New Forest District Council & New Forest National Park Authority

Level 1 Strategic Flood Risk Assessment

Phase Four report: Main Report

October 2017

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Revision History

Revision Ref / Date Issued	Amendments	Issued to
Version 1 / August 2017	-	Andrew Herring (New Forest District Council) and David Illsley (New Forest National Park Authority)
Version 2 / October 2017	Amendments made following comments received from New Forest District Council and New Forest National Planning Authority of 6 October 2017	Andrew Herring (New Forest District Council) and David Illsley (New Forest National Park Authority)

Contract

This report describes work commissioned by New Forest District Council and New Forest National Park Authority, on behalf of David Illsley, by a letter dated 20 September 2016. New Forest District Council's representative for the contract was Andrew Herring and New Forest National Park Authority's representative for the contract was David Illsley. Kristie Darling, Georgina Latus, Aaron Barber, Ffion Wilson and Ben Gibson of JBA Consulting carried out this work.

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Purpose

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JBA Consulting has no liability regarding the use of this report except to New Forest District Council and New Forest National Park Authority.

Acknowledgements

We would like to acknowledge the assistance of:

- New Forest District Council and New Forest National Park Authority
- The Lead Local Flood Authorities (Hampshire County Council and Wiltshire Council)
- The Environment Agency
- Southern Water
- Wessex Water

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Executive Summary

Introduction

New Forest District Council and New Forest National Park Authority have commissioned a Level 1 Strategic Flood Risk Assessment (SFRA) to provide a comprehensive evidence base to support the production of their respective Local Plans. This updated SFRA replaces the Level 1 SFRA published by New Forest District Council and New Forest National Park Authority in 2007. This report includes appropriate information contained in the PUSH SFRA covering the 'Solent' area and the Isle of Wight.

The SFRA has been prepared in a series of phases and this report is prepared under Phase 4 and draws on outputs prepared during Phases 1-3.

SFRA objectives

The updated SFRA update (2017 SFRA) will be used within decision making and to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

The key objectives of the review performed during the preparation of the 2017 SFRA are:

1. To take into account the latest flood risk policy
2. Take into account the latest flood risk information and available data
3. To provide individual flood risk analysis for sites identified by the Council and the National Park Authority as part of their respective Local Plan preparation.
4. To provide a comprehensive set of maps displaying flood risk information

SFRA Outputs

There are two levels of SFRA, described as follows:

- Level 1 – performed where flooding is not a major issue and where development pressures are low.
- Level 2 – Where it is not possible to find enough land for Plan allocations at locations outside of flood risk and so more detailed information is required to understand how the safety of the allocations might be affected (the Exception Test).

This report fulfils Level One SFRA requirements.

To meet the objectives, the following outputs have been prepared:

- Assessment of all potential sources of flooding
- Mapping of location and extent of functional floodplain
- Assessment of standard of protection provided by existing flood risk management infrastructure
- Assessment of the potential impact of climate change on flood risk
- Assessment of locations where additional development may increase flood risk elsewhere
- Identification of critical drainage areas and recommendations on potential need for Surface Water Management Plans
- 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.
- Guidance for developers including requirements for site specific flood risk assessments and the process for flood map challenges.

Summary of Level 1 Assessment

Appraisal of flood risk

- There have been several recorded flood incidents across the study area, from a combination of sources. The prominent source of flooding is fluvial with a significant influence from tidal conditions. More recent events, investigated by the Lead Local Flood Authorities (LLFAs) under Section 19 of the Flood and Water Management Act, indicates that flood events have been associated with exceedance of the capacity of the sewer network.
- There are several watercourses in the study area which are identified to contribute to fluvial flood risk. Flooding may not be from one watercourse alone. Often the combination of watercourses and the interaction of two or more sources of out of bank flow across the floodplain can have profound implications for the extent of the risk (e.g. Dockens Water and the River Avon).
- The study area is bound by the Solent and Christchurch Bay to the south and Southampton Water and the Tidal River Test to the east and as such there is a tidal flood risk. In addition, many river networks discharge into the sea. The combination of high tides and high river levels, can result in the tidal locking as the rivers are unable to discharge. There is also the possibility that tidal defences can fail or be overtopped. The assessment of the 'residual' risk of defence failure should be considered on a site by site basis.
- Coastal erosion is a prominent process along much of the study area's coast. Defences form a very important aspect of the control of the physical coastline.
- The Risk of Flooding from Surface Water (RoFSW) dataset shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas.
- Groundwater flooding is an issue in the Hampshire Avon Catchment at times of high water level in the watercourses.
- Historical incidents of flooding are detailed by Southern Water and Wessex Water. This database records incidents of flooding relating to public foul, combined or surface water sewers and identifies which properties suffered flooding. A total of 266 recorded flood incidents have been identified in the study area.
- There are no records of flooding from reservoirs impacting properties inside the study area.
- There are currently 13 Flood Alert Areas and 16 Flood Warning Areas in the study area.

Flood defences

There are a number of EA fluvial flood defences located throughout the study area. The standard of protection provided by these assets varies as does the condition. There are also tidal flood defences and coastal protection measures.

Development and flood risk

The Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments (FRAs) have been documented, along with guidance for planners and developers. Links have been provided for various guidance documents and policies published by other Risk Management Authorities such as the (LLFAs) and the Environment Agency (EA).

Relevant studies

There are many relevant regional and local key studies which complement the SFRA and have been considered, such as the Shoreline Management Plans, the Catchment Flood Management Plan, River Basin Management Plan, the Preliminary Flood Risk Assessment, Flood Risk Management Plan and Local Flood Risk Management Strategies. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management

Policy Recommendations

The following policy recommendations are to be considered by New Forest District Council and New Forest National Park Authority in the development of the Local Plan.

Development and planning considerations

Sequential approach to development

It is recommended that the sequential approach is adopted for all future developments within the study area.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site.

Sequential and Exception tests

The SFRA has identified that areas of New Forest District and National Park that are at high risk of flooding from tidal, fluvial and surface water sources. Therefore, proposed development sites at such locations will be required to satisfy the Sequential and, where necessary, Exception Tests in accordance with the NPPF. New Forest District Council and New Forest National Park Authority will use the information in this SFRA when deciding which development sites to take forward in their respective Local Plans.

Site-specific Flood Risk Assessments

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), to inform development zoning within the site and prove, if required, whether the Sequential and Exception Tests are satisfied (for windfall sites not included in the plan, evidence on the Sequential Test must be submitted in FRAs). Where a site-specific FRA has produced modelling outlines which differ from the Flood Map for Planning then a full evidence based review would be required. Where the watercourses are embanked, the effect of overtopping and breach must be considered and appropriately assessed.

All new development within the 1% AEP flood extent including an allowance for climate change (for the lifetime of the development) must not normally result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage. 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. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided so the total volume of the floodplain storage is not reduced.

There are several guidance documents which provide information on the requirements for site-specific FRAs:

- **Standing Advice on Flood Risk (Environment Agency)**
- **Flood Risk Assessment for Planning Applications (Environment Agency)**
- **Site-specific Flood Risk Assessment: CHECKLIST (NPPG, Defra)**

Developers should consult with New Forest District Council, New Forest National Park, the relevant LLFA, the Environment Agency and Wessex Water or Southern Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

Surface water management and SuDS

- Planners should be aware of the conditions and local requirements set by Hampshire County Council or Wilshire County (the LLFAs), for surface water management for major and minor developments and ensure development proposals and applications are compliant with the LLFAs policy.
- Hampshire County Council provide a **check list** for developers to assist in providing the correct information for planning applications.

- **Hampshire County Council's Surface Water and Sustainable Drainage: Guidance for Developers, Designers and Planners** and **Wiltshire Council's Developers Guidance Note: Flood Drainage and SuDS** details the LLFAs expectation on the SuDS disposal destination and state that the drainage hierarchy is to be followed.
- All new development should aim to minimise areas of impermeable ground to reduce surface water runoff and SuDS should be used on all new development, unless it is proved unfeasible
- It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will reduce the risk of flooding to properties from surface water, so development is safe. A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff
- At some locations a site-specific infiltration test should be conducted early on as part of the design of the development, to confirm whether the water table is low enough to allow for SuDS techniques that are designed to encourage infiltration.
- Where sites lie within or close to Groundwater Source Protection Zones or aquifers, treatment steps may be required ahead of discharge to the ground, sewers etc. Development proposals at sites across the area should assess the pollution risk to receiving water-bodies, and include appropriate treatment steps ahead of any discharge to surface or groundwaters. The CIRIA SuDS manual provides further guidance on this issue. The LLFA have published information relating to infiltration tests within their guidance document
- Consideration must also be given to residual risk (exceedance flows) and maintenance of sustainable drainage and surface water systems

Review of planning applications

New Forest District Council and New Forest National Park Authority should consult the Environment Agency's '**Flood Risk Assessment: Local Planning Authorities**', last updated 28 February 2017, when reviewing planning applications for proposed developments at risk of flooding. The Council and National Park Authority will consult the relevant statutory consultees as part of the planning application assessment and they may, in some cases, also contact non-statutory consultees (e.g. Wessex Water or Southern Water) that have an interest in the planning application

Infrastructure and safe access

Finished floor levels and safe access

Minimum finished floor levels for development should be above whichever is higher of the following:

- a minimum of 600mm above the 1% AEP fluvial event plus an allowance for climate change and an appropriate allowance for freeboard
- a minimum of 600mm above the 0.5% AEP tidal event plus an allowance for climate change and an appropriate allowance for freeboard
- 300mm above the general ground level of the site.

If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches.

Safe access and egress will need to be demonstrated at all development sites. Emergency vehicular access should be possible during times of flood.

Where development is located behind, or in an area benefitting from, defences, consideration should be given to the potential safety of the development, finished floor levels and the potential for safe access and egress in the event of rapid inundation of water due to a defence breach with little warning.

Resilience measures will be required if buildings are situated in the flood risk area, and opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought.

Residual risk

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse. Residual risks should be considered as part of site-specific Flood Risk Assessments

Further, any developments located within an area protected by flood risk management measures, where the condition of those defences is 'fair' or 'poor', where the standard of protection is not of the required standard or where the failure of the intended level of service gives rise to unsafe conditions should be identified.

Future flood management

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted.

The information provided in the SFRA should be used as a basis for investigating potential strategic flood risk solutions within the study area. Opportunities could consist of the following:

- Catchment and floodplain restoration;
- Flood storage areas;
- Opening up culverts, weir removal, and river restoration; and
- Green infrastructure

For successful future flood risk management, it is recommended that local planning authorities adopt a catchment partnership working approach in tackling flood risk and environmental management.

Potential modelling improvements

The Environment Agency regularly reviews its 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.

Use of Strategic Flood Risk Assessment data

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. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

The Environment Agency 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. It should be noted that the Environment Agency's Flood Zones, on their Flood Map for Planning website, may differ to the maps in the SFRA for a short period of time, whilst new modelling is incorporated into the Environment Agency's flood maps.

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

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Using this document

Hyperlinks

Hyperlinks have been provided where there are useful reference points. These are shown as **green bold text.**

Abbreviations and Glossary of Terms

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability
AONB	Area of Outstanding Natural Beauty
AStGWF	Areas Susceptible to Groundwater Flooding
Brownfield	Previously developed parcel of land
CFMP	Catchment Flood Management Plan - A high-level planning strategy through which the Environment Agency works with its key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Defra	Department for Environment, Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environment Agency
EC	European Commission
ESWSL	Extreme Still Water Sea Level
EU	European Union
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river
FRA	Flood Risk Assessment - A site specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FWMA	Flood and Water Management Act
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FZ	Flood Zones
GIS	Geographical Information System
Greenfield	Undeveloped parcel of land
Ha	Hectare
IDB	Internal Drainage Board
Indicative Flood Risk Area	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.
ISIS	Hydrology and hydraulic modelling software
JBA	Jeremy Benn Associates
LFRMS	Local Flood Risk Management Strategy

LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
M AOD	metres Above Ordnance Datum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
Major development	Residential development: 10 dwellings or more, or site area of 0.5 hectares or more is dwelling numbers are unknown. 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 flood area is not yet known, a site area of one hectare or more.
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NRD	National Receptor Database
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
OS NGR	Ordnance Survey National Grid Reference
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
PPG	National Planning Policy Guidance
RBMP	River Basin Management Plan
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
RoFSW	Risk of Flooding from Surface Water
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
SSSI	Site of Special Scientific Interest
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
TUFLOW	Two-dimensional Unsteady FLOW (a hydraulic model)
WFD	Water Framework Directive

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> "*Local Plans should be supported by a strategic flood risk assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change*". (National Planning Policy Framework, paragraph 100)

This Strategic Flood Risk Assessment (SFRA) document replaces the Level 1 SFRA published by New Forest District Council and New Forest National Park Authority in 2007 and includes, as appropriate information contained in the PUSH SFRA covering the 'Solent' area and the Isle of Wight. The SFRA study area is shown in Figure 1-1. This report replaces the content that was included in the previous SFRA, integrates as appropriate information contained in the PUSH SFRA and provides a comprehensive evidence base to support the production of Local Plans being prepared for the administrative areas of the New Forest District Council and New Forest National Park Authority.

The updated SFRA (2017 SFRA) will be used within decision making and to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

The key objectives of the review performed during the preparation of the 2017 SFRA are:

1. To take into account the latest flood risk policy
2. Take into account the latest flood risk information and available data
3. To provide individual flood risk analysis for sites identified by the two local planning authorities as part of their respective Local Plan preparation.
4. To provide a comprehensive set of maps displaying flood risk information

Updated information is available to inform the SFRA, including changes to each of the datasets which inform flood risk and guidance and policy documents.

1.2 SFRA structure

This Phase 4 report is a compilation of previous work carried out in the preceding phases of the Level 1 SFRA, described as follows:

- Phase 1: Data review and method statement
- Phase 2: Flood risk mapping
- Phase 3: Site summary sheets

1.3 Levels of SFRA

The Planning Practice Guidance advocates a tiered approach to risk assessment and 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 application of the Sequential Test.
2. Level Two: where land outside Flood Zones 2 and 3 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 a Flood Zone and assessment of other sources of flooding.

This report fulfils Level One SFRA requirements.

1.4 SFRA outputs

To meet the objectives, the following outputs have been prepared:

- Assessment of all potential sources of flooding
- Mapping of location and extent of functional floodplain
- Assessment of standard of protection provided by existing flood risk management infrastructure
- Assessment of the potential impact of climate change on flood risk
- Assessment of locations where additional development may increase flood risk elsewhere
- Identification of critical drainage areas and recommendations on potential need for Surface Water Management Plans
- 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.
- Guidance for developers including requirements for site specific flood risk assessments and the process for flood map challenges.

1.5 SFRA user guide

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed.
2. The Planning Framework and Flood Risk Policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.
3. The Sequential, risk based approach	Describes the Sequential Approach and application of Sequential and Exception Tests.
4. Climate change	Outlines climate change guidance and the implications for the joint SFRA area.
5. Sources of information used in preparing the SFRA	Outlines what information has been used in the preparation of the SFRA.
6. Understanding flood risk in New Forest District and New Forest National Park	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting the SFRA area. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered.
7. Flood and coastal defences	Assessment of residual risk from flood defences, including future protection from climate change.
8. FRA requirements and flood risk management guidance	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Provides guidance for developers and outlines conditions set by the LLFA that should be followed.
9. Surface water management and SuDS	Advice on managing surface water run-off and flooding.
10. Flood warning and emergency planning	Outlines the flood warning service in the joint SFRA area and provides advice for emergency planning, evacuation plans and safe access and egress.
11. Strategic Flood Risk Solutions	Summary of strategic flood risk solutions to managing flood risk.
12. Level 1 assessment of potential development sites	Summarise the information presented within the Phase 3 site summary sheets.
13. Summary and recommendations	Review of the Level 1 SFRA and identifies recommendations for New Forest District Council and New Forest National Park Authority to consider as part of Flood Risk Management policy.

Section	Contents
Appendix A: Grid squares for appendix mapping	Mapping showing grid squares and IDs for A3 appendix mapping
Appendix B: Watercourses	Mapping showing the locations of Main Rivers and Ordinary Watercourses.
Appendix C: Flood Zones	Flood Zone mapping
Appendix D: Climate change flood risk mapping	Joint SFRA area mapping of the 2080s climate change allowances (fluvial) and 2115 coastal/tidal extents.
Appendix E: Surface water flood risk mapping	Mapping of the updated Flood Map for Surface Water (uFMfSW) dataset.
Appendix F: Areas susceptible to groundwater flooding	Mapping of the Areas Susceptible to Groundwater Flooding (AStGWF) dataset.
Appendix G: Flood Alert and Flood Warning Areas	Mapping showing the extent of the Environment Agency's Flood Warning Service.
Appendix H: Historic flood risk records	Mapping of historic flood risk records.
Appendix I: Flood defence mapping	Mapping of flood defences.
Appendix J: Data used to inform the SFRA	Provides a list of the data sources used to inform the SFRA and who they were supplied by.

1.6 Consultation

The following parties (external to New Forest District Council and the New Forest National Park Authority) have assisted with the provision of information to inform the SFRA Environment Agency:

- Hampshire County Council
- Wiltshire Council
- Southern Water
- Wessex Water

Information from other parties (e.g. the Partnership for Urban South Hampshire [PUSH]) was obtained where available online. As shown on Figure 1-1 the New Forest National Park includes land within New Forest District, Wiltshire and Test Valley; and that for planning purposes the National Park Authority is the sole planning authority for the whole of the designated National Park area.

