevent sediments being washed into receiving water bodies or systems during events greater than what the component may have been designed for.
- Minimise the impact of spill: Designing SuDS to be able to trap spills close to the source or provide robust treatment along several components in series.

The number of treatment stages required depends primarily on the source of the runoff. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered. This involves determining a pollutant hazard score for each pollutant type. An index is then used to determine the treatment potential of different SuDS features for different pollutant types. This is known as the mitigation index. The Total SuDS mitigation index should be equal or greater than the pollution hazard score to deliver adequate treatment.

10.5.3 Overcoming SuDS constraints

The design of a SuDS system will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline and detailed stages of SuDS design. Table 10-2 details some possible constraints and how they may be overcome.

Table 10-2 Potential constraints on SuDS design and how they may be overcome

Considerations	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used within features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable liner or clay to prevent the egress of water into the feature. Additional, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow pumped systems can be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.
Open space in flood risk zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Facts such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	Local Planning Authority should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for on-going maintenance over the development's lifetime.

10.6 Relevant sources of SuDS guidance

The SDNPA and subsequent LLFAs have requirements for new developers on SuDS, which are set out on their websites, alongside supporting documents as discussed in Section 10.1. At the time of writing this SFRA, documents and policies relevant to SuDS and surface water in SDNPA are:

- Planning Practice Guidance: Flood Risk and Coastal Change paragraphs 055 to 061
- South Down National Park Authority Sustainable Construction SPD
- Each LLFA's Local Flood Risk Management Strategy
- The SuDS Manual (C753)
- Defra Non-statutory technical standards for sustainable drainage systems, 2015
- Defra National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011
- Part H (Drainage and Waste Disposal) of the Buildings Regulations

10.6.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) provides up to date guidance on planning, design, construction and maintenance of SuDS. The document is designed to help the implementation of these features into new and existing developments, whilst maximising the key benefits regarding flood risk and water quality. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document. It is recommended that developers and the LPA utilise the information within the manual to help design SuDS which are appropriate for a development.

10.6.2 Non-Statutory Technical Standards for Sustainable Drainage (2015)

The Non-Statutory Technical Standards for Sustainable Drainage have been developed by Defra to sit alongside NPPF and PPG to provide non-statutory standards as to the expected design, maintenance and performance for SuDS. The LPA will refer to these standards when determining whether proposed SuDS are considered reasonably practicable and appropriate.

In March 2015, the latest guidance was released providing amendments as to what is expected by the LPA to meet the National standards. The guidance provides a valuable resource for developers and designers outlining peak flow control, volume control, structural integrity of the SuDS, and flood considerations both within and outside the development as well as maintenance and construction considerations. It considers the following: flood risk inside and outside the development, peak flow, volume control, structural integrity, designing for maintenance considerations and construction.

Further guidance has been provided by a Steering Group established by Defra, consisting of industry-wide stakeholders to provide an interpretation of the non-statutory technical standards.

10.6.3 Design and Construction Guidance for foul and surface water sewers (2019)

The Design and Construction Guidance for foul and surface water sewers, which replaces the Sewers for Adoption 7th edition, is for use by developers when planning, designing and constructing foul and surface water drainage systems. The document sets out guidance for SuDS that are intended for adoption by water companies. It provides a mechanism by which water companies can secure the adoption of a wide range of SuDS components that are complaint with the legal definition of a sewer, therefore allowing for better managed and integrated surface water systems.

10.7 Wastewater

Developers should discuss public sewerage capacity with the water utility companies (Southern Water and Thames Water) at the earliest possible stage. The development must improve the drainage infrastructure to reduce flood risk on-site and regionally.

Major developments and those upstream of areas where sewer flooding is known to be a problem must carry out wastewater capacity checks and should liaise with the sewerage undertaker at an early stage. This is to prevent an increase in sewer flooding and/or spills from combined sewer overflows (CSOs) further down the wastewater system, because of the development.

The impact of an increased volume of foul water discharge on watercourses should also be considered for large sites, or where several sites are likely to be developed in the same Sewage Treatment Works (STW) catchment, particularly where the receiving STW discharges into the same watercourse as the surface water runoff from the site.

Southern Water's Surface Water Management Policy was updated in July 2024 and the link this is provided below:

- Southern Water Surface Water Management Policy

10.8 Other surface water considerations

10.8.1 Sites of Special Scientific Interest

Natural England have designated areas as Sites of Special Scientific Interest (SSSIs) where a site has features of special interest such as its wildlife, geology and landform. There are 86 SSSIs situated either partially or entirely within the boundary of the SDNPA (Figure 10-3). A number of these sites contain important species that are reliant on the hydrological properties of the area.

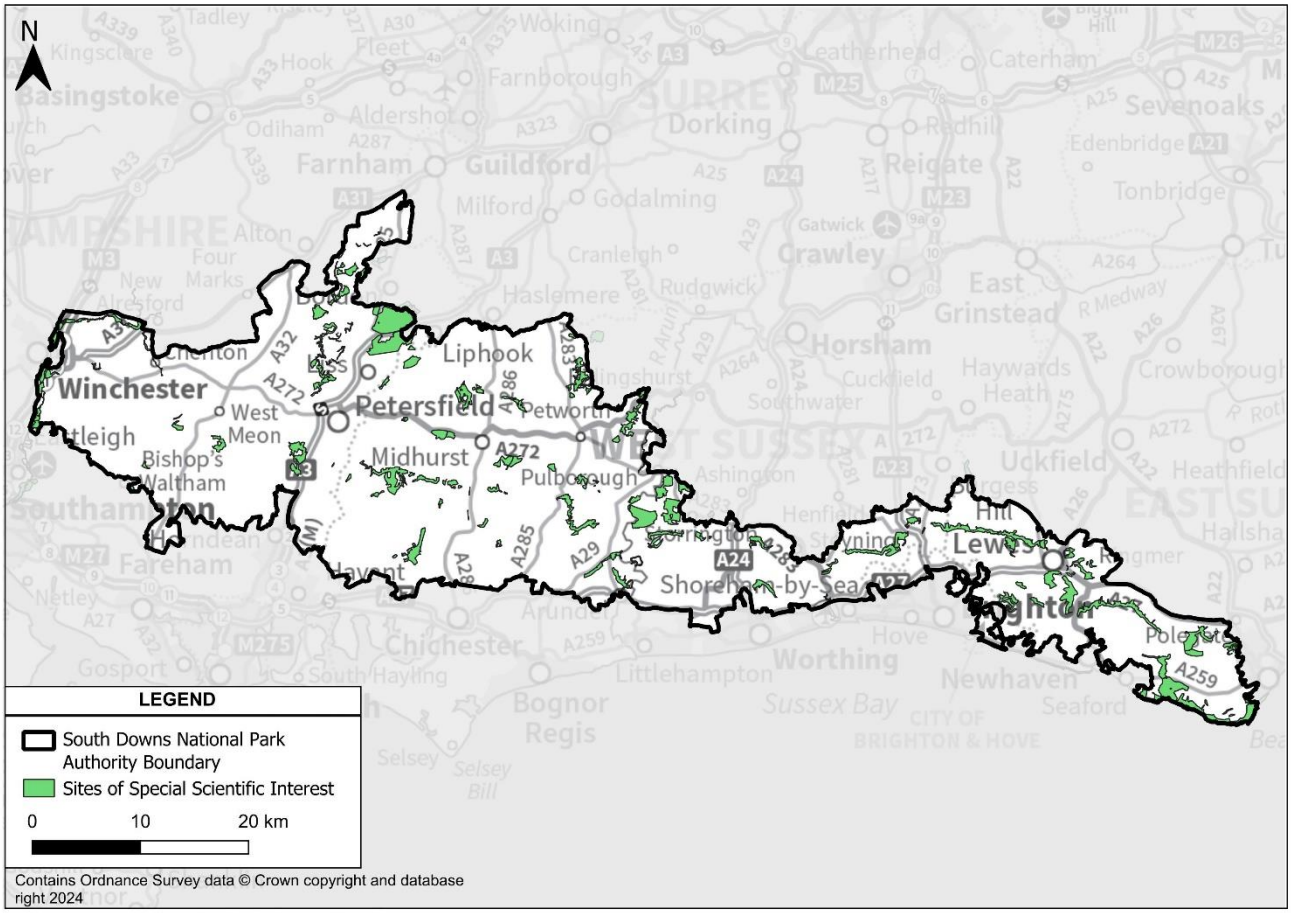


Figure 10-3 Map detailing the locations of the 86 Sites of Special Scientific Interest in the South Down National Park Authority boundary.

Mapping of these sites is available via Defra's Magic Map and should be considered when designing SuDS. Planners and developers should consult Natural England when designing sustainable drainage systems for developments within or draining to any SSSI, to learn more about any local issues that should be taken into consideration.

10.8.2 Groundwater Vulnerability Zones

The Environment Agency published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater to a pollutant discharged at a ground level based on the hydrological, hydro-ecological and soil properties within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found on Defra's interactive Magic map.

10.8.3 Groundwater Source Protection Zones

The Environment Agency also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The Environment Agency may object in principle to, or refuse to permit, some activities or developments if they have the potential to adversely affect groundwater, through SuDS, for example. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on Defra's interactive MAGiC map and within Figure 10-4.

The chalk that forms the South Downs is a Principal Aquifer and strategic groundwater resource in south of England, consequently there are numerous abstraction boreholes and GSPZs within the SDNPA area.