1.7 Use of SFRA data

It is important to recognise that SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. The SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

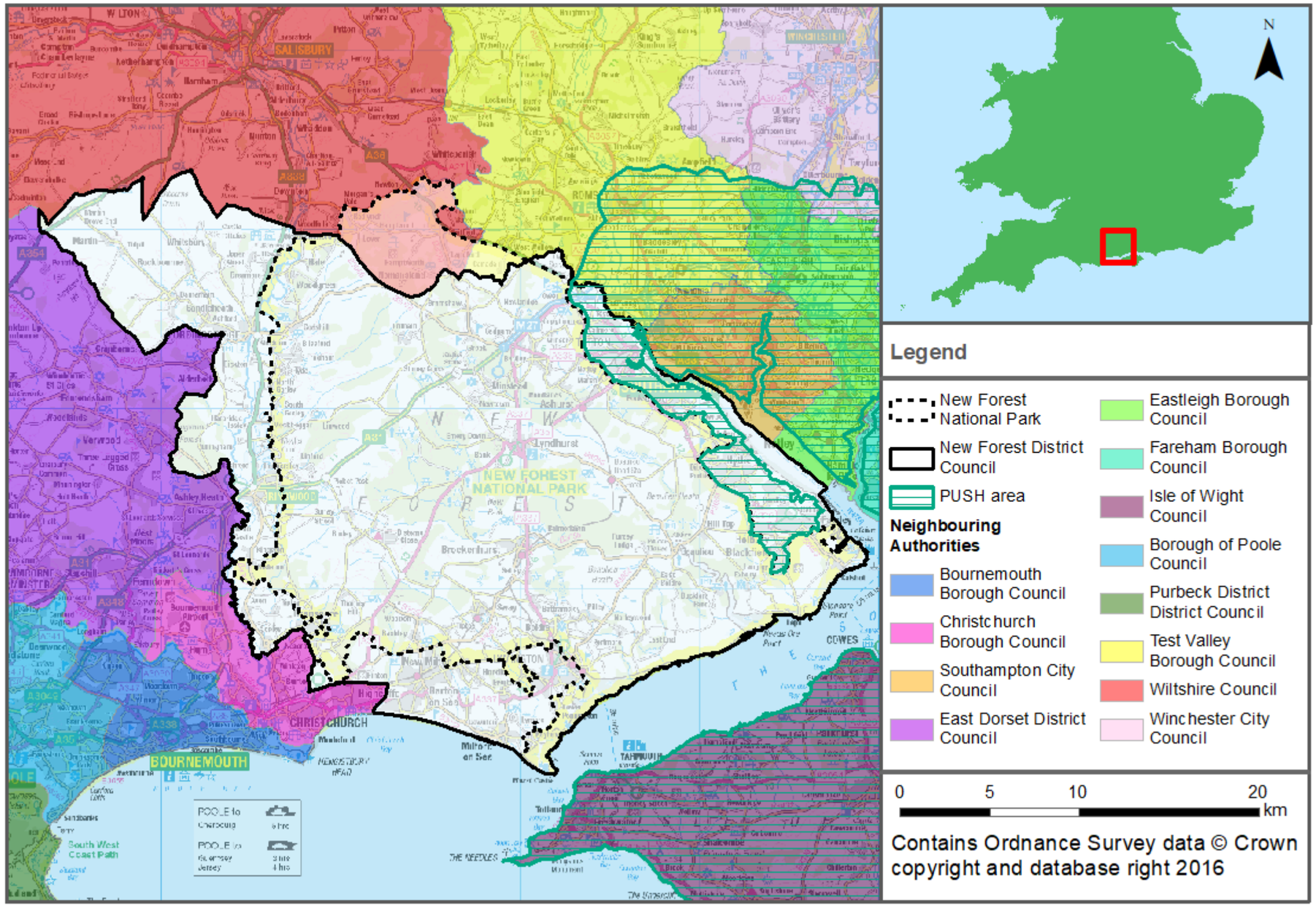
SFRAs should be a 'living document', and as a result should be updated when new information on flood risk, new planning guidance or legislation becomes available. New information on flood risk may be provided by New Forest District Council, New Forest National Park Authority, the Partnership for Urban South Hampshire (PUSH), the Environment Agency, Hampshire County Council, Wiltshire Council, Southern Water and Wessex Water. In addition, it is possible that information available from Southampton Water Harbour Authority (Associated British Ports Southampton [ABPS]) could be influential with respect to flood risk. Such information may be in the form of:

- New hydraulic modelling (flood risk) results
- Flood event information following a flood event
- Policy/ legislation updates

- Environment Agency flood map updates
- New flood defence schemes, works, dredging regimes etc.

The Environment Agency regularly reviews its flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a detailed Flood Risk Assessment.

Figure 1-1: Study area



2 The Planning Framework and Flood Risk Policy

2.1 Introduction

The overarching aim of development and flood risk planning policy in the UK is to ensure that the potential risk of flooding is taken into account at every stage of the planning process. This section of the SFRA provides an overview of the planning framework, flood risk policy and flood risk responsibilities.

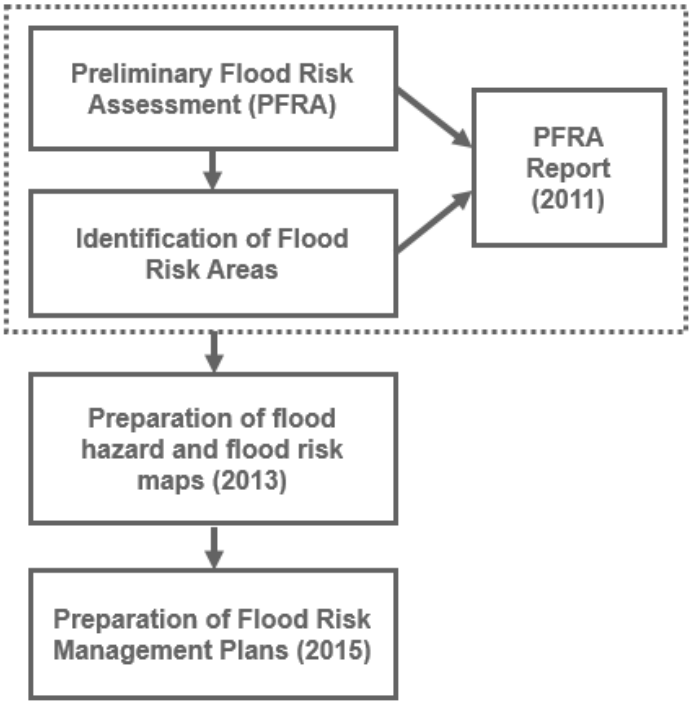
2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

2.2.1 Flood Risk Regulations, 2009

The Flood Risk Regulations (2009) translate the current EU Floods Directive into UK law and place responsibility upon all Lead Local Flood Authorities (LLFAs) to manage localised flood risk. Under the Regulations, the responsibility for flooding from rivers, the sea and reservoirs lies with the Environment Agency. However, responsibility for local and all other sources of flooding rests with LLFAs. In the instance of this SFRA, the LLFAs are Wiltshire Council and Hampshire County Council. Detail on the responsibilities of LLFAs is provided in Section 2.11.2.

Figure 2-1 illustrates the steps that were initially taken to implement the requirements of the EU Directive in the UK in accordance with the Flood Risk Regulations. The Regulations established a process that is repeated on a 6-year cycle.

Figure 2-1: Flood Risk Regulation Requirements



2.2.2 Preliminary Flood Risk Assessments (PFRAs)

Under this action plan and in accordance with the Regulations, LLFAs initially had the task of preparing a Preliminary Flood Risk Assessment (PFRA) report.

The documents that cover the study area are the **Hampshire County Council's PFRA (2011)** and **Wiltshire Council's Draft PFRA (2011).** The threshold for designating significant Flood Risk Areas is defined by Defra and the PFRA is the process by which these locations can be identified.

Of the ten national indicative Flood Risk Areas that were identified by the Defra/Environment Agency, none encroach on the New Forest District Council or the New Forest National Park.

A **review of preliminary flood risk assessments** was required to be completed by the LLFAs by the 22 June 2017. The LLFAs should be contacted to understand any changes to the previous recommendations or outputs made as part of the latest process.

2.2.3 Flood Risk Management Plans (FRMPs)

Under the Regulations the Environment Agency exercised an 'Exception' and did not prepare a PFRA for risk from rivers, reservoirs and the sea. Instead they had to prepare and publish hazard and risk mapping and an FRMP.

The study area is covered by the **South East River Basin District Flood Risk Management Plan (FRMP) (2016)** and the **South West River Basin District FRMP (2016).** The two FRMPs cover the period of 2015 to 2021. The FRMP draws on policies and actions identified in Catchment Flood Management Plans (Section 2.6) and also incorporates information from Local Flood Risk Management Strategies (Section 2.2.5).

2.2.4 Flood and Water Management Act (FWMA), 2010

Following the 2007 floods, Sir Michael Pitt was appointed to chair an independent review into the floods. The **final report** was published in June 2008. The Flood and Water Management Act (2010)[1] implements some of Sir Michael Pitt's recommendations and aims to create a simpler and more effective means of managing both flood risk and coastal erosion.

The FWMA established Lead Local Flood Authorities (LLFAs). Hampshire County Council and Wiltshire Council are the LLFAs for the study area. Further information on the LLFA role and responsibilities are provided in Section 2.11.2.

2.2.5 Local Flood Risk Management Strategies

Hampshire County Council and Wiltshire Council are responsible for developing, maintaining, applying and monitoring a LFRMS's for Hampshire and Wiltshire respectively. The **Hampshire Local Flood Risk Management Strategy (2013)** and the **Wiltshire Local Flood Risk Strategy (2014)** are used as a means by which the LLFAs co-ordinate Flood Risk Management on a day to day basis. The Strategies also set measures to manage local flood risk i.e. flood risk from surface water, groundwater and Ordinary Watercourses.

2.2.6 The National Flood and Coastal Erosion Risk Management Strategy for England (2011)

The **National Flood and Coastal Erosion Risk Management Strategy for England** provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. It was prepared by the Environment Agency with input from Defra.

The Strategy builds on existing approaches to flood and coastal risk management and promotes the use of a wide range of measures to manage risk. It describes how risk should be managed in a co-ordinated way within catchments and along the coast and balance the needs of communities, the economy and the environment.

2.3 National Planning Policy and Guidance

The **National Planning Policy Framework (NPPF)** was issued in 2012 to replace the previous documentation as part of reforms to make the planning system less complex and more accessible, and to protect the environment and promote sustainable growth. It replaces most of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs) that were referred to in the previous version of the SFRA. The NPPF sets out the Government's requirements for the planning system and provides a framework within which local people and councils can produce distinctive local and neighbourhood plans to reflect the needs and properties of their communities. The NPPF must be taken into account by local planning authorities when preparing Local Plans and for applicants preparing planning submissions.

National Planning Practice Guidance (NPPG) was published in 2014 and sets out how the NPPF should be implemented. **NPPG: Flood Risk and Coastal Change** advises on how planning can account for the risks associated with flooding and coastal change in plan making and the application process. It sets out Flood Zones, the appropriate land uses for each zone, flood risk assessment

1 Flood and Water Management Act (2010): http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

requirements, including the Sequential and Exception Tests and the policy aims for developers and authorities regarding each Flood Zone. Further details on Flood Zones and associated policy is provided in Table 3-1 and throughout this report. The Sequential and Exception tests are covered in greater detail in Sections 3.2 to 3.4.

A description of how flood risk should be taken into account in the preparation of Local Plans is outlined in Diagram 1 contained within the Planning Practice Guidance (Figure 2-2).

The Sequential Test

"The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones, as refined in the Strategic Flood Risk Assessment for the area, provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required".

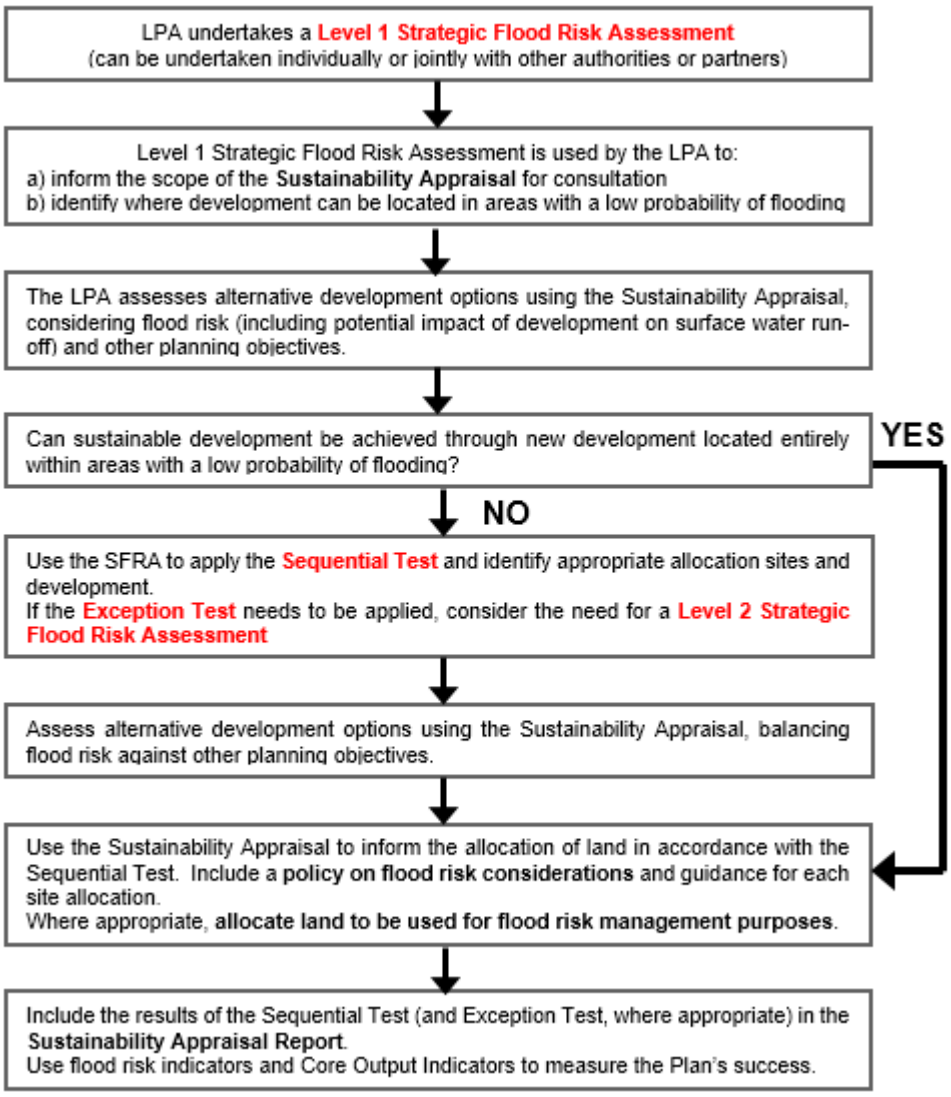
(National Planning Practice Guidance, paragraph 019)

The Exception Test

"The Exception Test, as set out in paragraph 102 of the NPPF, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
Essentially, the two parts to the Test require proposed development to show that it will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.".

(National Planning Practice Guidance, paragraph 023)

Figure 2-2: Flood risk and the preparation of Local Plans†



† Diagram 1 of NPPG: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-005-20140306) March 2014

2.4 LLFAs, surface water and SuDS

On 18 December 2014 a **Written Ministerial Statement** laid by the Secretary of State for Communities and Local Government set out changes to the planning process that would apply for major development from 6 April 2015.

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 1 hectare or more.

When considering planning applications, Local Planning Authorities should consult the LLFA on the management of surface water so that:

- the proposed minimum standards of operation are appropriate
- there are clear arrangements for on-going maintenance over the development's lifetime, through the use of planning conditions or planning obligations.

Hampshire County Council's Surface Water and Sustainable Drainage: Guidance for Developers, Designers and Planners (2015) provides information on what is required by developers, designers and planners to provide to support planning applications for new developments. Further information can be found on the Hampshire County Council **website**.

Wiltshire Council has produced **Developer's Guidance Note: Flooding, Drainage and SuDS** which provides an introduction to the drainage strategy within the Wiltshire Catchment area.

New Forest District Council also provides information about how the Council deals with surface water drainage matter during the planning process on their **website**.

Surface water management and SuDS is described further in Section 9.

2.4.1 Defra Non-Statutory Technical Standards for SuDS

On March 23 2015, the Department for Environment, Food and Rural Affairs (Defra) published the Non-Statutory Technical Standards for SuDS. The standards should be used in conjunction with the NPPF and NPPG. These standards cover the following

- Flood risk outside the development
- Peak flow control
- Volume control
- Flood risk within the development
- Structural integrity
- Designing for maintenance considerations
- Construction

2.4.2 C753 CIRIA SuDS Manual (2015)

The **C753 CIRIA SuDS Manual (2015)** replaces and updates the previous version (C697) providing 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.

2.5 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location and establish a long-term action plan.

In Hampshire, in order to carry out appropriate SWMPs, a strategic level SWMP has been carried out for the entire county in the form of the Preliminary Flood Risk Assessment (PFRA). As there are 11 District, Borough or City Authorities within Hampshire, it has been decided that intermediate SWMPs for each district will be carried out followed by detailed SWMPs where required for specific sites. No SWMPs have currently been carried out by Hampshire County Council for the study area. Further information can be found on the Hampshire County Council **website**.

Wiltshire Council has not produced any SWMPs for the study area.

2.6 Catchment Flood Management Plans

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.

2.6.1 New Forest CFMP (2009)

The policies for the study area within the **New Forest CFMP** are:

- **Policy 3 – Lyndhurst**. Areas of low to moderate flood risk where we (the Environment Agency) are generally managing existing flood risk effectively
- **Policy 4 – Milton/Milford, Brockenhurst, Lymington, Hythe/Fawley, Totton**. Areas of low, moderate or high flood risk where we (the Environment Agency) are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.
- **Policy 6 – New Forest.** Areas of low to moderate flood risk where we (the Environment Agency) will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.