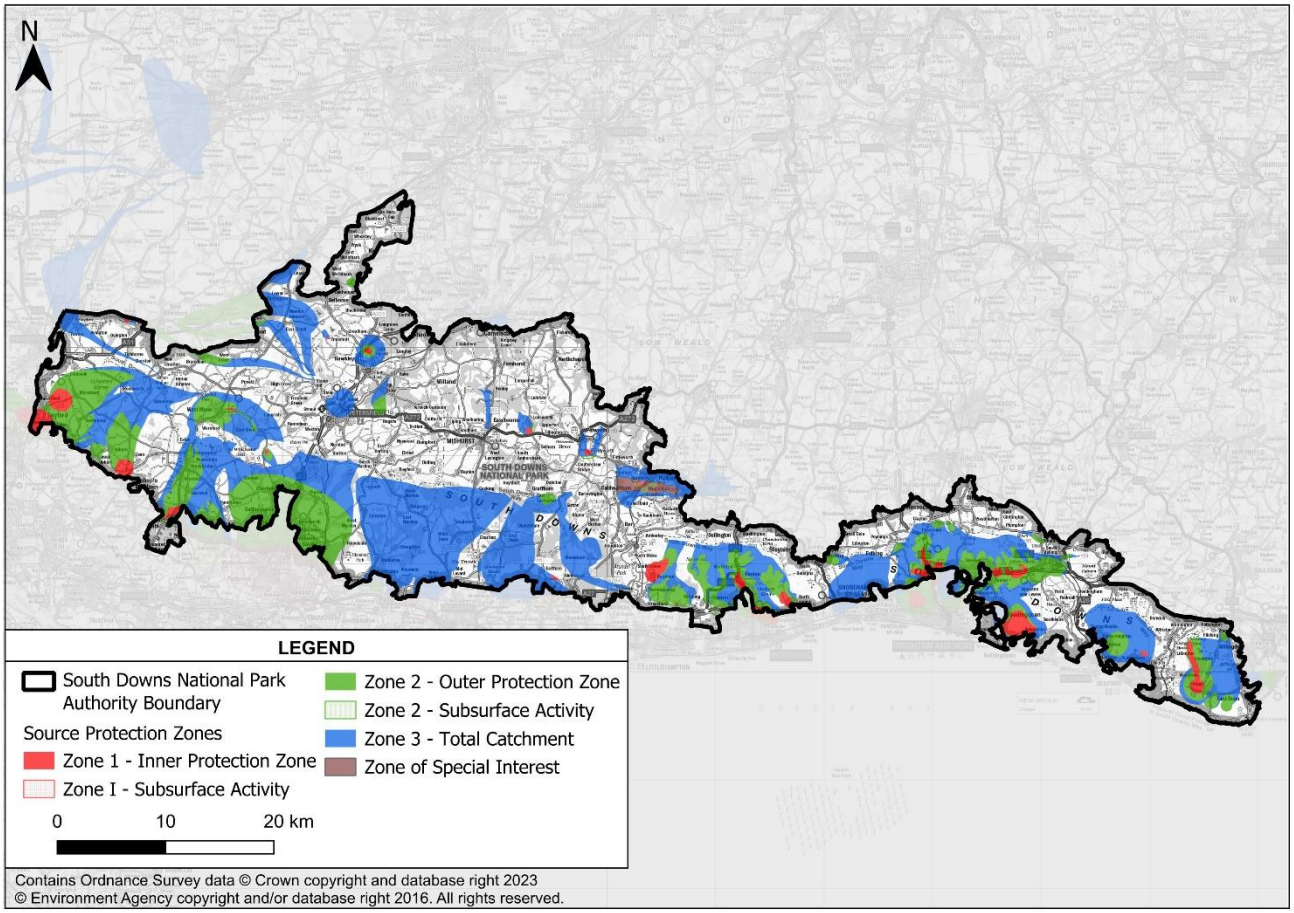


Figure 10-4 Map detailing the Groundwater Source Protection Zones in the South Down National Park Authority boundary.

10.8.4 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies.

NVZs can be viewed on the Environment Agency's interactive mapping application. There are currently 11 NVZs within the SDNPA area, as shown in Figure 10-5:

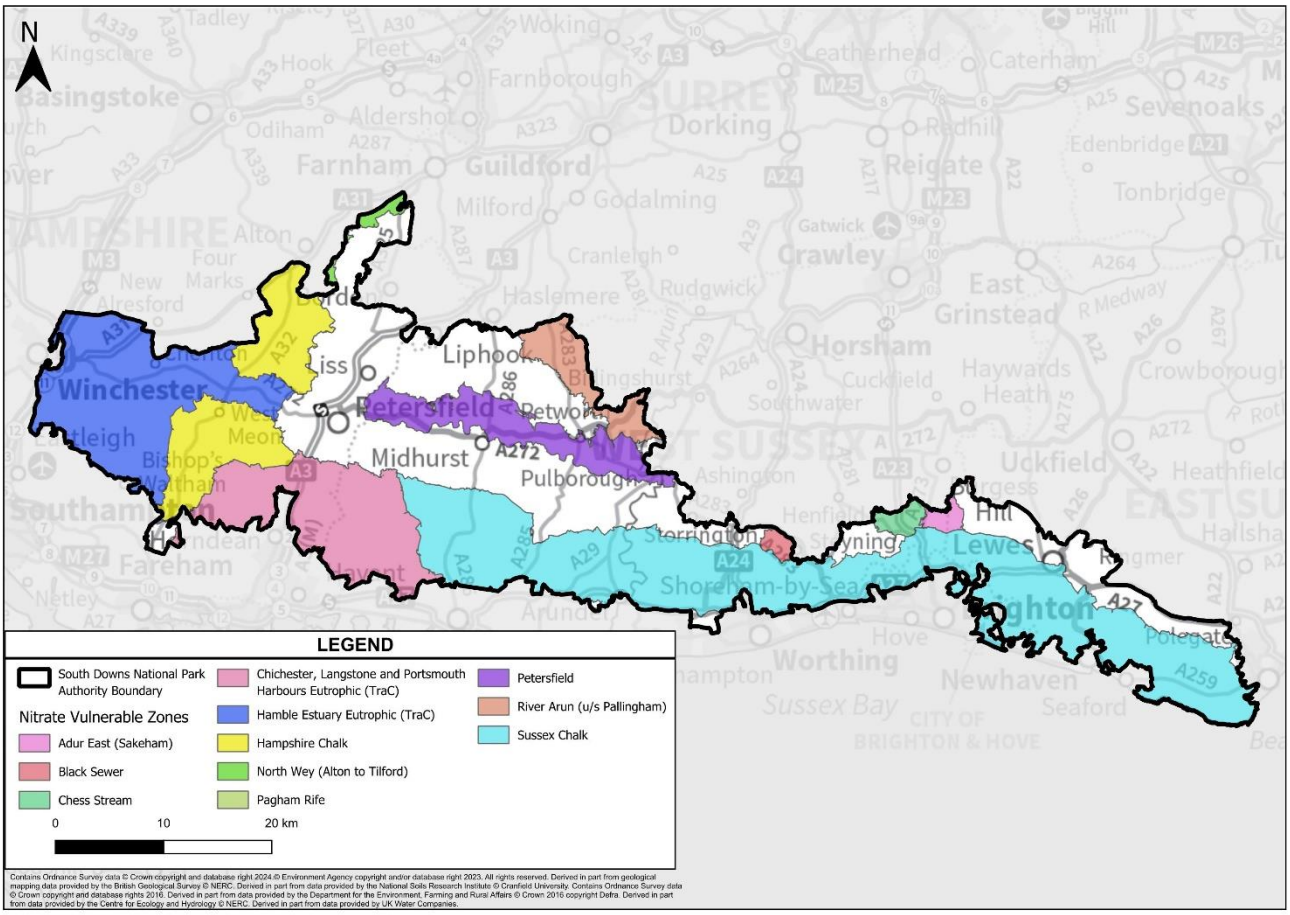


Figure 10-5 Map detailing the Nitrate Vulnerable Zones in the South Down National Park Authority boundary.

The NVZs are as follows:

- Adur East NVZ
- Black Sewer NVZ
- Chess Stream NVZ
- Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ
- Hamble Estuary Eutrophic NVZ
- Hampshire Chalk NVZ
- North Wey NVZ
- Pagham Rife
- Petersfield NVZ
- River Arun NVZ
- Sussex Chalk NVZ

Agricultural nitrate pollution in and around the SDNPA boundary could impact the nitrate levels of watercourses within the National Park. The level of nitrate contamination will

potentially influence the choice of SuDS used for development within the SDNPA boundary and should be assessed as part of the design process.

11 Flood warnings and emergency planning

11.1 Emergency planning

Emergency planning is one option to help manage flood related incidents. From a flood risk perspective, emergency planning can be broadly split into three phases: before, during and after a flood. The measures involve 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 emergency planning activities are already integrated in national building control and planning policies e.g., Table 2 of the PPG (flood risk vulnerability and flood zone 'incompatibility') seeks to avoid inappropriate development in areas at risk from all sources of flooding. Flood warning and emergency planning is a last resort after using this SFRA to undertake the Sequential Test appropriately first.

However, safety is a key consideration for any new development and includes residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures.

The Association of Directors of Environment, Economy, Planning and Transport (ADEPT) and the Environment Agency have published a Flood Risk Emergency Plans for New Development document, which provides guidance for Local Planning Authorities regarding their decisions over planning applications.

PPG outlines how developers can ensure safe access and egress to and from development to demonstrate that development satisfies the second part of the Exception Test. As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the LPA and the Environment Agency.

There are circumstances where a flood warning and evacuation plan is required and / or advised:

- It is a requirement under the NPPF that safe access and escape routes are included in an FRA where appropriate, as part of an agreed emergency plan.
- The Environment Agency and Defra's standing advice for undertaking flood risk assessments for planning applications states that details of emergency escape plans will be required for any parts of the building that are below the estimated flood level.

It is recommended that Emergency Planners at the relevant Local Authority are consulted prior to the production of any emergency flood plan.

In addition to the flood warning and evacuation plan considerations listed in the NPPF / PPG, it is advisable that developers also acknowledge the following:

- How to manage the consequences of events that are unforeseen or for which no warnings can be provided e.g., managing the residual risk of a breach.

- Proposed new development that places additional burden on the existing response capacity will not normally be considered to be appropriate.
- Developers should encourage those owning or occupying developments where flood warnings can be provided to sign up to receive these warnings. This applies even if the development is defended to a high standard.
- The vulnerability of site occupants.
- Situations may arise where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain “in-situ” and / or move to a higher floor or safe refuge area (e.g. at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where applicable, a site-specific Flood Risk Assessment to help develop emergency plans.

Further emergency planning information links:

- 2004 Civil Contingencies Act
- Defra (2014) National Flood Emergency Framework for England
- Sign up for Flood Warnings with the Environment Agency
- National Flood Forum
- UK Government – make a Flood Plan guidance and templates
- FloodRe

11.2 Flood warning systems

Flood warnings can be derived and, along with evacuation plans, can inform emergency flood plans or flood response plans. The Environment Agency is the lead organisation for providing warnings of fluvial flooding (for watercourses classed as Main Rivers) and coastal flooding in England. Flood Warnings are supplied via the Flood Warning Service (FWS), to homes and business within Flood Zones 2 and 3. The different levels of warnings are displayed in Table 11-1.

Table 11-1 The Environment Agency's flood warning symbols and a short explanation of each of them describe

Flood Warning Symbol	What it means	What to do
 **Flood Alert**	Flood Alerts are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advance notice of the possibility of flooding, but before there is full confidence that flooding in Flood Warning Areas is expected.	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on the Environment Agency website. Stay tuned to local radio or TV. Alert your neighbours. Check pets and livestock. Reconsider travel plans.
 **Flood Warning**	Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Seal up ventilation system if safe to do so. Put flood protection equipment in place. Be ready should you need to evacuate from your home. 'Go In, Stay In, Tune In'
 **Severe Flood Warning**	Severe Flood Warnings warn people of expected severe flooding where there is a significant threat to life.	Stay in a safe place with a means of escape. Co-operate with the emergency. services and local authorities. Call 999 if you are in immediate danger.

Flood Warning Symbol	What it means	What to do
Warning no longer in force	Informs people that river or sea conditions begin to return to normal and no further flooding is expected in the area. People should remain careful as flood water may still be around for several days.	Be careful. Flood water may still be around for several days. If you've been flooded, ring your insurance company as soon as possible.

It is the responsibility of individuals to sign-up to the Flood Warning Service in order to receive the flood warnings via FWS. Registration and the service is free and publicly available through https://www.gov.uk/sign-up-for-flood-warnings or by calling 0345 988 1188.

It is recommended that any household considered at risk of flooding signs-up. Developers should also encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.

There are currently 32 Flood Alert Areas (FAAs) and 40 Flood Warning Areas (FWAs) wholly or partially within the SDNPA area, as mapped in Appendix F.

11.3 Emergency planning and development

11.3.1 The PPG

Table 2 of the PPG (flood risk vulnerability and flood zone 'incompatibility') seeks to avoid inappropriate development in areas at risk from all sources of flooding. It is essential that any development which will be required to remain operational during a flood event is located in the lowest flood risk zones to ensure that, in an emergency, operations are not impacted on by flood water or that such infrastructure is resistant to the effects of flooding such that it remains serviceable/operational during 'upper end' events, as defined in the Environment Agency's Climate Change allowances (July 2021). For example, the NPPF classifies police, ambulance and fire stations and command centres that are required to be operational during flooding as Highly Vulnerable development, which is not permitted in Flood Zones 3a and 3b and only permitted in Flood Zone 2 providing the Exception Test is passed. Essential infrastructure located in Flood Zone 3a or 3b must be operational during a flood event to assist in the emergency evacuation process. All flood sources such as fluvial, surface, groundwater, sewers and artificial sources (such as canals and reservoirs) should be considered. In particular sites should be considered in relation to the CDAs highlighted in the relevant SWMPs.