2.6.2 Hampshire Avon CFMP (2012)

The policies for the study area within the **Hampshire Avon CFMP** are:

- **Policy 2 – New Forest Streams.** Areas of low to moderate flood risk where we (the Environment Agency) can generally reduce existing flood risk management actions
- **Policy 4 – Lower Avon**. Areas of low, moderate or high flood risk where we (the Environment Agency) are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change
- **Policy 5 – Christchurch.** Areas of moderate to high flood risk where we (the Environment Agency) can generally take further action to reduce flood risk

2.6.3 Test and Itchen CFMP (2009)

The policies for the study area within the **Test and Itchen CFMP** are:

- **Policy 2 – Clay Catchment**. Areas of low to moderate flood risk where we (the Environment Agency) can generally reduce existing flood risk management actions
- **Policy 3 – Rural Chalk/Upper/Middle & Lower Test**. Areas of low to moderate flood risk where we (the Environment Agency) are generally managing existing flood risk effectively

2.6.4 Dorset Stour CFMP (2012)

The policy for the study area within the **Dorset Stour CFMP** is:

- **Policy 6 – St Leonards, Verwood and West Moors.** Areas of low to moderate flood risk where we (the Environment Agency) will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.

The CFMPs provide specific 'actions' for flood risk management for each sub area.

2.7 Shoreline Management Plans

Shoreline Management Plans (SMP) form part of Defra's strategy for flood and coastal defence. They provide a large-scale assessment of risks associated with coastal evolution and present the policy framework to address these risks in a sustainable manner. The SMP policies defined by Defra are:

- Hold the line – maintain or upgrade the level of protection provided by defences.
- Advance the line – build new defences seaward of the existing defence line.
- Managed realignment – allowing retreat of the shoreline, with management to control or limit the movement.
- No active intervention – a decision not to invest in providing or maintaining defences.

2.7.1 Poole and Christchurch Bays (2011)

The **Poole and Christchurch Bays SMP** covers the study area from Naish Cliff to Hurst Spit. The following policies are outlined for the study area:

- **Hurst Spit and Milford-on-Sea –** Hold the line policies are associated with Hurst Spit and Rook Cliff in the short, medium and long term. At Milford seafront, the plan is to hold the line in the short term, with managed retreat in the medium and long term. At Cliff Road, the plan is for managed retreat in the short, medium and long term**.**
- **Hordle Cliff to Chewton Bunny** – From Hordle Cliff to Barton the plan is for no active intervention in the short, medium and long term to allow natural rollback. From Barton-on-Sea to Naish Cliff the plan is managed realignment.

2.7.2 North Solent Shoreline Management Plan (2010)

The **North Solent SMP** covers the study area from Hurst Spit to Lower Test Valley. The following policies are outlined for the study area:

- **Hurst Spit to Elmer's Court** – The policy in the short, medium and long term is to hold the line.
- **Elmer's Court to Sowley** – The policy is for no active intervention in the short, medium and long term.
- **Sowley to Slaternshill** – Hold the line is the policy for the short, medium and long term.
- **Salternshill to Calshot Spit** – The policy is no active intervention in the short, medium and long term.
- **Calshot Spit** – Hold the line is the policy in the short and medium term, with no active intervention in the long term.

2.8 River Basin Management Plans

River Basin Management Plans (RBMPs) are prepared under the Water Framework Directive (WFD) and assess the pressure facing the water environment in River Basin Districts. New Forest District and New Forest National Park fall with the **South East river basin district RBMP** and the **South West river basin district RBMP**.

2.9 Water Cycle Studies

Water Cycle Studies assist Local Authorities to select and develop sustainable development allocations so that there is minimal impact on the environment, water quality, water resources, and infrastructure and flood risk. This can be achieved in areas where there may be conflict between any proposed development and the requirements of the environment through the recommendation of potential sustainable solutions.

No Water Cycle Study has been carried out by New Forest District Council or the New Forest National Park Authority. Future investigations may wish to understand if such studies have since been commissioned.

2.10 Riparian ownership

A riparian owner is a person who owns land on, or adjacent to, a watercourse. The law presumes, in the absence of any other evidence, that the land adjoining the watercourse includes the watercourse to its mid-point; therefore, there may be more than one riparian owner of a watercourse.

Anyone with a watercourse in or adjacent to their land has rights and responsibilities as a riparian owner. The Environment Agency, LLFA and other risk management authorities have permissive powers to work on watercourses under their jurisdiction, however, they are not required to do so.

Under land drainage law, watercourses cannot be obstructed and the riparian owner must accept water flowing onto their land.

Hampshire County Council have prepared **Flood Risk Management Guidance for Landowners (2016)** which provides further information on the rights and responsibilities of riparian owners.

2.11 Roles and responsibilities of Risk Management Authorities

The roles and responsibilities of Risk Management Authorities (RMAs) in the New Forest District and New Forest National Park are summarised as follows.

2.11.1 New Forest District Council and New Forest National Park Authority

As a Local Planning Authority, New Forest District Council and New Forest National Park Authority assess, consult on and determine whether or not development proposals are acceptable, so that flooding and other, similar, risks are effectively managed.

The Council and the National Park Authority will consult relevant statutory consultees as part of planning application assessments and may, in some cases, also contact non-statutory consultees, such as Wessex Water and Southern Water, that have an interest in the planning application.

2.11.2 Hampshire County Council and Wiltshire Council

As LLFAs, Hampshire County Council and Wiltshire Council's duties include:

- Local Flood Risk Management Strategy (LFRMS): LLFAs must develop, maintain, apply and monitor a LFRMS to outline how they will manage flood risk, identify areas vulnerable to flooding and target resources where they are needed most.
- Flood Investigations: When appropriate and necessary LLFAs must investigate and report on flooding incidents (Section 19 investigations).
- Register of Flood Risk Features: LLFAs must establish and maintain a register of structures or features which, in their opinion, are likely to have a significant effect on flood risk in the LLFA area.
- Designation of Features: LLFAs may exercise powers to designate structures and features that affect flood risk, requiring the owner to seek consent from the authority to alter, remove or replace it.
- Consenting: When appropriate, LLFAs will perform consenting of works on ordinary watercourses.
- Preparing and issuing information to satisfy the requirements of the Flood Risk Regulations

Hampshire County Council and Wiltshire Council are also the Local Highway Authority and manage highway drainage, carrying out maintenance and improvement works on an on-going basis, as necessary, maintain existing standards of flood protection for highways, making appropriate allowances for climate change. It also has the responsibility to ensure road projects to no increase flood risk.

2.11.3 Environment Agency

The Environment Agency is responsible for protecting and enhancing the environment as a whole and contributing to the government's aim of achieving sustainable development in England and Wales. The Environment Agency has powers to work on Main Rivers to manage flood risk. These powers are permissive, which means they are not a duty, and they allow the Environment Agency to carry out flood and coastal risk management work and to regulate the actions of other flood risk management authorities on main rivers and the coast.

The EA also has powers to regulate and consent works to Main Rivers. Prior written consent is required from the Environment Agency for any work in, under, over or within nine metres of a Main River or between the high-water line and the secondary line of defence e.g. earth embankment.

The Environment Agency also has a strategic overview role across all types of flooding as well as other types of water management matters. Additionally, the Environment Agency prepares and issues mapping and plan to meet the requirements of the Flood Risk Regulations.

2.11.4 Water and wastewater providers

Southern Water and **Wessex Water** are the sewerage undertaker for the study area. They have the responsibility to maintain surface, foul and combined public sewers to ensure the area is effectively drained. When flows (foul or surface water) are proposed to enter public sewers, Southern Water or Wessex Water will assess whether the public system has the capacity to accept these flows as part of their pre-application service. If there is not available capacity, they will provide a solution that identifies the necessary mitigation. Southern Water or Wessex Water will also comment on the available capacity of foul and surface water sewers as part of the planning

application process. Further information can be found on the respective Southern Water and Wessex Water websites.

Southern Water and Wessex Water also supply potable water, along with **Bournemouth Water**, to the study area. Consent, prior to commencing work, is required from the relevant provider if installing water systems, or altering existing systems, is intended.

2.12 When to consult authorities

The new and emerging responsibilities under the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009 are summarised in Table 2-1.

Table 2-1: When to consult authorities in New Forest District and National Park

Key Authority	When to consult
New Forest District Council and New Forest National Park Authority	Pre-application consultation is recommended to identify the range of issues that may affect the site and, following on from the Sequential and, if necessary, Exception Test, determine whether the site is suitable for its intended use. Should be consulted where an awarded watercourse runs within or adjacent to proposed development consultation
Environment Agency	Should be **consulted** on development, other than minor or as defined in the Environment Agency's Flood Risk Standing Advice document within Flood Zone 2 or 3, or in Flood Zone 1 where critical drainage problems have been notified to the LPA. Consultation will also be required for any development projects within 20m of a Main River or flood defence, and other water management matters.
Hampshire County Council and Wiltshire Council (LLFAs)	Where the proposed work will either affect or use an ordinary watercourse or require consent permission, outside of an IDB's rateable area. As of the 15th April 2015 the LLFA should be consulted on surface water drainage proposal for all major developments
Hampshire County Council and Wiltshire Council (Local Highway Authority)	Where the proposed development will either involve a new access to the local highway network or increase or change traffic movements
Highways England	When the quality and capacity of the **Highways England** (strategic) road network could be affected.
Historic England	Whilst Historic England are not a RMA, they should be consulted where proposals may affect heritage assets and their settings.
Natural England	**Natural England** has mapped 'risk zones' to help developers and LPAs determine whether consultation is required. This is likely where water bodies with special local or European designations (e.g. SSSI or Ramsar) exists
Wessex Water and Southern Water	Where connection to surface water sewers is required, or where the flow to public sewerage system may be affected
Wessex Water, Southern Water and Bournemouth Water	Where new connections to the water supply network are required or if any alterations are made to existing connections

3 The Sequential, risk based approach

3.1 The sequential, risk-based approach

This approach is designed to ensure areas with little or no risk of flooding (from any source) are developed in preference to areas at higher risk, with the aim of keeping development outside of medium and high flood risk areas (Flood Zones 2 and 3) and other sources of flooding, where possible. The sequential approach can be applied both between and within Flood Zones.

When drawing up a local plan, it is often the case that it is not possible for all new development to be allocated on land that is not at risk from flooding. In these circumstances, the Flood Zone maps (that show the extent of inundation assuming that there are no defences) do not contain enough information and a greater understanding of the scale and nature of the flood risks is required, as described in a Level 2 SFRA.

3.1.1 Flood Zones

Table 1 of NPPG Flood Risk and Coastal Change identifies the following Flood Zones. These apply to both Main River and Ordinary Watercourses. Flood risk vulnerability and flood zone compatibility is set out in **Table 3** of the NPPG. Table 3-1 summarises this information and also provides information on when an FRA would be required.

Table 3-1: Flood Zone descriptions

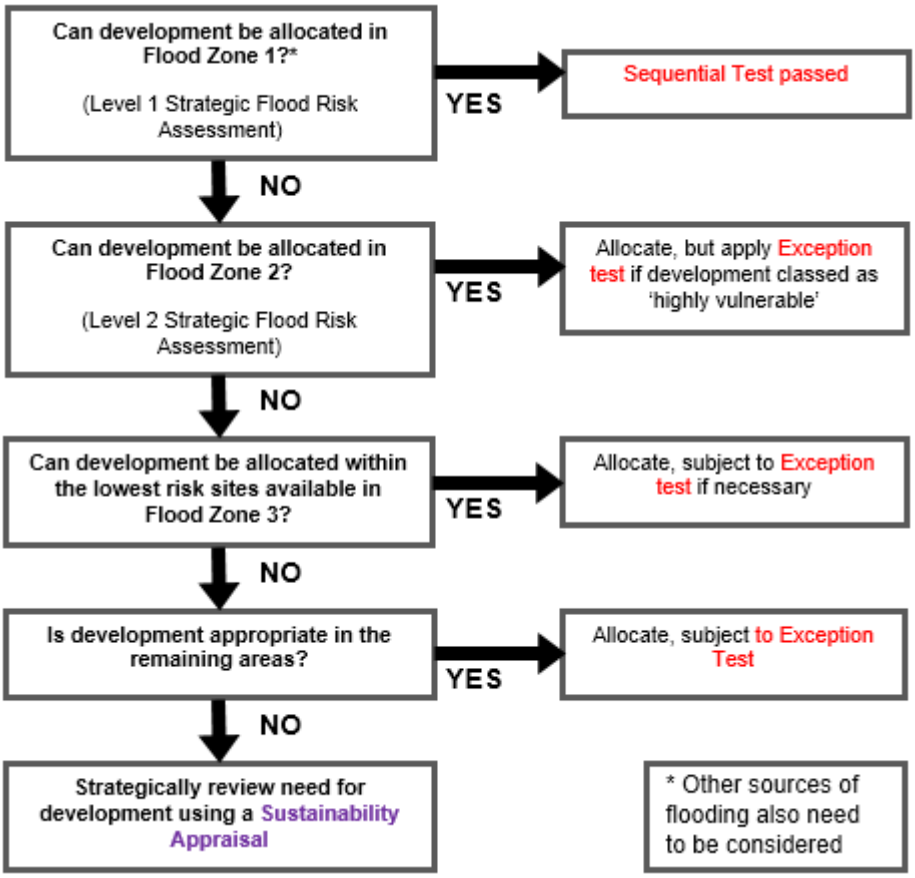
Zone	Probability	Description
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
		All land uses are appropriate in this zone.
		For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment.
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1% - 1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1% – 0.5%) in any year.
		Essential infrastructure, water compatible infrastructure, less vulnerable and more vulnerable land uses (as set out by NPPF) are appropriate in this zone. Highly vulnerable land uses are allowed as long as they pass the Exception Test.
		All developments in this zone require an FRA.
Zone 3a	High	This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1.0%) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5%) in any year. Developers and the local authorities should seek to reduce the overall level of flood risk, relocating development sequentially to areas of lower flood risk and attempting to restore the floodplain and make open space available for flood storage.
		Water compatible and less vulnerable land uses are permitted in this zone. Highly vulnerable land uses are not permitted. More vulnerable and essential infrastructure are only permitted if they pass the Exception Test.
		All developments in this zone require an FRA.
Zone 3b	Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify, in their SFRA, areas of functional floodplain, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances.
		Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. They must also be safe for users and not increase flood risk elsewhere. Essential Infrastructure will only be permitted if it passes the Exception Test.
		All developments in this zone require an FRA.

3.2 Applying the Sequential Test and Exception Test in the preparation for a local plan

When preparing a Local Plan, the Local Planning Authorities should demonstrate that a range of site allocations has been considered, using an SFRA to apply the Sequential and Exception Tests where necessary.

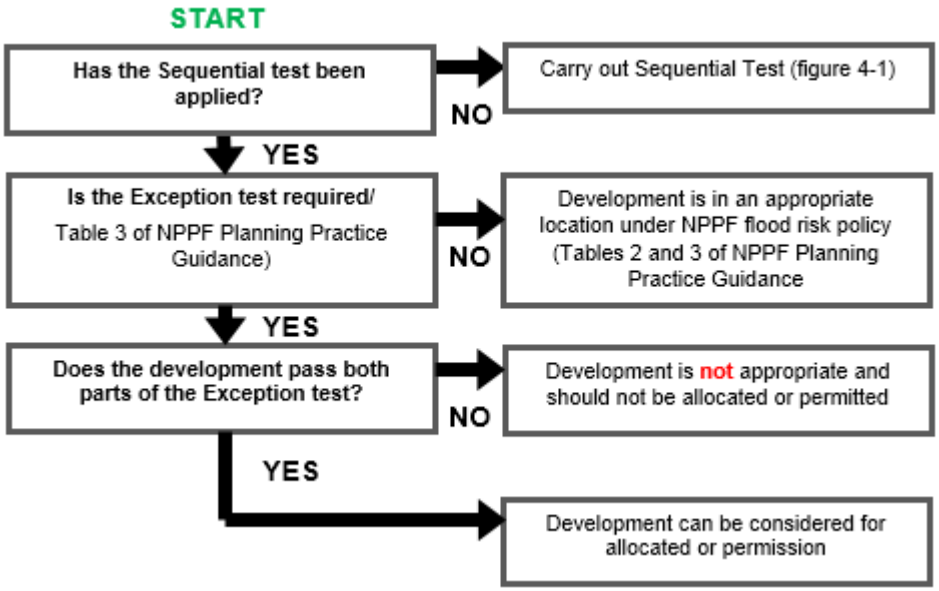
The Sequential Test should be applied to the whole Local Planning Authority area to increase the likelihood of allocating development in areas not at risk of flooding. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. NPPG for Flood Risk and Coastal Change describes how the **Sequential Test should be applied in the preparation of a Local Plan** (Figure 3-1).

Figure 3-1: Applying the Sequential Test in the preparation of a Local Plan



The Exception Test should only be applied following the application of the Sequential Test and as set out in Table 3 of the NPPG Flood Risk and Coastal Change. The NPPG describes **how the Exception Test should be applied in the preparation of a Local Plan** (Figure 3-2)

Figure 3-2: Applying the Exception Test in the preparation of a Local Plan



It is understood that New Forest District Council and New Forest National Park Authority will each prepare a stand-alone Sequential Test for the respective portions of the study area.

3.2.1 Sequential Test

Local circumstances must be used 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, in other cases it may be identified by other Local Plan policies. A pragmatic approach should be taken when applying the Sequential Test.

New Forest District Council and New Forest National Park Authority, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied, and will need to be satisfied that the proposed development would be safe and not lead to increased flood risk elsewhere.

The Sequential Test does not need to be applied for individual developments under the following circumstances:

- The site has already been identified in development plans through the application of the Sequential Test.
- Applications for minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site).

It is normally reasonable to presume and state that individual sites that lie in Zone 1 satisfy the requirements of the Sequential Test; however, consideration should be given to risks from all sources, areas with critical drainage problems and critical drainage areas.

3.2.2 Exception Test

If, following 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 deemed appropriate. The aim of the Exception Test is to ensure that more vulnerable uses, such as residential development can be implemented safely and are not located in areas where the hazards and consequences of flooding are inappropriate. For the Test to be satisfied, the following two elements have to be accepted for development to be allocated or permitted:

1. **It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared.**

   Local Planning Authorities will need to consider what criteria they will use 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. If the application fails to prove this, the Local Planning Authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused.

2. **A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.**

   The site-specific Flood Risk Assessment should demonstrate that the site will be safe and the people will not be exposed to hazardous flooding from any source. The following should be considered:

   - The design of any flood defence infrastructure.
   - Access and egress.
   - Operation and maintenance.
   - Design of the development to manage and reduce flood risk wherever possible
   - Resident awareness.
   - Flood warning and evacuation procedures.
   - Any funding arrangements required for implementing measures.