The outputs of this SFRA should be compared and reviewed against any emergency plans and continuity arrangements. This includes the nominated rest and reception centres (and prospective ones), so that evacuees are outside of the high-risk Flood Zones and will be safe during a flood event.

11.3.2 Safe access and egress

The PPG outlines how developers can secure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test. Access considerations should include the voluntary and free movement of people during a 'design flood event' as well as for the potential of evacuation before a more extreme flood, considering the effects of climate change for the lifetime of the development. Access and escape routes need to be designed to be functional for changing circumstances over the lifetime of development. Specific guidance in Paragraph 047 of the PPG include:

- Access routes should allow occupants to safely access and exit their dwellings in design flood conditions. Vehicular access to allow the emergency services to safely reach the development during design flood conditions will also normally be required in addition to the requirements of the building regulations.
- Wherever possible, safe access routes should be provided that are located above design flood levels and which avoid flow paths. Where this is not possible, limited depths of flooding may be acceptable, provided that the proposed access is designed with appropriate signage etc. to make it safe. The acceptable flood depth for safe access will vary depending on flood velocities and the risk of debris within the flood water. Even low levels of flooding can pose a risk to people in situ (because of, for example, the presence of unseen hazards and contaminants in floodwater, or the risk that people remaining may require medical attention).
- Safe access and egress will need to be provided in the design event for all sources of flooding (including surface water), considering the likely depth, velocity and hazards. Whilst a site itself may be at low risk from all sources, it is important that access and egress remains possible during a flood event noting that surface water flowpaths often naturally follow road networks.
- Where a failure of flood risk management infrastructure would result in flooding with a speed-of-onset that would not allow sufficient time for safe access and escape, an internally accessible place of safety, capable of accommodating the likely number of occupants or users of the proposed development should also be provided. Local planning authorities should consider whether the development can be considered safe given the predicted duration of flooding and the vulnerability of occupants/users. In doing so, local planning authorities should account for the likely impacts of flooding on essential services such as electricity, gas, telecommunications, water supply and sewerage. Any place of safety needs to be designed to facilitate rescue in case emergency care is needed or if it is

unlikely to be safe for occupants/users to wait until flood waters have receded sufficiently for safe access/escape to be possible.

- The depth, velocity and hazard mapping from hydraulic modelling should help inform the provision of safe access and egress routes.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the SDNPA and the Environment Agency. Site and plot specific velocity and depth of flows should be assessed against standard hazard criteria to ensure safe access and egress can be achieved.

11.3.3 Potential evacuations

During flood incidents, evacuation may be considered necessary. Paragraph 044 of the PPG states that the practicality of safe evacuation from an area will depend on:

- the type of flood risk present, and the extent to which advance warning can be given in a flood event;
- the number of people that would require evacuation from the area potentially at risk;
- the adequacy of both evacuation routes and identified places that people from evacuated places use/are taken to (and taking into account the length of time that the evacuation may last); and
- sufficiently detailed and up to date multi-agency flood plans being in place for the locality that address these and related issues. These are prepared by local resilience forums.

In the SDNPA area, the Sussex Resilience Forum and Hampshire and Isle of White Resilience Forum are the local resilience forum.

The vulnerability of the occupants is also a key consideration. The NPPF and application of the Sequential Test aims to avoid inappropriate development in flood risk areas. However, developments may contain proposals for mixed use on the same site. In this instance, the PPG (Para 004) states that layouts should be designed so that the most vulnerable uses are restricted to higher ground at lower risk of flooding, with development which has a lower vulnerability (parking, open space etc.) in the highest risk areas, unless there are overriding reasons to prefer a different location. Where the overriding reasons cannot be avoided, safe and practical evacuation routes must be identified.

The Environment Agency and Defra provide standing advice for undertaking flood risk assessments for planning applications. Please refer to UK Government guidance for the criteria on when to follow the standing advice. Under these criteria, you will need to provide details of emergency escape plans for any parts of the building that are below the estimated flood level. As per UK Government guidance for preparing a flood risk assessment: standing advice the plans should show:

- that any single storey buildings or ground floors without access to upper floors can access a safe refuge above the estimated flood level.

- that any basement rooms have clear internal access (for example a staircase) to an upper floor above the estimated flood level.
- a safe route of access and escape which is set above the estimated flood level and connects the site to an area away from flood risk.

Situations may arise where occupants cannot be evacuated (e.g., prisons) or where it is safer to remain “in-situ” and / or move to a higher floor or safe refuge area (e.g., developments located immediately behind a defence and at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where applicable, a site-specific Flood Risk Assessment to help develop appropriate emergency plans.

11.3.4 Flood warning and evacuation plans

Flood warning and evacuation plans are potential mitigation measures to manage the residual risk, as stated in the NPPF and accompanying PPG. It is a requirement under the NPPF/PPG that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g., hostels and hotels).