The **NPPG** provides detailed information on how the Test can be applied. For the purpose of supporting land use allocation with respect to satisfying appropriate levels of safety and hazards, the evidence in the Level 2 SFRA is used to provide strategic information so the nature and scope of the flood risk management or mitigation responses is identified.

3.3 Actual flood risk

If it has not been possible for all future development to be situated in Zone 1 then a more detailed assessment is needed to understand the implications of locating proposed development in Zones 2 or 3. This is accomplished by considering information on the "actual risk" of flooding. The assessment of actual risk takes account of the presence of flood defences and provides a picture of the safety of existing and proposed development. It should be understood that the standard of protection afforded by flood defences is not constant and it is presumed that the required minimum standards for new development are:

- residential development should be protected against flooding with an annual probability of river flooding of 1% (1 in 100 chance of flooding) in any year; and
- residential development should be protected against flooding with an annual probability of tidal (sea) flooding of 0.5% (1 in 200 chance of flooding) in any year.

The assessment of the actual risk should take the following issues into account:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for the Flood Risk Management Strategy to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change may reduce the standard of protection afforded by defences, due to increased river flows and levels, and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary land secured that is required for affordable future flood risk management measures.

- The assessment of actual risk can include consideration of the magnitude of the hazard posed by flooding. By understanding the depth, velocity, speed of onset, rate of rise and duration of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources. This assessment will be needed in circumstances where a) the consequences of flooding need to be mitigated or b) where it is proposed to place lower vulnerability development in areas of flood risk.

3.4 Impact of additional development on flood risk

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 increase 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 more flow entering watercourses, increasing the risk of fluvial flooding downstream.

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. Further information on flood plain compensation is provided in Section 8.3.4.

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 measures.

The cumulative impact of development should be considered at the planning application and development design stages and the appropriate mitigation measures undertaken, within an appropriate FRA, to ensure flood risk is not exacerbated, and in many cases the development should be used to improve the flood risk. It is possible that it might be more appropriate to consider strategic measures, but additional studies would be required to provide evidence that the provisions supported the principle of development and were deliverable.

Maintenance and upkeep of SuDS have been neglected in the past as a result of lack of clarity over where responsibility rests. Therefore, is it important that maintenance and upkeep for mitigation measures, such as SuDS, has been set out as part of a drainage strategy and that management funding for the lifetime of the development is agreed.

4 Climate change

4.1 Climate change and the NPPF

The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. NPPF and NPPG describe how FRAs should demonstrate how flood risk will be managed over the lifetime of the development, taking climate change into account.

4.2 Revised climate change guidance

The Environment Agency published **updated climate change guidance** on 19 February 2016, 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 taken into account when considering development, specifically how allowances for climate change should be included with FRAs. The Environment Agency can give a free preliminary opinion to applicants on their proposals at pre-application stage. There is a charge for more detailed pre-application planning advice

4.3 Climate change allowances

By making an allowance for climate change it will help reduce the vulnerability of the development and provide resilience to flooding in the future. The 2016 climate change guidance includes climate change predictions of anticipated change for peak river flow and peak rainfall intensity. The guidance also covers sea level rise and water height. These allowances are based on climate change projections and difference scenarios of carbon dioxide emissions to the atmosphere. Due to the complexity of projecting climate change effects, there are uncertainties attributed to climate change allowances related to the confidence in the prediction. As a result, the guidance presents a range of possibilities to reflect the potential variation in climate change impacts over the three periods as a consequence of differing levels of confidence in the predictions.

4.4 Peak river flows

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

The peak river flow allowances provided in the guidance show the anticipated changes to peak flow for the river basin district within which the subject watercourse is located. Once the river basin district has been identified, guidance on uplift in peak flows are provided for three allowance categories, Central, Higher Central and Upper End which are based on the 50th (Central), 70th (Higher Central) and 90th (Upper End) percentiles respectively. The 'percentile' is a measure of the confidence in the magnitude of the allowance, i.e. lower uplift values (50th percentile – 'Central) are statistically more likely and thus attributed with greater confidence compared with higher uplift values (e.g. 90th percentile – 'Upper End'). The allowance category to be used is based on the vulnerability classification of the proposed development and the flood zones within which it is to be located.

These allowances are provided, in the form of figures for the total potential change anticipated, for three climate change periods:

- The '2020s' (2015 to 2039)
- The '2050s' (2040 to 2069)
- The '2080s' (2070 to 2115)

The time period used in the assessment depends upon the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years, whilst the lifetime of a non-residential development depends upon the characteristics of that development. Further information on what is considered to be the lifetime of development is provided in the **NPPG**.

New Forest District and New Forest National Park lie within the South East and the South West River Basin Districts as illustrated in Figure 4-1. The allowances for the two river basin districts are provided in Table 4-1 and Table 4-2.

Figure 4-1: River Basin Districts in New Forest District and National Park

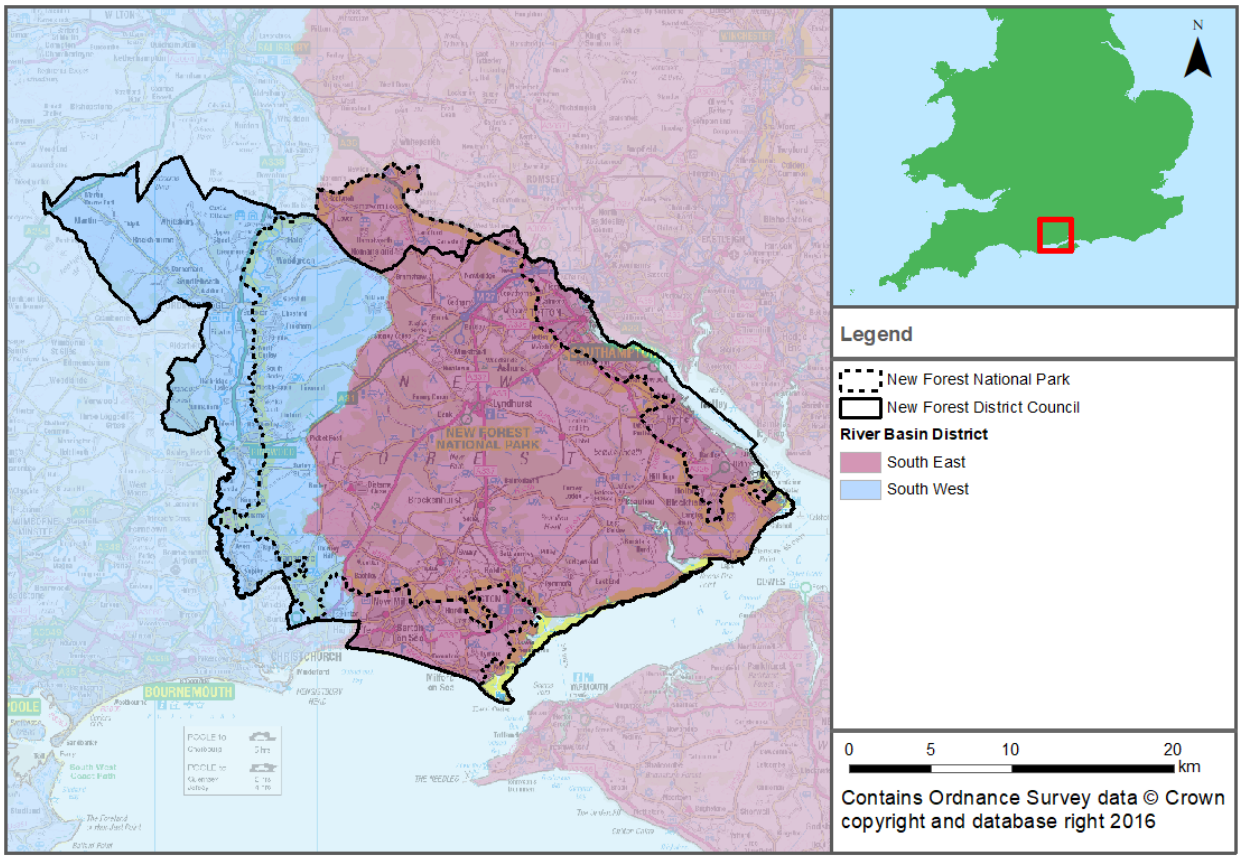


Table 4-1: Peak river flow allowances for the South East river basin district

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	25%	50%	105%
Higher central	15%	30%	45%
Central	10%	20%	35%

Table 4-2: Peak river flow allowances for the South West river basin district

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	25%	40%	85%
Higher central	20%	30%	40%
Central	10%	20%	30%

4.4.1 High++ allowances

High++ allowances only apply in assessments for developments that are very sensitive to flood risk, for example large scale energy generating infrastructure, and that have lifetimes beyond the end of the century. H++ estimates represent the upper limit of plausible climate projections and would not normally be expected for schemes or plans to be designed to or incorporate resilience for the H++ estimate. Further information is provided in the Environment Agency publication, **Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities**

4.4.2 Which peak river flow allowance to use?

The flood zone and flood risk vulnerability classification should be considered when deciding which allowances apply to the development or the plan. Vulnerability classifications are found in the **NPPG**. The guidance states the following

Flood Zone 2

Vulnerability classification	Central	Higher Central	Upper end
Essential infrastructure		✓	✓
Highly vulnerable		✓	✓
More vulnerable	✓	✓	
Less vulnerable	✓		
Water compatible	None		

Flood Zone 3a

Vulnerability classification	Central	Higher Central	Upper end
Essential infrastructure			✓
Highly vulnerable	Development not permitted		
More vulnerable		✓	✓
Less vulnerable	✓	✓	
Water compatible	✓		

Flood Zone 3b

Vulnerability classification	Central	Higher Central	Upper end
Essential infrastructure			✓
Highly vulnerable	Development not permitted		
More vulnerable			
Less vulnerable			
Water compatible	✓		

4.5 Peak rainfall intensity allowance

Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This increased rainfall intensity will affect land and urban drainage systems, resulting in surface water flooding, due to the increased volume of water entering the systems. The table below shows anticipated changes in extreme rainfall intensity in small and urban catchments. These allowances should be used for small catchments and urban drainage sites. For catchments, larger than 5km^2, the guidance suggests the peak river flow allowances should be used.

For Flood Risk Assessments, both the central and upper end allowances should be assessed to understand the range of impact.

Table 4-3: Peak rainfall intensity allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

4.6 Tidal/coastal change

Sea level allowances have been used in the preparation of this report and should be considered for use in FRAs. Additionally, offshore wind speed and extreme wave height allowances should be considered as part of tidal/coast climate change assessment. The EA guidance and allowances can be found on their **website**

4.7 Using climate change allowances

To help decide which allowances to use to inform the flood levels that flood risk assessments and management strategies are based on for a development or development plan allocation, the following should be considered:

- likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s)
- vulnerability of the proposed development types or land use allocations to flooding
- 'built in' resilience measures used, for example, raised floor levels
- capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach

4.8 Groundwater

The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows, is more uncertain. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months. 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.

4.9 The impact of climate change in New Forest District and New Forest National Park

4.9.1 Previous studies

The **UK Climate Projection 2009** (UKCP09) predict the following climatic changes to the study area:

South East England

- Increased summer temperatures of 3.1°C by 2050
- Increased winter temperatures of 2.5°C by 2050
- Reduced summer rainfall of 19% by 2050 making summers much drier
- Increased winter rainfall of 19% by 2050.

South West England

- Increased summer temperatures of 3.1°C by 2050
- Increased winter temperatures of 2.3°C by 2050
- Reduced summer rainfall of 20% by 2050 making summers much drier
- Increased winter rainfall of 18% by 2050.

The New Forest National Park Authority have produced a **Conservation in the New Forest National Park – Climate Change** factsheet. Within this document, the threats and opportunities of climate change to the national park are shown. The threats include:

- Rising sea levels and possible increased storminess will increase coastal erosion and damage coastal infrastructure.
- Replacement of existing sea defences unlikely to be affordable.
- Historic sites in coastal locations may be lost as sea levels rise.
- Storm and flood damage to caravan sites and other tourist infrastructure.
- Flow rates in streams and rivers will reduce in summer and increase in winter with major temperature, erosion and ecological issues.

The document sets out how the New Forest National Park Authority can help reduce the impacts of climate change.

Wiltshire Council has produced a **Climate change Action Plan** to consider the impacts and opportunities across all the council services. The plan states that investment in flood and coastal defence assets will need to steadily increase in the future.

The plan states that due to changing rainfall, it is expected that there will be more extreme weather events with an increase in the frequency and intensity of heavy rainfall, leading to flash flooding in summer and saturated soils leading to flooding in winter. More frequent heatwaves are also expected along with continuing sea level rise.

Concerted efforts will also be needed by local authorities and partner organisations to improve the management of catchments, the coast, and urban areas in ways that alleviate the potential for flooding

Wiltshire Council have also prepared an **Energy Change and Opportunity Strategy** for the period 2011-2020. The strategy suggests the long term/seasonal changes and extreme events that will be observed in Wiltshire in the future. The strategy provides new action plans to tackle climate change, including how water resources will be effected and what the council will do to manage any changes.

New Forest District Council are monitoring coastal changes through a **regional monitoring programme**. The programme comprises field-based, remote sensing, and environmental surveys to provide detailed baseline digital mapping of marine and terrestrial environments. The programme includes analysis of aerial photography through a series of PDFs to illustrate the changing coastline.

4.9.2 SFRA climate change modelling

Climate change modelling for the watercourses in the study area was undertaken based on the new climate change guidance. Existing Environment Agency hydraulic models were run for the 2080s period for all three allowance categories. Mapping of the climate change modelling outputs are provided in Appendix D.

4.9.3 Adapting to climate change

NPPG Climate Change contains information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses

- Identifying no or low cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.

Hampshire County Council has produced a **Climate Resilience Toolkit Web App** which provides information and advice on how buildings can be designed and adapted to be more resilient to the effects of a changing climate. This toolkit offers a practical resource for those who work on and manage buildings and estates in Hampshire.

Hampshire County Council provides further information about how they are preparing for the impacts of climate change on their **website**.

5 Sources of information used in preparing the SFRA

5.1 Fluvial flood risk models used in this SFRA

Table 5-1 lists the fluvial flood risk modelling used to inform the SFRA.

Table 5-1: Fluvial flood risk models used in this SFRA

Model name	Year	Software (Type)	Extent	Comments
Hampshire Avon: Downton	2008	ISIS-TUFLOW (1D-2D)	Focused on the settlement of Downton.	Detailed modelling provided by the Environment Agency
Hampshire Avon: Fordingbridge	2008	ISIS-TUFLOW (1D-2D)	Focused on the settlement of Fordingbridge	Detailed modelling provided by the Environment Agency
Hampshire Avon: Ringwood	2011	ISIS-TUFLOW (1D-2D)	Focused on the settlement of Ringwood	Detailed modelling provided by the Environment Agency
Bartley Water (Southampton Water Communities Model)	2010	ISIS-TUFLOW (1D-2D)	The Bartley Water watercourse from the top of the main river in Bartley Village to Rum Bridge, Totton.	The Environment Agency noted that only the fluvial Bartley Water section of this model remains relevant. The coastal model has been superseded by the Southampton Water Model.
Generalised main river and ordinary watercourse modelling	2017	JFlow (2D)	Notable lengths of main river and ordinary watercourses in the SFRA area. The ordinary watercourses modelled were those identified within the Detailed River Network (DRN) dataset	New modelling prepared for this study using the most recent LIDAR data available (resampled to 5m resolution). Modelling uses the same techniques as the Environment Agency's existing generalised modelling
Hydraulic models available, but not used as part of the SFRA: Generalised JFlow modelling from 2004, 2008, 2009 and 2016. New generalised modelling of these areas was prepared given discrepancies between inflow locations and latest ground elevations, and to ensure consistency across the full SFRA area. **Danes Stream (2009) – InfoWorks RS (1D-2D)** **Lymington River (2007) – ISIS-TUFLOW (1D-2D)** The Environment Agency indicated that these models were not fit for informing the Flood Map, so were not considered further.				

5.2 Fluvial flooding

Flood Zones 2, 3a and 3b as shown in Appendix C.2 haves been compiled for the study area as part of this SFRA based on the results of the models in Table 5-1. Flood Zones are based on the undefended scenario with the exception of Zone 3b, which includes the presence of defences on the basis that land behind existing defences is not functional flood plain.

The following categories have been used to define each Flood Zone:

- **Flood Zone 1:** Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.
- **Flood Zone 2:** Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200.
- **Flood Zone 3a:** This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding.
- **Flood Zone 3b:** This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain).

  The joint SFRA identifies this Flood Zone as land which would flood with a 5% chance in each and every year (a 1 in 20 annual probability), where modelling exists. The presence of defences are considered when mapping Flood Zone 3b.

  If existing or proposed development is shown to be in Flood Zone 3a where no Flood Zone 3b information exists, further work should be undertaken as part of a detailed site specific assessment to understand the extent of Flood Zone 3b.

  If existing development or infrastructure is shown in Flood Zone 3b, additional consideration should be given to whether the specific location is appropriate for designation as 'Functional' with respect to the storage or flow of water in time of flood.

  Where flood risk is dominated by tidal and coastal mechanisms, the flood mechanisms may differ from that of fluvial flooding. In tidal and/or coastal flooding, flood volumes might not necessarily provide the same functionality as for river flooding. Given this potential difference in influence, the functional nature of a floodplain in a tidal/coastal situation may be less evident or not applicable at all and so should be assessed for the specific sites under consideration

5.2.1 Climate change

Hydraulic modelling has been undertaken to provide updated climate change flood mapping for the New Forest District and National Park Authority areas. This modelling follows the latest guidance for climate change in FRAs/SFRAs released by the Environment Agency in February 2016 (and updated in April 2016).

Climate change for fluvial events has been prepared for the Central, Higher Central and Upper End estimates for the 2080s epoch (2070-2115). Present day flood risk information is available for comparison.

New Forest District and the New Forest National Park Area are situated across two River Basin Districts; the South East, and South West River Basin Distracts. Therefore, different allowances have been used in the different River Basin Districts as shown in Table 4-1 and Table 4-2.

5.3 Tidal/Coastal flooding

Tidal and coastal modelling is available for Southampton Water, which was prepared in 2014[2], but no hydraulic modelling of tidal/coastal flooding is available for the Solent and Christchurch Bay, so alternative methods have been used to prepare outputs along this coastline (refer to section 5.3). The tidal mapping provides information for present day Flood Zone 3b, 3a and 2 and for the for the climate change Flood Zones 3a to the year 2115.

The existing Southampton Water information used 2012 as the base year for the present-day sea level, so the tidal boundary is 20mm lower than would be the case if the assessment were completed

[2] Environment Agency (May, 2014) Southampton Water Coastal Modelling study, Final Main Assessment Report.

for the 2017 base year. However, in the context of the resolution of modelling and the scale of information presented for a Level 1 SFRA, it is not considered that this would notably alter predictions.

5.3.1 Tidal/coastal flooding along the Solent and Christchurch Bay coastline

The Environment Agency has provided guidance relating to extreme still water levels in the Solent and Christchurch Bay areas (document: Extreme Still Water Levels for Planning: Hampshire & Isle of Wight (2016)[3]) which draws on information from the Coastal Flood Boundary dataset (2015)[4] and the Extreme Sea Levels for Southern Estuaries and Harbour Study (2015)[5].

The information provided is points around the Hampshire and Isle of Wight coast which contains corresponding peak still water levels for the 200-year and 1000-year return period (0.5% and 0.1% AEP) events, which relate to Flood Zones 3a and 2, respectively. Information is provided for the present day (year 2008) and climate change (2070 and 2115) years. No information is provided in the Extreme Still Water Levels for Planning for the 20-year return period (5% AEP) event which would be used to inform Flood Zone 3b, but this information is available within the Extreme Sea Levels for Southern Estuaries and Harbour Study (2015) study report.

To prepare flood extents from this data, points from the water level datasets were extracted and their water levels projected inland to produce a water surface. The elevations from a 5m DTM (prepared from filtered LIDAR data) were then subtracted from the water surface to indicate areas of flooding (where the water level is above ground level). Areas of disconnected flooding were removed (as high ground would prevent ingress of tidal/coastal water). For Flood Zone 3b, where the presence of defences are considered, checks were made against the reported standard of protection for defences. If the standard of protection of the defence was greater than 20-years, then any predicted flooding behind the defences was removed. If standard of protection information wasn't available, then a.) the crest level in the defence dataset, or b.) the crest level data from LIDAR data (in that order of preference) was used to inform whether flooding should be retained behind the defence line.

In the approach noted above no allowance was made for the influence of waves and potential for overtopping of defences and/or raised ground along the tidal frontage. The influence of waves may be most prominent in the Lymington area, but reducing further east. The need to consider waves is recommended if detailed analysis of sites is conducted where this may be influential. Additionally, no consideration of breach modelling/mapping has been conducted for the Level 1 SFRA. Again, this should be considered if necessary as part of more detailed investigations into sites.

Coastal Flood Zone mapping can be found in Appendix C.1 and coastal climate change mapping can be found in Appendix D.1.

5.4 Surface water

Mapping of surface water flood risk in New Forest District Council and New Forest National Park Authority has been taken from the updated the Risk of Flooding from Surface Water (RoFSW) published online by the Environment Agency. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the Environment Agency and any potential developers to focus their management of surface water flood risk.

The RoFSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water (Table 5-2).

[3] Environment Agency, 2016. Extreme Still Water Levels for Planning: Hampshire & Isle of Wight (March, 2016)
[4] Environment Agency, 2015. Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels.
[5] JBA Consulting for the Environment Agency, 2015. Extreme Sea-Levels for Southern Estuaries and Harbours (April, 2015)

Table 5-2: RoFSW risk categories

Category	Definition
High	Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year (annual probability of flooding 3.3%)
Medium	Flooding occurring as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
Low	Flooding occurring as a result of rainfall of between 1 in 1,000 (0.1%) and 1 in 100 (1%) chance in any given year.
Very Low	Flooding occurring as a result of rainfall with less than 1 in 1,000 (0.1%) chance in any given year.

Although the RoFSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRAs for local authorities. If a particular site is indicated in the Environment Agency mapping to be at risk from surface water flooding, a more detailed assessment should be considered to more accurately illustrate the flood risk at a site-specific scale. Such an assessment will use the RoFSW in partnership with other sources of local flooding information, such as the modelling undertaken as part of the SWMPs, to confirm the presence of a surface water risk at that particular location.

5.5 Groundwater

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater Flooding (AStGWF) dataset.

The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring, does not take account of the chance of flooding from groundwater rebound and does not define areas of inundation in the same way that fluvial or surface water mapping does. This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets

5.6 Sewers

Historical incidents of flooding are detailed by Southern Water through their Sewer Incident Report Form (SIRF) Data and by Wessex Water in their Inadequate Capacity Incidents data. These databases records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding.

5.7 Reservoirs

The risk of inundation due reservoir breach or failure of reservoirs within the area has been mapped using the outlines available from the Risk of Flooding from Reservoirs dataset made published by the Environment Agency.

5.8 Suite of maps

All of the mapping can be found in the appendices to this SFRA and is presented in the following structure:

- Appendix A: Grid squares for appendix mapping
- Appendix B: Watercourses
- Appendix C: Flood Zones
    - Appendix C.1: Coastal Flood Zones
    - Appendix C.2: Fluvial Flood Zones
- Appendix D: Climate change flood risk mapping
    - Appendix D.1: Coastal climate change
    - Appendix D.2: Fluvial climate change
- Appendix E: Surface water flood risk mapping
- Appendix F: Areas susceptible to groundwater flooding
- Appendix G: Flood Alert and Flood Warning Areas
- Appendix H: Historic flood risk records
- Appendix I: Flood defence mapping
- Appendix J: Data used to inform the SFRA

5.9 PUSH SFRA area

The Partnership for Urban South Hampshire (PUSH) is a partnership of local authorities working alongside government agencies to address development, housing and economic issues. A map showing the authorities cooperating in PUSH is displayed on the **PUSH website**.

The PUSH SFRA was published in 2016. Part of the PUSH area (referred to as the 'Solent' area) is located along the eastern side of the joint SFRA area extending from Langley in the south to Totton in the north. The PUSH Level 1 SFRA also provides flood risk mapping for Flood Zones which can be found on their **website**. However, due to updated information being presented in this document, this New Forest District and National Park Level 1 SFRA presents the flood risk mapping again and both sets of mapping should be referred to when assessing flood risk in the PUSH area.

5.10 Other relevant flood risk information

Users of this SFRA should also refer to other relevant information on flood risk where available and appropriate. This information includes:

- **New Forest Catchment Flood Management Plan (2009)**, **Hampshire Avon CFMP (2012), Test and Itchen CFMP (2009)** and **Dorset Stour CFMP (2012)**

  Provides information on the catchment-wide strategy for flood risk management. It should be ensured that any flood risk management measures are consistent with the strategy.

- **Hampshire Local Flood Risk Management Strategy (2013)** and the **Wiltshire LFRMS (2014)**

  Provides information on local flooding issues and the plan for managing risk. It should be ensured that development and any flood risk management measures are consistent with the Plan

- **South East River Basin District Flood Risk Management Plan (2016)** and the **South West River Basin District FRMP (2016)**

  Provides information on the catchment-wide strategy for flood risk management. It should be ensured that any flood risk management measures are consistent with the strategy.

- The **Poole and Christchurch Bays Shoreline Management Plan (2011)** and the **North Solent SMP (2010)**

  Provides large-scale assessment of risks associated with coastal evolution and presents the policy framework to address these risks in a sustainable manner. It should be ensured that any coastline development and flood risk management measures are consistent with the plan.

- **Environment Agency's Asset Information Management System (AIMS)**

  Users should note that recently completed schemes may not yet be included in this dataset. Provides information on assets in the area. Can be used to identify where residual risk should be assessed

6 Understanding flood risk in New Forest District and National Park Authority

6.1 Historic flooding

New Forest District and the National Park have a history of documented flood events with the main sources being from fluvial sources with a significant influence from tidal conditions.

The historic flood information described below has been taken from:

- The 2007 New Forest District Council and New Forest National Park Authority SFRA
- The Environment Agency Recorded Flood Outlines dataset.
- The Hampshire Avon Catchment Flood Management Plan.
- The Hampshire County Council Preliminary Flood Risk Assessment.
- Additional information provided by New Forest District Council

The historical flood events have been recorded in New Forest:

- **January 1959** – The EA data indicates that the River Avon flooded due to the river capacity being exceeded with no raised defences.
- **22 October 1966** – The EA data indicates that the River Lymington flooded at Brockenhurst
- **December 1979** - The River Stour flooded near Sopley due to the river capacity being exceed with no raised defences according to the EA data.
- **March 1982** – The EA data indicates that the River Avon flooded from Chartford to Sopley due to the channel capacity being exceeded with no raised defences.
- **November 1982** – Danes Stream in Milford-on-Sea flooded according to the EA.
- **December 1989** – Heavy rain. Tidal induced flooding in Keyhaven and King's Saltern Road, Bath Road and Waterloo Road, Lymington.
- **1 February 1990** – The Lymington River in Brockenhurst is reported by the EA to have caused a flood
- **3 February 1990** - Heavy rain.
- **23 June 1991** - Heavy rain.
- **2 December 1992** - Heavy rain.
- **20-30 December 1993** - Heavy rain. Flooding was noted in Milford-on-Sea, Barton-on-Sea, Portmore, Ashley and New Milton
- **November 1994** – The EA has recorded flooding from the Bartley Water at Bartley.
- **November 1995** – The Beaulieu River caused flooding in Lyndhurst according to the EA data.
- **24 December 1999** - Very heavy rain caused many dwellings to flood. Deep flooding of parts of Lymington occurred when a surge tide trapped fluvial flood flows in the Lymington River. This caused river floodwater to discharge over the railway line and into residential and commercial development. The EA have reported that the Beaulieu River, Bartley Water, Cadman River and Lymington River flooded at this time. This caused flooding in Beaulieu, Eling, Cadnam and Lymington.
- **30 October 2000** – The EA has reported that the Cadnam River, Bartley Water and the Pollardsmoor Drain caused flooding at Cadnam, Marchwood, Hounsdown, Ashurst and Copythorne.

- **29 November 2000-30 March 2001** - Very high rainfall, with return periods of 1:50 and 1:200, caused widespread flooding in southern England. The EA has recorded a number of flood events in Hythe, Portmore, Calmore, Sway, Lymington, Pennington, Bartley, Brokenhurst, Totton, Sway, Marchwood and Minstead
- **December 2000** – River flooding affected properties in Fordbridge and Ringwood after a period of heavy rainfall on an elevated water table.
- **7 July 2001** - Severe rainfall.
- **February 2002** - Prolonged rainfall.
- **14 November 2002** - Heavy rain.
- **1 & 2 January 2003** - Heavy rain.
- **3 October 2008** – The EA data indicates that the sea caused flooding at Crackmore Hard, Eling, Marchwood, and Hythe.
- **Winter 2013-2014** – Prolonged severe storms along the southern coast of England. The beaches along the south coast had less than a week's recovery before the next storm, and hence each storm was working on a progressively weakened beaches. Erosion rates greater than 25 times the annual average were observed at numerous sites. Some sites which had generally been accreting of 10 years experienced large scale erosion. The EA data also indicates that during this time, the River Avon flooded which affected areas of land from Chartford to Sopley
- **February 2014** – Extensive flooding in the Fordingbridge area. New Forest District Council, along with Hampshire County Council, the police and fire, diverted the flow of water back to the River Avon. The situation was still quite severe and required a long period of monitoring but it did have the effect of reducing water levels significantly around the schools and properties in Pennys Lane/Crescent. Funding for permanent action in the area is currently being considered.

- **1996, 2013 and 2014** – The 1.5m shingle bank at Hurst Spit was hit by major storms in 1996 and coastal protection works were carried out. Extreme weather in 2013 and 2014 resulted in serious damage and loss of beach material and the spit is now in need of a 'recharge' of materials with proposals to add another 150,000 cubic metres of beach material within the next five years.

Under Section 19 of the Flood and Warning Management Act, Hampshire County Council and Wiltshire Council; in their role as LLFA, have published flood investigation reports covering the several communities and flood events. Please refer to the relevant LLFA for further information.

Historic flood information can be used for:

- Model calibration. This involves checking the model results align with historic flood information.
- The basis of Environment Agency Flood Zone extents. In certain locations, the Flood Zone extents are based on the Environment Agency's Historic Flood Map rather than hydraulic modelling data.
- A driver for preparing a site-specific Flood Risk Assessment for a site. If the site is known to be affected by historic flood events, a site-specific Flood Risk Assessment may be required to investigate the risk further.

6.2 Topography, geology and soils

6.2.1 Topography

The topography of the area can be seen in Figure 6-1 and is primarily comprised of higher elevations in the north west. These areas reach approximate elevations of 162 metres Above Ordnance Datum (m AOD), decreasing in a south easterly direction. Some areas are below sea level.

6.2.2 Geology

The geology of the catchment can be an important influencing factor on the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

Figure 6-2 shows the bedrock (solid permeable) formations in the District and Figure 6-3 shows the superficial (permeable, unconsolidated (loose) deposits). These are classified as the following:

- Principal: layers of rock or drift deposits with high permeability and, therefore, provide a high level of water storage
- Secondary A: rock layers or drift deposits capable of supporting water supplies at a local level and, in some cases, forming an important source of base flow to rivers
- Secondary B: lower permeability layers of rock or drift deposits which may store and yield limited amounts of groundwater
- Secondary undifferentiated: rock types where it is not possible to attribute either category a or b.
- Unproductive Strata: rock layers and drift deposits with low permeability and therefore have negligible significant for water supply or river base flow.

The majority of the bedrock in the study area is classified as a Secondary A aquifer which is associated with areas of clay, silt and sand geology. A Principal aquifer is located in the north-west which is associated with chalk geology. An unproductive bedrock stratum is found in the north-west which is associated with London Clay. Within the centre of the study area lies a further unproductive stratum.

The superficial deposits in the study are primarily classified as Secondary A aquifers associated with areas of sand and gravel. Several Secondary B aquifers are located throughout the study area which are predominately associated with silt geology in the area.