A flood warning and evacuation plan should detail arrangements for site occupants on what to do before, during and after a flood as this will help to lessen its impact, improve flood response and speed up the recovery process. The Environment Agency provides practical advice and templates on how to prepare flood plans for individuals, communities and businesses (see text box below for useful links).

It is recommended that emergency planners at the local authorities are consulted prior to the production of any emergency flood plan. The LLFA will provide guidance to help local communities to protect their home and valuables and understand what to do before, during and after a flood.

Once the emergency flood plan is prepared, it is recommended that it is distributed to emergency planners at each local authorities and the emergency services. When developing a flood warning and evacuation plan, it is recommended that it links in with any existing parish / community level plan. Parish Councils should be contacted to establish if a community level plan exists for an area.

Guidance documents for preparation of flood response plans.

- Environment Agency (2012) Flooding – minimising the risk, flood plan guidance for communities and groups
- Environment Agency (2014) Community Flood Plan template
- Environment Agency Personal flood plans
- ADEPT and the Environment Agency (2019) - Flood Risk Emergency Plans for New Development

12 Level 1 summary assessment of potential development locations

12.1 SFRA site screening

A total of 496 sites were provided by the SDNPA. They have been screened against a suite of available flood risk information and spatial data to provide a summary of risk to each site (see Appendix G).

The information considered includes the flood risk datasets listed below:

- Environment Agency Flood Zones 1, 2 and 3
- Flood Zone 3b
- Environment Agency Risk of Flooding from Surface Water
- Risk of Flooding from Surface Water plus climate change
- JBA Groundwater Flood Map
- EA Reservoir flood extent
- Environment Agency Historic Flood Map

A site screening spreadsheet has been prepared which identifies the proportion of each site that is affected by the different sources of flooding. The information provided is intended to enable a more informed consideration of the sites when applying the sequential approach. The site screening spreadsheet has been used to determine whether more detailed assessment of sites is needed to further identify those that should be taken forward as potential development allocations for a Level 2 assessment.

13 Recommendations

13.1 For the South Downs National Park Authority

13.1.1 Policy Recommendations

The following recommendations are made which can be incorporated into policies within the SDNPA new local plan.

Buffer Strips Policy

An undeveloped buffer strip should be retained from the edge of bank of any Main River or tidally influenced watercourse. At a minimum, an 8m buffer strip should be retained for Main Rivers and Ordinary Watercourses and a 16m buffer should be retained for tidally influenced watercourses. Where flood defences are present, the same distances should be applied from the landward toe of the defence.

Opportunities should be sought on a site-by-site basis to increase these buffer distances to 'make space for water', allowing additional capacity to accommodate climate change.

Site-specific Flood Risk Assessments

When a site-specific FRAs is required to be produced it should be undertaken in-line with the Governments FRA: applying for planning permission at Flood risk assessments: applying for planning permission - GOV.UK.

Developers should consult with the SDNPA, appropriate LLFA, the EA, and Southern or Thames Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

Flood Risk Assessments for development within the Climate Change Impact Zone

To ensure the risk of flooding in the future is considered, if development is proposed within the Climate Change Impact Zone shown within the Appendix A maps, the risk of flooding should be considered further in a site-specific Flood Risk Assessment.

Surface Water Drainage Strategies and SuDS

Space should be provided for the inclusion of SuDS on all developments, including outline proposals and full planning applications. SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. water quality, landscape enhancement, biodiversity, recreation, amenity, leisure.

SuDS must be designed appropriately for the area. Large parts of the SDNPA area are underlain by chalk geology; therefore, infiltration SuDS may not be appropriate in these areas. Infiltration testing must be undertaken to determine whether infiltration rates are suitable for the use of infiltration SuDS. Where sites lie within or close to groundwater source protection zones (GSPZs) or aquifers, there may be restrictions on infiltration SuDS and guidance should be sought from the LLFA and the EA. Additionally, mitigation

measures may be required to ensure groundwater sources are not contaminated as a result of surface water runoff and infiltration.

Internal Drainage Boards

When carrying out development within the Arun Internal Drainage Board district, agreement should be sought to regarding matters relating to flood risk management and surface water drainage design.

13.1.2 Requirements for a Level 2 SFRA

Following the application of the sequential test, where sites cannot be appropriately accommodated in low-risk areas, the SDNPA will apply the NPPF's exception test. In these circumstances, a Level 2 SFRA may be required, to assess in more detail the nature and implications of the flood characteristics.

As part of this Level 1 SFRA, an initial site screening exercise using site boundaries and flood risk data has been undertaken for the SDNPA to help inform the application of the sequential test and subsequent potential requirement for a Level 2 SFRA.

13.2 For developers

Developers should follow the national guidance and policy requirements and recommendations as provided on their website. Guidance should also be followed for the relevant LLFA, IDB and SDNPA Local Plan Policies.

13.3 Updates to SFRA

SFRAs are high-level strategic documents and, as such, do not go into detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation.

Over time, new information will become available to inform planning decisions. When using the SFRA to prepare FRAs it is important to check that the most up to date information is used.

The EA regularly reviews its hydrology, hydraulic modelling, and flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

The EA are currently producing new national flood risk mapping (NaFRA2) which is expected to be available in 2025, although these timescales are subject to change due to the complexities of the project.
Developers should check the online Flood Map for Planning (gov.uk) in the first instance to identify any major changes to the Flood Zones and the long-term flood risk mapping portal for any changes to flood risk from surface water or inundation from reservoirs.

Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by RMAs.

Appendix A – Flood Risk Mapping

Appendix B – Data Sources

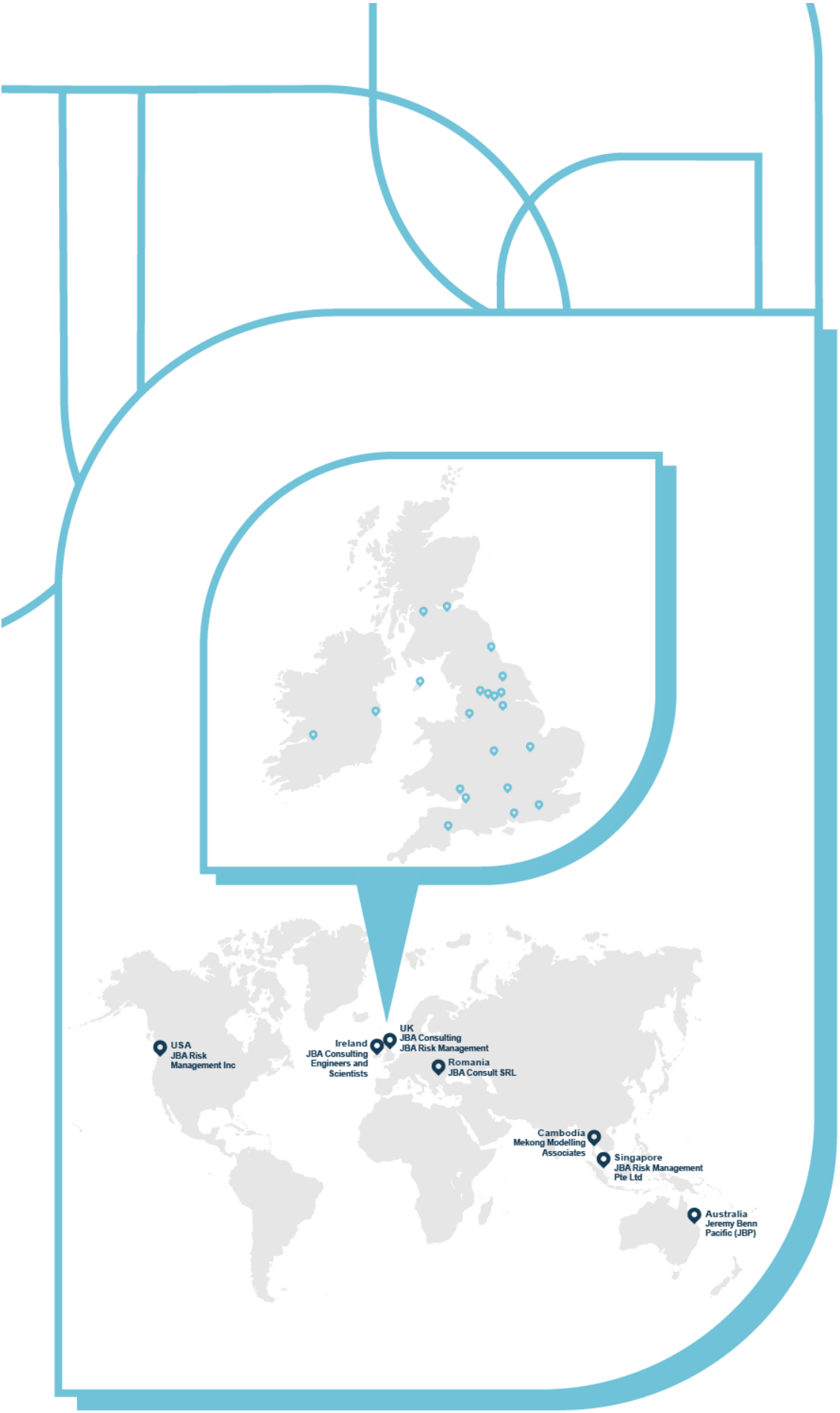
Appendix C – Sequential Test Guidance

Appendix D – Flood risk to key settlements

Appendix E- Cumulative Impact Assessment

Appendix F- Flood Warnings and Flood Alerts

Appendix G- Site Screening



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