Figure 6-1: New Forest District and National Park topography

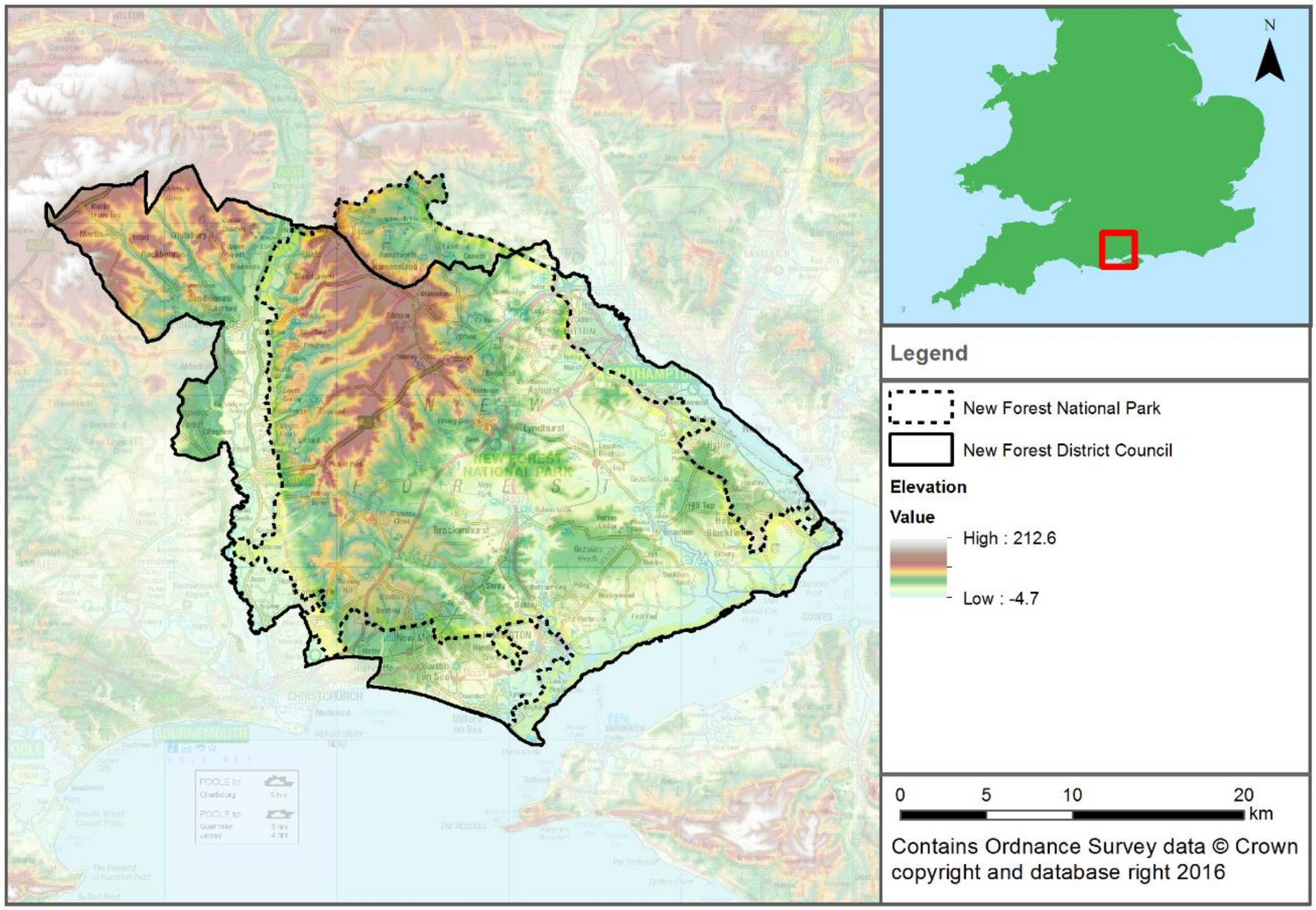


Figure 6-2: Bedrock aquifer designation in New Forest District and National Park

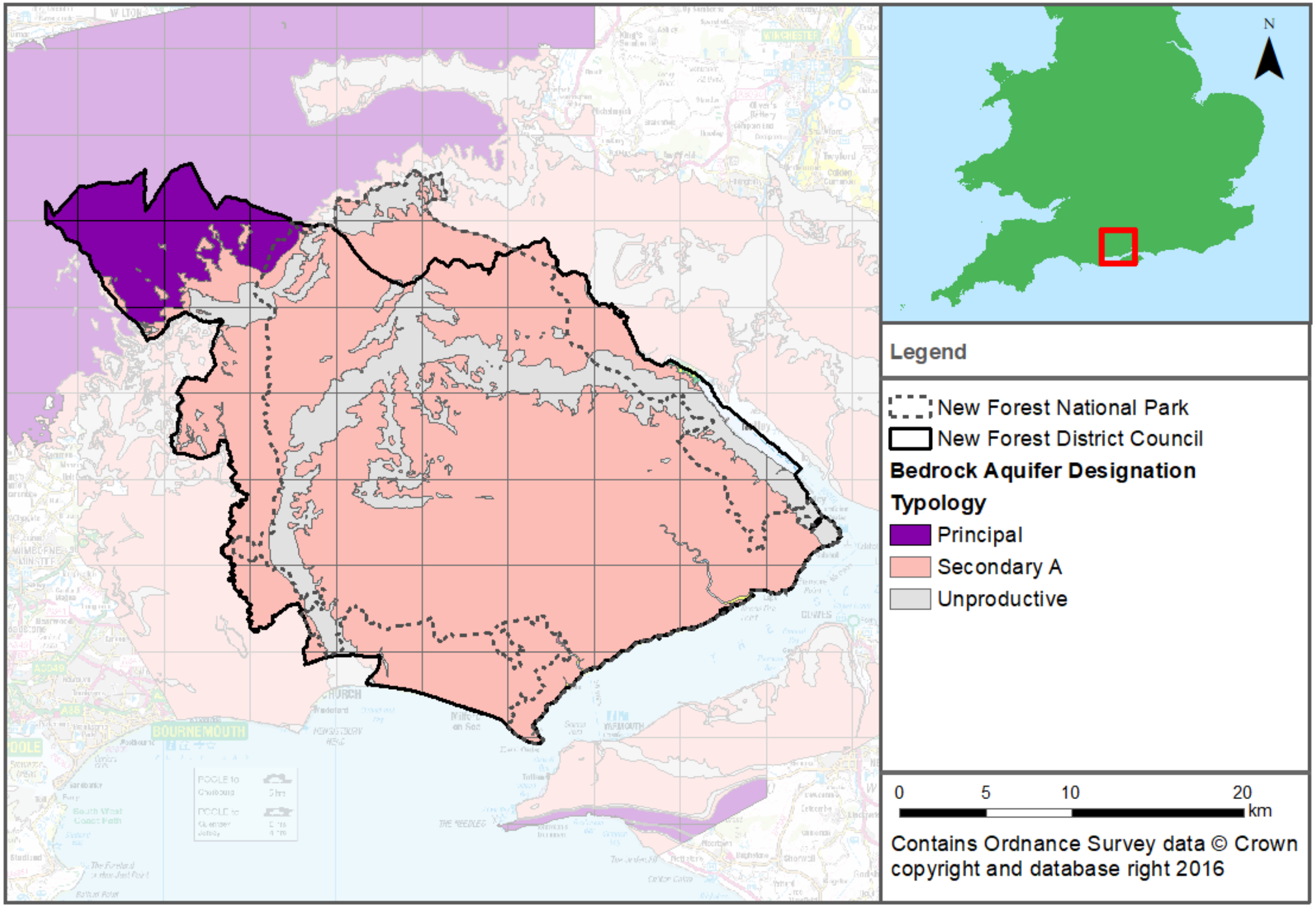
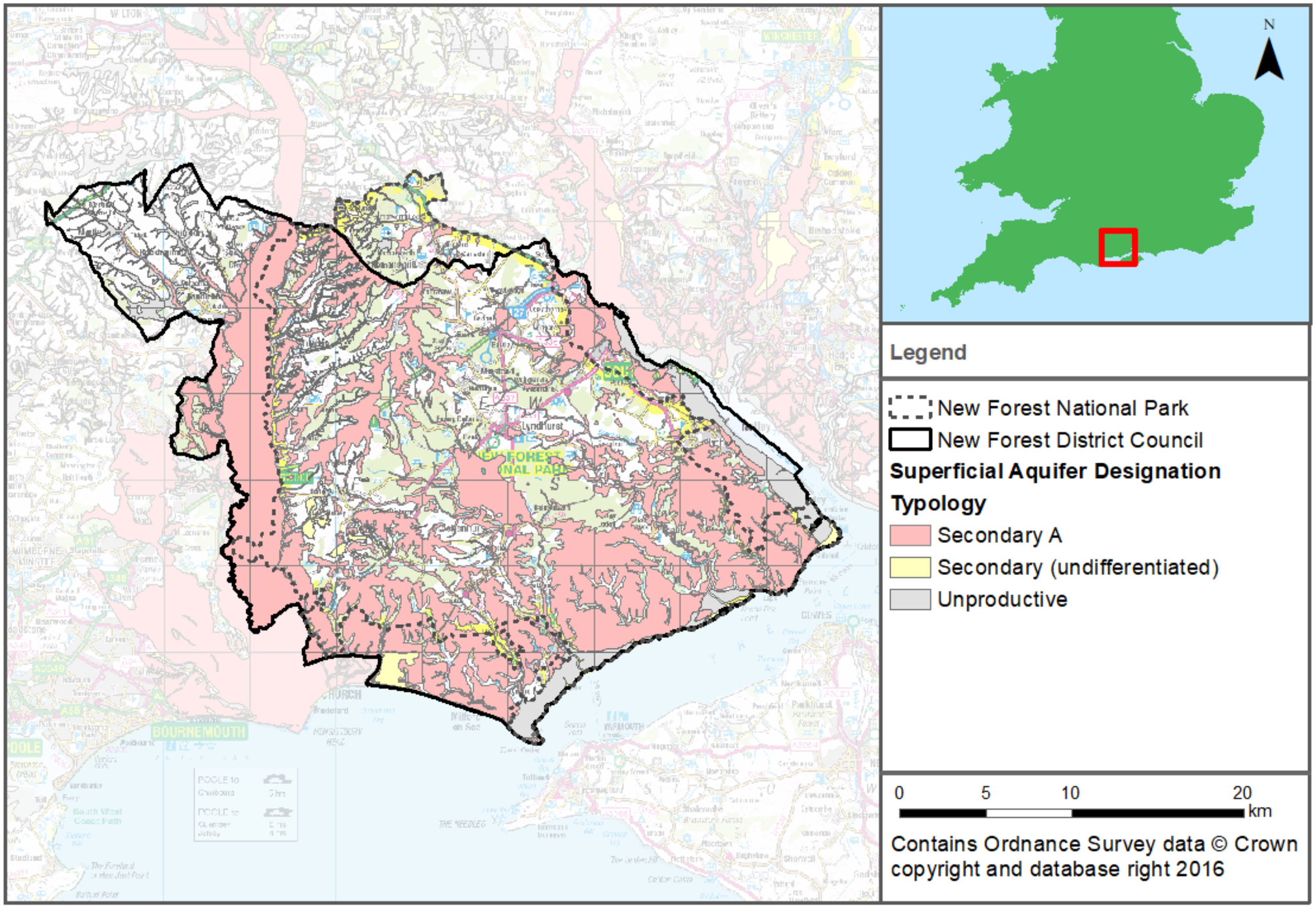


Figure 6-3: Superficial aquifer designation in New Forest District and National Park



6.3 Watercourses in New Forest District and National Park

There are numerous watercourses flowing through the study area. These include Main Rivers and ordinary watercourses. Appendix B shows the location of Main Rivers and Ordinary Watercourses in the study area.

- Main Rivers: These tend to be larger streams and rivers, though some of them are smaller watercourses of local significance. The Environment Agency has permissive powers to carry out maintenance, improvement or construction work on Main Rivers to manage flood risk. Consultation with the Environment Agency will be required for any development projects within 20m of a Main River or flood defence, and any other water management matters.
- Ordinary watercourses: These are all watercourses not designated as Main River or IDB watercourses. The operating authority (local authority or IDB) has permissive powers to maintain them, but the responsibility lies with the riparian owner.

6.4 Fluvial flood risk

The main source of flooding in the New Forest District and National Park is from rivers with significant influence from tidal conditions. Significant rivers and their tributaries within the study area contribute towards flood risk but are not limited to:

- River Avon
- Avon Water
- Lymington River
- Beaulieu River
- River Darkwater
- Stanswood Stream
- Bartley Water
- Cadnam River
- Danes Stream

Flooding may not be from one watercourse alone. Often the combination of watercourses and the interaction of two or more sources of out of bank flow across the floodplain can have profound implications for the extent of the risk (e.g. Dockens Water and the River Avon)

Although New Forest District and National Park is largely rural there are a sizable number of urban areas where these watercourses have the potential to get out of bank and cause limited flooding to property. Risks are most significant in the following urban locations:

- Fordingbridge
- Brokenhurst
- Milford-on-Sea
- Lymington
- Hythe
- Marchwood
- Totton

Table 6-3 describes the flood risk from all sources to these urban settlements and to further principal urban settlements in the study area.

In addition to these settlements, the **Hampshire Avon CFMP** states that prolonged deep flooding can have a negative impact on the Avon Valley Site of Special Scientific Interest and several Scheduled Monuments are at risk of flooding.

6.5 Tidal flood risk

Tidal flood risk is assessed based on Extreme Still Water Sea Levels (ESWSL), plus an allowance for the interaction of wind and waves. An ESWSL is the level the sea is expected to reach during a storm event for a particular magnitude of flood event as a result of the combination of astronomical tides and meteorological surges. It is conventional to assess the magnitude of these events by referring to 'still' water, and then to make additional allowances for the effect of waves, wind and swell. The astronomical tide levels are primarily generated by the gravitational effects of the sun and the moon. Surge events are the result of meteorological conditions where low atmospheric pressure causes the sea level to be increased to a higher level than for normal atmospheric conditions. The wave heights and swells are influenced by the strength, direction and persistence of the wind and the profile of the nearshore.

Tidal flooding is caused by extreme tide levels exceeding ground and/or defence levels. Flood Zones 1, 2 and 3 delineate areas at low risk, medium risk and high risk respectively from both tidal and fluvial flooding. Flood Zones do not take into account the effects of flood defences, and as such provides a worst-case assessment of flood risk. Flood Zone 3 and 2 represent the area that would be flooded in the 0.5% AEP and 0.1% AEP tidal event in the absence of defences, respectively. The delineation of the tidal Flood Zones and the areas of the New Forest District and National Park, which are within tidal Flood Zones are shown in Appendix C.1. Consideration of how climate change may influence the predicted Flood Zones in the future is indicated within the mapping of Appendix D.1.

The New Forest District and National Park are bound by the Tidal River Test, Southampton Water, The Solent and Christchurch Bay. As such the coastline is potentially at risk of tidal flooding. The study area also has numerous river networks which ultimately discharge into the sea. With a combination of high tides and high river levels, there is a high potential for river or surface water flooding where rivers in flood are unable to discharge into the sea due to high tides[6] and can cause tidal locking.

The probability of a failure of the sea defences occurring is reduced by the actions of the defence owners in maintaining the defences and beach, but there remains a residual risk from tidal flooding if the defences do fail or are overtopped. The necessity for assessment of the 'residual' risk defence failure (e.g. breach) should be considered on a site by site basis. Information on defences within the district is provided in Section 7.

6.6 Coastal flood risk

In coastal locations, the risk of flooding is linked to the stability of the coastline. If the coast is eroding, then the potential effect is that tidal flood defences near to the sea will be lost and flood risk will increase. To maintain an appropriate standard of safety from flooding it is sometimes necessary to implement works to slow down or stop the rate of coastal erosion and so maintain the integrity of the tidal defences. The **Poole and Christchurch Bays SMP** covering Naish Cliff to Hurst Spit and the **North Solent SMP covering** Hurst Spit to Lower Test Valley describe the arrangements and strategy for managing coastal erosion.

Coastal erosion is a prominent process along much of the study area's coastline. According to the Poole and Christchurch Bays SMP and North Solent SMP much of the coastline is protected from flooding and/or erosion with structures and/or beach management. The defences form a very important aspect of the control on the physical coastline. The Poole and Christchurch Bays SMP and North Solent SMP state that along much of shoreline lie areas of International and European importance which requires protection from coastal erosion.

6.7 Surface water flood risk

Flooding from surface water runoff (or 'pluvial' flooding) is usually caused by intense rainfall that may only last a few hours, occurring often where the natural (or artificial) drainage system is unable to cope with the volume of water. Surface water flooding problems are inextricably linked to issues of poor drainage, or drainage blockage by debris, and sewer flooding.

6 Hampshire County Council (2011) Preliminary Flood Risk Assessment

The Risk of Flooding from Surface Water (RoFSW) dataset shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas.

The **Hampshire County Council** PFRA states that surface water flooding is an issue in Hampshire within both urban and rural areas. In both cases, critical transport routes can be affected. The PFRA does not identify any settlement within New Forest District or National Park to be designated as a 'Flood Risk Area'.

A summary of surface water flood risk to key locations in the study area (as well as other sources of flooding) are detailed in Table 6-3. The RoFSW mapping for New Forest District and National Park can be found in Appendix E.

6.8 Groundwater flood risk

In comparison to fluvial flooding, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Under the Flood and Water Management Act (2010), LLFAs have powers to undertake risk management functions in relation to groundwater flood risk. Groundwater level monitoring records are available for areas on Major Aquifers. However, for lower lying valley areas, which can be susceptible to groundwater flooding caused by a high groundwater levels in mudstones, clays and superficial alluvial deposits, very few records are available. Additionally, there is increased risk of groundwater flooding where long reaches of watercourse are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas.

As part of the SFRA deliverables, mapping of the study area has been provided showing the Areas Susceptible to Groundwater Flooding (AStGWF). This information is provided in Appendix F. The AStGWF is a strategic-scale map showing groundwater flood areas on a 1km square grid.

The AStGWF data should be used only in combination with other information, for example local or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. It should be noted that although an area may be designated as susceptible to groundwater flooding, this does not mean that groundwater flooding will definitely be a problem within these areas, rather it provides an indication of potential risk.

The **Hampshire Avon CFMP** states that the catchment has a history of groundwater flooding due to prolonged wet periods. The 2007 New Forest District Council and New Forest National Park Authority SFRA[7] states that groundwater flooding has been an issue in the Avon catchment at times of high water level in the watercourses. The previous SFRA also states that groundwater flooding has been an issue in Cadham and Bartle.

6.9 Flooding from artificial sources

6.9.1 Flooding from sewers

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 such as blockages, collapses or equipment failure occur in the sewerage system. Infiltration or entry of soil or groundwater into the sewer system via faults within the fabric of the sewerage system, is another cause of sewer flooding. Infiltration is often related to shallow groundwater, and may cause high flows for prolonged periods of time.

Since 1980, the Sewers for Adoption guidelines have meant that most new surface water sewers have been designed to have capacity for a 1 in 30-year rainfall event (3.3% AEP), although until recently this did not apply to smaller private systems. This means that, even where sewers are built to current specification, they are likely to be overwhelmed by larger events of the magnitude often considered when looking at river or surface water flooding. Existing sewers can also become overloaded as new development adds to the discharge to their catchment, or due to incremental

7 New Forest District Council and New Forest National Park (2007) Strategic Flood Risk Assessment

increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Historical records of flooding are detailed by Southern Water in their Sewer Incident Report Form (SIRF) Data and by Wessex Water in their Inadequate Capacity Incidents data. These databases record incidents of flooding relating to public foul, combined or surface water sewers and identifies which properties suffered flooding. For confidentiality reasons, this data has been supplied on a postcode basis. The information from the two datasets are shown in Table 6-1 and Table 6-2.

The two data sets indicate a total of 266 recorded flood incidents in the study area. The more frequently flood postcodes are: BH24 1 (47 incidents), SP6 1 (23 incidents), SO41 0 (19 incidents) and BH24 4 (18 incidents). It is important to recognise the data does not contain information about properties and areas at risk of sewer flooding caused by operational issues such as blockages. Also, the register represents a snap shot in time and will get outdated with properties being added to the register following rainfall events, whilst risk will be reduced in some locations by capital investment to increase the capacity of the network. As such the sewer flooding flood risk register is not a comprehensive 'at risk register'.

Table 6-1: Southern Water Sewer Incident Report Form data

Postcode	Recorded Flood incidents
BH25 5	2
BH25 7	2
SO40 2	9
SO40 3	7
SO40 4	6
SO40 7	11
SO40 8	4
SO40 9	7
SO41 0	19
SO41 3	5
SO41 5	1
SO41 6	7
SO41 8	12
SO41 9	5
SO42 7	1
SO43 7	5
SO45 1	4
SO45 2	6
SO45 3	12
SO45 4	8
SO45 5	10
SO45 6	7
Total: 150	
Note: Based on information received 03/11/2016	

Table 6-2: Wessex Water Inadequate Capacity Incidents data

Postcode	Recorded Flood incidents
BH23 7	5
BH23 8	12
BH23 7	4
BH24 1	47
BH24 3	6
BH24 4	18
SP6 1	23
SP6 3	1
Total: 116	
Note: Based on information received 18/06/2017	

6.9.2 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs 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. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs . The Environment Agency is currently progressing a 'Risk Designation' process so that the risk is formally determined.

Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The risk of inundation to the study area as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study. Several reservoirs are located within the study area. However, there are also reservoirs outside of the area whose inundation mapping is shown to affect the study area. Maps of the flood extent can be found on the Government's **Long term flood risk information website**.

The Government's maps represent a credible worst-case scenario. In these circumstances, it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage.

- Developers should seek to contact the reservoir owner to obtain information which may include:
    - reservoir characteristics: type, dam height at outlet, area/volume, overflow location;
    - operation: discharge rates / maximum discharge;
    - discharge during emergency drawdown; and
    - inspection / maintenance regime.
- Developers should 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 lay-out?

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

- Consult with relevant authorities regarding emergency plans in case of reservoir breach
- In addition to the risk of inundation those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

Table 6-3: Summary of flood risk to the key towns and villages in the study area

Settlement	Fluvial/tidal/coastal flood risk	Formal flood defences	Surface water flood risk	Susceptibility to groundwater				Reservoir inundation
				<25%	>=25% <50%	>=50% <75%	>75%	
Fordingbridge	The confluence of the Ashford Water and Sweatford's Water lies in the south of Fordingbridge. The River Avon lies to the east its confluence with Sweatford's water is situated to the south-east. The Flood Zone mapping shows that much of the settlement lies in Flood Zone 3b, particularly in the south. Several properties are located in Flood Zone 3b. Flood Zones show the undefended scenario. The EA historic flood outline dataset shows that there has been a history of fluvial flooding at the settlement. Defences to the south-east of Fordingbridge provide protection against a 1% AEP event. Here there remains a residual risk should the defences breach or fail.	See Section 7	Mapping shows that surface water flood risk generally follows similar paths to the watercourses. Away from the watercourses, surface water flood risk is mainly confined to areas of open space and residential roads, particularly Station Road/ Shaftesbury Street and Bowerwood Road		✓	✓	✓	None
Ringwood	The River Avon flows to the west of the settlement, with Foulford Bottom and several unnamed drains located to the east and south-east. Flood Zones 2, 3a and 3b surround these watercourses. Several properties in the south-west and east of the settlement lie within Flood Zone 2 or 3a. The EA historic flood outline dataset shows that there has been a history of flooding in the far south-west of Ringwood. The EA flood defence data indicates that defences to the south-west of Ringwood provide protection against the 1.3% AEP event. Here there remains a residual risk should the defences breach or fail.	See Section 7	Mapping shows that the surface water flood risk tends to follow the paths of the roads. Surface water tends to pond in residential gardens and areas of open space in Ringwood. Specific roads which are at risk of surface water flooding include the A31, Southampton Road, Gorley Road and Linford Road.	✓	✓	✓	✓	Inundation from the Blashford Lake reservoir may potentially affect properties the far west of the settlement along West Street
Bransgore	The Bransgore Drain flows from the north-east of the settlement to the west. Much of the centre of Bransgore lies within Flood Zone 2, 3a or 3b.	None	Surface water flood risk mapping shows that generally surface water flows along the roads. The roads that are at risk include Burnthouse Lane, Betsy Lane, Burley Road, Ringwood Road and West Road.	✓	✓	✓		None
New Milton/ Barton-on-Sea	Danes Stream passes through the north and centre of New Milton and Becton Bunny passes through the centre and east of Barton-on-Sea. Much of the area surrounding the two watercourses lies within Flood Zone 2, 3a or 3b. Several properties in proximity to the watercourse lie within these Flood Zones. The EA historic flood outline dataset indicates that fluvial flooding has occurred in the Brook Avenue/ Manor Road/Oakwood Avenue area in New Milton. The data also indicates that fluvial flooding has occurred in the Southern Oaks/Albany Close area and Friars Walk in Baron-on-Sea. Flood defences located along Brook Avenue in New Milton offer protection against the 4% AEP flood event. Here there remains a residual risk should the defences breach or fail.	See Section 7	Mapping shows that the surface water flood risk tends to follow the watercourses or roads.	✓	✓	✓		None

Settlement	Fluvial/tidal/coastal flood risk	Formal flood defences	Surface water flood risk	Susceptibility to groundwater				Reservoir inundation
				<25%	>=25% <50%	>=50% <75%	>75%	
Lymington	The Pennington Lake Stream is located in the west of the settlement and the Pennington/Waterford Stream flows through the centre and to the south-east. The tidally influenced Lymington River lies in the far east of the settlement. Flood Zones 2, 3a and 3b surround the Pennington Lake Stream and Pennington/Waterford Stream. Several properties in proximity to these watercourses lie within these Flood Zones. The land to the east and west of the Lymington River also lies within Flood Zone 2, 3a or 3b. Within the King's Saltern Road/Bath Road area, much of the land is located within Flood Zone 3a. The EA historic flood outline data indicates that flooding has occurred in the King's Saltern Road/ Bath Road/Lymington Town Station area. Historical flooding is also noted along Undershore Road. Flood defences along the Lymington River protect against the 4%, 1% and 0.5% flood events. Here there remains a residual risk should the defences breach or fail. Tidal locking has the potential to increase levels upstream in the Lymington River due to the watercourse not being able to discharge effectively during high tide.	See Section 7	Surface water flood risk mapping indicates that the surface water tend to follow the path of the watercourses and roads. The risk is prominent in the north-east of Lymington and in the Waterford Lane/Stanley Road area.	✓	✓	✓		None
Brockenhurst	A tributary of the Lymington River flows through the centre of Brockenhurst. The tributaries confluence with the Lymington River lies to the north-east of the settlement. Alongside this watercourse lies Flood Zones 2, 3a and 3b and several properties are included in these areas. The EA historic flood outline data indicates that there is a history of fluvial flooding at the settlement caused by the Lymington River tributary. Historic flood events are noted in the town during 1966, 1990, 2000.	None	Mapping shows that the surface water flood risk predominately follows the path of the watercourses and is greatest at the confluence of the tributary and the Lymington River. Surface water is also noted to follow the path of the roads, particularly the B3055.	✓	✓	✓		None
Blackfield	The Stanswood Stream lies in the north-east of the settlement and the River Darkwater is situated to the south-west. Flood Zones 2, 3a and 3b lie either side of the watercourses. Properties in Valley Close are situated in Flood Zone 2 and 3a.	None	The surface water flood risk predominately follows the flow of the watercourse. The risk also tends to follow the paths of the roads, with Hampton Lane and Lepe Road at risk. Surface water is noted to pool between Hampton Lane and Tom's Down.	✓	✓	✓	✓	None
Holbury	The River Darkwater lies to the west of the settlement. Flood Zones 2, 3a and 3b lie either side of the watercourse. Part of Park Lane and a property lie within Flood Zone 3b	None	The surface water flood risk predominately flows along the roads and watercourse.	✓		✓		None

Settlement	Fluvial/tidal/coastal flood risk	Formal flood defences	Surface water flood risk	Susceptibility to groundwater				Reservoir inundation
				<25%	>=25% <50%	>=50% <75%	>75%	
Hythe	The source of the flood risk in the area is a combination of fluvial and tidal. The Hythe South Watercourse flows through the south of the settlement, with a number of connected drains and culverted watercourses in the area. The Hythe Centre Watercourse flows through the centre of the settlement and is mostly culverted. The North Dibden Stream is situated to the north of Hythe with several connected drains in the area. Southampton Water lies to the east of the settlement. Unnamed tributaries of the River Beaulieu lie in the west of Hythe. Flood Zones 2, 3a and 3b lie either side of the North Dibden Stream and the Hythe South Watercourse. As majority of the Hythe Centre Watercourse is culverted, Flood Zones 2, 3a and 3b lie either side of the watercourse as the culvert ends. As the watercourse flows towards Southampton Water it is no longer surrounded by Flood Zone 3b. EA data indicates that flooding occurred on South Street in the winter of 2000/2001. The data also shows that flooding occurred along Prospect Place and The Promenade caused by the sea in 2009. The majority coastal defences protect the settlement against the 0.5% AEP event. However, there remains a residual risk should the defences breach or fail.	See Section 7	Mapping shows that the surface water flood risk predominately follows the similar path of the roads and watercourses. Roads which are at risk include Southampton Road, South Street and Shore Road	✓	✓	✓		None
Marchwood	The tidally influenced River Test lies to the north-east of the settlement. The tidal Magazine Lane Stream crosses the north of Matchwood, with Cracknore Hard Stream in the south. Flood Zones 2, 3a and 3b lie either site of the Magazine Lane Steam but are predominately located towards the north-west of the watercourse. Flood Zones 2, 3a and 3b are situated in the east of Marchwood which are associated with the Cracknore Hard Stream. The majority of Frobisher Court is situated in Flood Zone 3a although flood zones show the undefended scenario. A large area including fifteen Acre Wood, Gardiner Close and Central Crescent id located with Flood Zones 2, 3a or 3b. EA historic flood outline data indicates that tidal flooding was experienced in Cracknore Hard Lane and Magazine Lane in 2008 from the Cracknore Hard Stream. The data indicates that flooding occurred on Hythe Road and Long Lane in 2000 although the cause is unknown. EA flood defence data indicates that defences surrounding Frobisher Court offer protection up to the 0.5% AEP event. However, there remains a residual risk should the defences breach or fail. Tidal locking has the potential to increase levels upstream in the watercourses due to the watercourses not being able to discharge effectively during high tide.	See Section 7	Surface water flood risk mapping shows that surface water tends to follow a similar flow path to the watercourse and roads. In addition, surface water tends to pool in the Mulberry Road area and the Fifteen Acre Wood area.		✓	✓	✓	None

Settlement	Fluvial/tidal/coastal flood risk	Formal flood defences	Surface water flood risk	Susceptibility to groundwater				Reservoir inundation
				<25%	>=25% <50%	>=50% <75%	>75%	
Totton /Calmore	A number of tidally influenced watercourses flow through and in the vicinity of Totton and Calmore. The River Test lies to the east, with its tributary Calmore Canal passing through Calmore and a further tributary is located in the centre of Totton. Bartley Water and its tributaries pass through the south of Totton. Flood Zones 2, 3a and 3b follow the paths of the watercourses. Many properties in the Calmore/Hammond's Green/Testwood area are situated in Flood Zones 2, 3a or 3b, although flood zones show the undefended scenario. Many properties in the Hawkers Close, Greenfield Avenue and Testwood Lane areas are also located in Flood Zones 2, 3a and 3b. EA historic flood data indicates that floods have occurred at the Marchwood Road/Burt Lane area, Jacob's Gutter Lane, Calmore Road and the Down's Park/Eling Hill crossroads. EA Flood defences in the Eling area provide some level of protection up to the 2% AEP event. Defences along the Calmore Canal offer protection against the 4% AEP event.	See Section 7	Mapping indicates that surface water flood risk tends to follow paths of the watercourses and roads. The area between Calmore/Totton/Hammond Green is at particularly high risk.	✓	✓	✓	✓	None
Lyndhurst	The Beaulieu River flows through the north of the settlement, with a tributary located to the north of Custards. A number of drains are situated to the south of Lyndhurst. Flood Zones 2, 3a and 3b follow the River Beaulieu and its tributary, resulting in several properties in the Custards area being located within these Flood Zones. The EA historic flood data indicates that flooding was caused by the River Beaulieu in the Custards area during November 1995.	None	Mapping indicates that surface water flood risk tends to follow the paths of the watercourses. Areas at higher risk include the Custards, The Meadows area and Gosport Lane.	✓		✓		None

7 Flood and coastal defences

Preparation of the SFRA has included a high-level review of available information on formal flood defences (flood risk management assets) and involved interrogation of existing evidence on asset condition and standards of protection. Details of the flood defence locations and condition were provided by the Environment Agency for the purpose of preparing this assessment, in addition to some supplementary explanation on asset performance. Defences are categorised as either raised flood defences (e.g. walls/embankments) or flood storage areas (FSAs). The assessment has considered man-made defences and not natural defences which may arise for instance due to the presence of naturally high ground adjacent to a settlement.

7.1 Defence standard of protection and residual risk

One of the principal aims of the SFRA is to outline the present risk of flooding across The New Forest District and National Park including consideration of the effect of flood risk management measures (including flood banks and defences). The modelling that informs the understanding of flood risk within the district is typically of a catchment wide nature, suitable for preparing evidence on possible site options for development. In cases where a specific site risk assessment is required, detailed studies should seek to refine the results used to provide a strategic understanding of flood risk from all sources.

Consideration of the residual risk behind flood defences has been undertaken as part of this study. Residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse.

Developers should also consider the standard of protection provided by defences and residual risk when preparing detailed Flood Risk Assessments.

Standard of Protection

Flood defences are designed to give a specific standard of protection, reducing the risk of flooding to people and property in flood prone areas. 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.

Although flood defences are designed to a standard or protection it should be noted that, over time, the actual standard of protection provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change

7.2 Defence condition

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

Table 7-1: Flood defence 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.

Source: Condition Assessment Manual – Environment Agency 2006

A review of key defences across the study area, their condition and standard of protection is included in the following sections.

7.3 Flood defences in New Forest District and National Park

Flood defence maps can be found in the following appendix sections

Table 7-2: Flood defence mapping

Appendix	Location	Details of mapping
I.1	Fordingbridge/ Martin/Rockbourne/Woodgreen	Defence type
I.2	Fordingbridge/ Martin/Rockbourne/Woodgreen	Defence condition
I.3	Fordingbridge/ Martin/Rockbourne/Woodgreen	Standard of protection
I.4	Ringwood	Defence type
I.5	Ringwood	Defence condition
I.6	Ringwood	Standard of protection
I.7	New Milton/Milford-on-Sea/Lymington area	Defence type
I.8	New Milton/Milford-on-Sea/Lymington area	Defence condition
I.9	New Milton/Milford-on-Sea/Lymington area	Standard of protection
I.10	East Boldre	Defence type
I.11	East Boldre	Defence condition
I.12	East Boldre	Standard of protection
I.13	Cadnam/Totton/Marchwood/Hythe	Defence type
I.14	Cadnam/Totton/Marchwood/Hythe	Defence condition
I.15	Cadnam/Totton/Marchwood/Hythe	Standard of protection

7.3.1 Fordingbridge/ Martin/Rockbourne/Woodgreen

In the Bridge Street area of Fordingbridge, several flood walls, embankments and demountable defences are in proximity to the River Avon. Also within Fordingbridge, flood walls are located to the west of West Mills Road and Reeder Close. Embankments are located along the River Avon in Breamore and Brickton, with further embankments situated to the south of Fordingbridge along the Midgham Drain and along the Ashford Water in Martin.

The overall condition of the defences in the area. The majority of the defences are in either 'good' or 'fair' condition. The data indicates that the standard of protection varies from protection against the 1 in 2-year event to the 1 in 100-year event.

The Hampshire Avon CFMP states that over the last 25 years, engineering schemes have been implemented to reduce flood risk in the catchment including Fordingbridge[8].

7.3.2 Ringwood

Several walls and embankments lie in the west of Ringwood. The defences protect Ringwood from the Bickerley Millstream and are in fair to good condition and the defences offer protection against the 1 in 75-year event.

8 Environment Agency (2012) Hampshire Avon Catchment Flood Management Plan

7.3.3 New Milton/Milford-on-Sea/Lymington

Embankments, walls and a number of flood gates are situated along the coastline from New Lane to the Lymington Marina. From Lymington Marina to Lymington New Forest Hospital, lie walls, flood gates, quays and embankments which offer flood protection against the Lymington River.

Embankments and walls offer protection along areas of the Dane Stream and its tributaries. These include the Milford Crescent area of Milford-on-Sea, the Downton Lane area of Downton, Stopples Lane in Hordle and Brook Avenue in New Milton.

The defences vary in condition from very poor to very good.

Some of the small defences are noted to offer 'zero' standard of protection particularly in the Lymington, Keyhaven and Stopples Lane areas and therefore the standard of protection is unknown. If these defences will impact development please refer to the relevant authority. However, most of defences protect against the 1 in 200-year event.

The **New Forest CFMP** states that a flood storage reservoir on Danes Stream protects Milford-on-Sea. The Danes Stream has been significantly modified for flood defence purposes in Milford-on-Sea[9] .

The New Forest CFMP also states that Lymington benefits from a Flood Alleviation Scheme.

7.3.4 East Boldre

The flood defences in the East Boldre area consist of embankments. An Embankment is situated to the south of Sowley Lane and is noted to offer 0 standard of protection. Therefore, the level of protection is unknown and further advice should be sought from the relevant authority if these defences may be influential to development. Further embankments are located along the right and left bank of the Beaulieu River in Bucklers Hard and continue along the right bank to Needs Ore Point.

The defences are in either good or fair condition and defences along the Beaulieu River offer protection against the 1 in 10, 25 or 100-year events.

7.3.5 Cadnam/Totton/Marchwood/Hythe

There are a number of defences located in the north-east of the study area. Embankments lie either side of the Pollardsmoor Stream near Newbirdge Road in Copthorne. These defences are in good or fair condition and either offer protection against the 1 in 5 or 25-year event.

Embankments border the majority of the Calmore Canal, which are either in good or fair condition and offer protection against the 1 in 25-year event.

Tidal and fluvial defences are located along Barley Water in Rushington. These are a combination of walls and embankments, they are in good, fair or very poor condition and either offer no protection or protect against the 1 in 5 or 50-year event.

Along the River Test lies a number of embankments, flood gates, walls and beaches which provide fluvial, tidal and coastal protection. The defences are in very good, good or fair condition and offer protection from the 1 in 25, 50, 100 or 200-year events. Several defences in Marchwood Industrial Park area offer 0 standard of protection from flood events. Therefore, the level of protection is unknown and further advice should be sought from the relevant authority if these defences may be influential development

An embankment is situated along the North Didben Stream to the north of Hithe. The embankment is in good condition and offers protection from the 1 in 25-year event.

Along the bank of the River Test in Hythe lie embankments, walls and a promenade. These are in good or fair condition and offer protection from either the 1 in 25 or 200-year event.

9 New Forest National Park and Pond Conservation (2012) New Forest Catchment: Water Environment Improvement Plan

7.4 Coastal defences

The **Poole and Christchurch Bays SMP** and **North Solent SMP** describe the arrangements and strategy for managing coastal erosion and influential measures. More detailed strategies have been developed to address coastal erosion and flood risk, describing the approach to meeting the outcomes of the SMP, and these are described in the following documents:

- **New Forest District Coastal Management Plan**
- **West Solent Coastal Defence Strategy**

An area of the coastline which is particularly vulnerable to storms is Hurst Spit. Hurst Spit is a natural beach which has been hit by major storms in the past. After the 1996 storm, coastal protection works were completed which saw 300,000 cubic metres of beach material and 125,00 tonnes of rock used to stabilise the spit. The storms in the winter of 2013 and 2014 resulted in serious damage and loss of beach material and the spit is now in need of a 'recharge' of materials with proposals to add another 150,000 cubic metres of beach material within the next five years[10]

10 New Forest District Council (2017) Hurst Spit £300k coastal defence project - Guardian of the western Solent

8 FRA requirements and flood risk management guidance

8.1 Over-arching principles

This SFRA focuses on delivering a strategic assessment of flood risk within New Forest District and National Park. Due to the strategic scope of the study, prior to any construction or development, site-specific assessments will need to be undertaken for individual development proposals (where required) so all forms of flood risk at a site are fully addressed. It is the responsibility of the developer to provide an FRA with an application.

It should be acknowledged that a detailed FRA may show that a site is not appropriate for development of a particular vulnerability or even at all. Where the FRA shows that a site is not appropriate for a particular usage, a lower vulnerability classification may be appropriate.

8.2 Requirements for site-specific flood risk assessments

8.2.1 What are site specific FRAs?

Site specific FRAs are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted to LPAs with planning applications and should demonstrate how flood risk will be managed over the development's lifetime, taking into account climate change and vulnerability of users.

8.2.2 When are site specific FRAs 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 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.

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 the site is intended to discharge to the catchment or assets of a water management authority which requires a site-specific FRA
- Where the site's drainage system may have an impact on an IDB's system
- Where evidence of historical or recent flood events have been passed to the LPA
- In an area of significant surface water flood risk.
- In circumstances where land is not identified as being in a flood Zone on the basis that no mapping has been prepared. Such sites are typically located adjacent to drainage features that might not have been included in flood modelling, but can often be identified using the RoFSW mapping.

In some cases, a development meeting the criteria below may need to submit a FRA to the Internal Drainage Board to inform any consent applications. However, no IDBs are located within the study area.

8.2.3 Objectives of site specific FRAs

Site specific FRAs should be proportionate to the degree of flood risk, as well as appropriate to 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
- Whether, if applicable, the development will be safe and pass the Exception Test, if applicable

FRAs for sites located in New Forest District and National Park should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency. Guidance and advice for developers on the preparation of site specific FRAs include:

- **Standing Advice on Flood Risk (Environment Agency)**
- **Flood Risk Assessment for Planning Applications (Environment Agency)**
- **Site-specific Flood Risk Assessment: CHECKLIST (NPPG, Defra)**

Guidance for local planning authorities for reviewing flood risk assessments submitted as part of planning applications has been published by Defra in 2015 – **Flood Risk Assessment: Local Planning Authorities**

8.3 Flood risk management guidance – mitigation measures

Mitigation measures should be seen as a last resort to address flood risk issues. Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered.

8.3.1 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 Flood Zones 2 and 3, to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas

However, vehicular parking in floodplains should be based on the nature of parking, flood depths and hazard including evacuation procedures and 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 as water levels rise.

Making space for water

The NPPF sets out a clear policy aim in Flood Zone 3 to create space for flooding by restoring functional floodplain.

All new development close to rivers should consider the opportunity presented 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.

The provision of a buffer strip can 'make space for water', allow 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. Building adjacent to riverbanks can also cause problems

to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult

8.3.2 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.

If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, finished flood levels should be set to whichever is higher of the following:

- a minimum of 600mm above the 1% AEP fluvial event plus an allowance for climate change and an appropriate allowance for freeboard
- a minimum of 600mm above the 0.5% AEP tidal event plus an allowance for climate change and an appropriate allowance for freeboard
- 300mm above the general ground level of the site.

If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches.

The additional height that the floor level is raised above the maximum water level is referred to as the “freeboard”. Additional freeboard may be required because of risks relating to blockages to the channel, culvert or bridge and should 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. However, access and egress would still be an issue, particularly when flood duration covers many days.

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test.

Ideally, access should be situated 300mm above the design flood level and waterproof construction techniques used. If safe access and egress cannot be achieved, the Defra/EA Technical Report: FD2320: Flood Risk Assessment Guidance for New Development, should be referred to, to determine the hazard to people posed along the access route. This can also be used to inform a Flood Response Plan for the site.

8.3.3 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. It would be preferable for schemes to involve an integrated flood risk management solution.

Temporary or demountable defences are not acceptable forms of flood protection for a new development but might be appropriate to address circumstances where the consequences of residual risk are severe but the time required to install the defences, for example in an overtopping scenario, would be realistic. In addition to the technical 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. The storage and accessibility of such structures must be considered.

8.3.4 Modification of ground levels

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 for flood waters. However, care must be taken at locations where raising ground levels could adversely affect existing communities and property; in most areas of fluvial flood risk, raising land above the floodplain would reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land.

All new development within the 1% AEP flood extent including an allowance for climate change (for the lifetime of the development) must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

Where proposed development results in a change in building footprint, the developer should normally ensure that it does not impact upon the ability of the floodplain to store or convey water, and seek opportunities to provide floodplain betterment. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided to so the total volume of the floodplain storage is not reduced.

For compensatory flood storage to be effective and not require hydraulic modelling, it must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership/control and linked to the site. Floodplain compensation should be considered in the context of the 1% annual probability (1 in 100 year) flood level including an allowance for climate change. When designing a scheme, flood water should normally be able to flow in and out unaided. An FRA should normally demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the life of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C62430.

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.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to confirm it would not cause increased ponding or build-up of surface runoff on third party land.

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

8.3.5 Developer contributions

In some cases, and following the application of the sequential test, it may be necessary for the developer to make a contribution 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).

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRMGiA)[11] can be obtained by operating authorities to contribute towards the cost of a range of activities including flood risk management schemes that help reduce the risk of flooding and coastal erosion. Some schemes are only partly funded by FCRMGiA and therefore any shortfall in funds will need to be found from elsewhere when using Resilience Partnership Funding, for example local levy funding, local businesses or other parties benefitting from the scheme.

For new development in locations without existing defences, or where the development is the only beneficiary, the full costs of appropriate risk management measures for the life of the assets proposed must be funded by the developer.

However, the provision of funding by a developer for the cost of the necessary standard of protection from flooding or coastal erosion does not mean the development is appropriate as other policy aims must also be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the Council and the Environment Agency.

The appropriate route for the consideration of strategic measures to address flood risk issues is the LFRMS. The LFRMS describes the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS, can be afforded and have an appropriate priority.

11 Flood and coastal defence funding: for risk management authorities (Environment Agency, 2014)

The Environment Agency is also committed to working in partnership with developers to reduce flood risk. Where assets are in need of improvement or a scheme can be implemented to reduce flood risk, the Environment Agency request that developers contact them to discuss potential solutions.

8.4 Flood risk management guidance – resistance measures

Measures designed to keep flood water out of properties and businesses.

There may be instances where flood risk to a development remains despite implementation of such planning measures as those outlined above. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk at the 0.1% AEP scenario. In these cases, (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not normally be relied on for new development as an appropriate mitigation method.

Most of the measures should be regarded as reducing the rate at which flood water can enter a property during an event and considered an improvement on what could be achieved with sand bags. They are often deployed with small scale pumping equipment to control the flood water that does seep through these systems. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system to user the measures are deployed in advance of an event. The following measures are often deployed:

Permanent barriers

Permanent barriers can include 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.

8.5 Flood risk management guidance – resilience measures

Measures designed to reduce the impact of water that enters property and businesses.

Flood-resilient buildings are designed and constructed to reduce the impact of flood water entering the building. 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 include:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level
- Water-resistant materials for floors, walls and fixtures
- Non-return valves to prevent waste water from being forced up bathroom and kitchen plugs, or lavatories
- Front doors that reduce ingress of water all the time with no further installation required. Such methods must consider hydrostatic pressure and that water may still come in through the floor. Such methods offer time and reduce damage but may not remove flood water from entering the house completely

8.5.1 Further guidance

The Environment Agency recommend that consideration is given to the use of flood proofing measures to reduce the impact of flooding if / when it occurs. To minimise the disruption and cost implications of a flood event the Environment Agency encourage development to incorporate flood resilience/resistance measures up to the 1 in 1,000-year (extreme) event plus climate change flood level. Both flood resilience and resistance measures can be used for flood proofing. Futher information can be found in the following publications: '**Improving the flood performance of new buildings**' and '**Prepare your property for flooding'**.

8.6 Reducing flood risk from other sources

8.6.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and for this reason many conventional flood defence and mitigation methods are not suitable. The principal way to fully reduce flood risk would be through building design (development form), so floor levels are raised above the water levels caused by a 1% AEP plus climate change event, or where high ground water levels are known. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream. In some circumstances it might be possible to consider installing measures to control groundwater levels and so reduce the magnitude and frequency of flooding.

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

When redeveloping existing buildings, it may be acceptable to install pumps in basements as a resilience measure. However, for new development this is not considered an acceptable solution.

8.6.2 Surface water and sewer flooding

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 shows that development will not make the risk worse, 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, providing they are maintained appropriately. 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, and appropriately, maintained. Consideration must also be given to attenuation and flow ensuring that flows during the 100-year plus climate change storm event are retained within the site if any flap valves shut. This must be demonstrated with suitable modelling techniques.

8.6.3 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) re-create the benefits of natural drainage systems by integrating water management with urban form to create and enhance the public realm, streets and open spaces. The flexibility of SuDS components means that SuDS can apply in both the urban and rural context and in both natural and man-made environments.

SuDS allow the delivery of high quality surface water drainage whilst at the same time supporting urbanised areas in coping with severe rainfall. SuDS generally replace traditional underground, piped systems that gather runoff using grates or storm water drains. They control flows to prevent deluges during times of high rainfall and reduce the risk of flooding whilst also providing benefits for amenity and biodiversity. The SuDS approach keeps water on the surface as much as possible to avoid concentration and acceleration of flows in piped systems while also taking the opportunity to provide valuable amenity assets for local residents and increase the provision of green infrastructure in urban areas. Keeping water on the surface also means that any problems with the system are

quicker and easier to identify than with a conventional system and are generally cheaper and more straightforward to rectify.

SuDS provide an opportunity to improve and connect habitat in urbanised environments, as well as playing an important role in delivering and reinforcing wider green infrastructure ambitions. SuDS can also deliver recreation and education opportunities.

SuDS must be considered at the outset, during preparation of the initial site conceptual layout to ensure that enough land is given to design spaces that will be an asset to the development rather than an after-thought. Advice on best practice is available from Hampshire County Council and Wiltshire Council (as the LLFAs), the Environment Agency and the Construction Industry Research and Information Association (CIRIA). More detailed guidance on the use of SuDS is providing in Section 9.

9 Surface water management and SuDS

9.1 Water is meant by surface water flooding?

Surface water flooding describes flooding from sewers, drains, and ditches that occurs during heavy rainfall.

Surface water flooding includes:

- **pluvial flooding**: flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (overland surface runoff) before it either enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity;
- **sewer flooding**: flooding that occurs when the capacity of underground water conveyance systems is exceeded, resulting in flooding inside and outside of buildings. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters which may cause water to back up and flood around buildings or in built up areas. Sewer flooding can also arise from operational issues such as blockages or collapses of parts of the sewer network; and
- **overland flows entering the built up area from the rural/urban fringe**: includes overland flows originating from groundwater springs.

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

From April 2015, local planning policies and decisions on planning applications relating to major development should ensure that SuDS for management of run-off are put in place. The approval of SuDS lies with the Local Planning Authority.

In April 2015 Hampshire County Council and Wiltshire Council were made statutory consultees on the management of surface water and, as a result, will be required to provide technical advice on surface water drainage strategies and designs put forward for major development proposals. Major developments are defined as:

- The winning and working of minerals or the use of land for mineral-working deposits
- Waste development
- The provision of dwelling houses where the number of dwelling houses to be provided is 10 or more; or the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the number of dwelling houses to be provided is 10 or more
- The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more
- Development carried out on a site having an area of one hectare or more

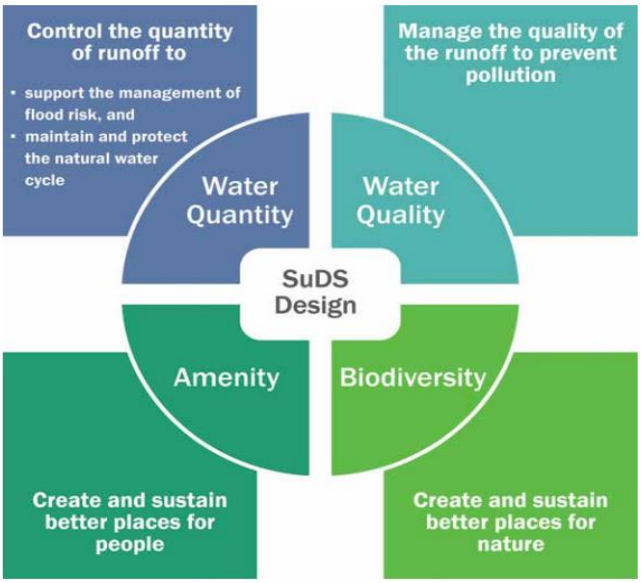
When considering planning applications, New Forest District Council and New Forest National Park will seek advice from the relevant flood risk management bodies, principally Hampshire County Council and Wiltshire Council on the management of surface water, to satisfy themselves that the development's proposed minimum standards of operation are appropriate, and to 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 will be through reference to the following documents:

- **Hampshire County Council's Surface Water and Sustainable Drainage: Guidance for Developers, Designers and Planners**
- **Wiltshire Council's Developers Guidance Note: Flood Drainage and SuDS**
- **Defra's Non-Statutory Technical Standards for SuDS**
- **The CIRIA SuDS Manual (C753) (2015)**

Hampshire County Council also provide further information regarding the use of SuDS on their **website**. The website also provides a **check list** for developers to assist in providing the correct information for planning applications.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. This will assist with the delivery of well designed, appropriate and effective SuDS. Proposals should also comply with the key SuDS principles regarding solutions that deliver multiple long-term benefits. These four principles are shown in Figure 9-1

Figure 9-1: Four principles of SuDS design



Source: **The SuDS Manual (C753) Ciria (2015)**

9.3 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are designed to maximise the opportunities and benefits that can be secured from surface water management practices. SuDS provide a means of dealing with the quantity and quality of surface water whilst offering additional benefits over traditional systems of improving amenity and biodiversity. The correct use of SuDS can also allow developments to counteract the negative impact that urbanisation has on the water cycle by promoting infiltration and replenishing ground water supplies. SuDS if properly designed can improve the quality of life within a development offering additional benefits such as:

- Improving water quality
- Habitat creation and improvement
- Improving amenity
- Improving air quality
- Regulating building temperatures
- Reducing noise
- Providing education opportunities
- Cost benefits over underground piped systems.

Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into the majority of spaces. For example, permeable paving could be used in parking spaces or rainwater gardens into traffic calming measures.

It is a requirement for all new major development proposals to ensure that sustainable drainage systems for management of runoff are put in place. Likewise, minor developments should also

ensure sustainable systems for runoff management are provided. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential

Hampshire County Council's Surface Water and Sustainable Drainage: Guidance for Developers, Designers and Planners and **Wiltshire Council's Developers Guidance Note: Flood Drainage and SuDS** details the LLFAs expectation on the SuDS disposal destination and the drainage hierarchy is to be followed; any submission should clearly demonstrate how the proposals will follow the drainage hierarchy

9.3.1 Types of SuDS Systems

There are many different SuDS components that can be implemented in attempts to mimic predevelopment drainage (Table 9-1). 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 9-1: Examples of SuDS techniques and 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	✓		

9.3.2 Treatment

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:

1. **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.
2. **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.

3. **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.
4. **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.
5. **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.

9.3.3 SuDS Management

SuDS components 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. 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 components in series it is possible to reduce the flow and volume of runoff as it passes through the system as well as minimising pollutants which may be generated by a development.

Further details about the adoption of SuDS can be found in the **Hampshire County Council's Surface Water and Sustainable Drainage: Guidance for Developers, Designers and Planners** document and **Wiltshire Council's Developers Guidance Note: Flood Drainage and SuDS** document.

9.3.4 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 9-2 details some possible constraints and how they may be overcome and includes information from the SuDS Manual (C753). Guidance should also be sought from the Environment Agency.

Table 9-2: Example SuDS constraints and possible solutions

Constraint	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 with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable line 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 indicate 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 floodplain zones	Design decisions should take into account the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain

Constraint	Solution
	and take into consideration the influence that a watercourse may have on a system. Factors 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.

Further, there may be constraints to surface water discharges relating to high water levels in a receiving watercourse especially those which are tidal.

For SuDS components that are designed to encourage infiltration, it is imperative that groundwater levels are low enough and a site-specific infiltration test is conducted early on as part of the design of the development. Infiltration should be considered with caution within areas of possible subsidence or sinkholes. Where sites lie within or close to groundwater source protection zones (GSPZs) or are underlain by an aquifer, further restrictions may be applicable and guidance should be sought from the LLFA. Where potential polluting activities are proposed, the Environment Agency should also be consulted.

9.4 Other surface water considerations

9.4.1 Groundwater Source Protection Zones (GSPZ)

In addition to the AStGWF data the Environment Agency also defines Groundwater Source Protection Zones in the vicinity of groundwater abstraction points. These areas are defined to protect areas of groundwater that are used for potable supply, including public/private potable supply, or for use in the production of commercial food and drinks. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. The definition of each zone is shown below:

- Zone 1 (Inner Protection Zone) – Most sensitive zone: defined as the 50-day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres
- Zone 2 (Outer Protection Zone) – Also sensitive to contamination: defined by a 400-day travel time from a point below the water table. This zone has a minimum radius around the source, depending on the size of the abstraction
- Zone 3 (Total Catchment) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source.
- Zone 4 (Zone of special interest) – A fourth zone SPZ4 or 'Zone of Special Interest' usually represents a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream).

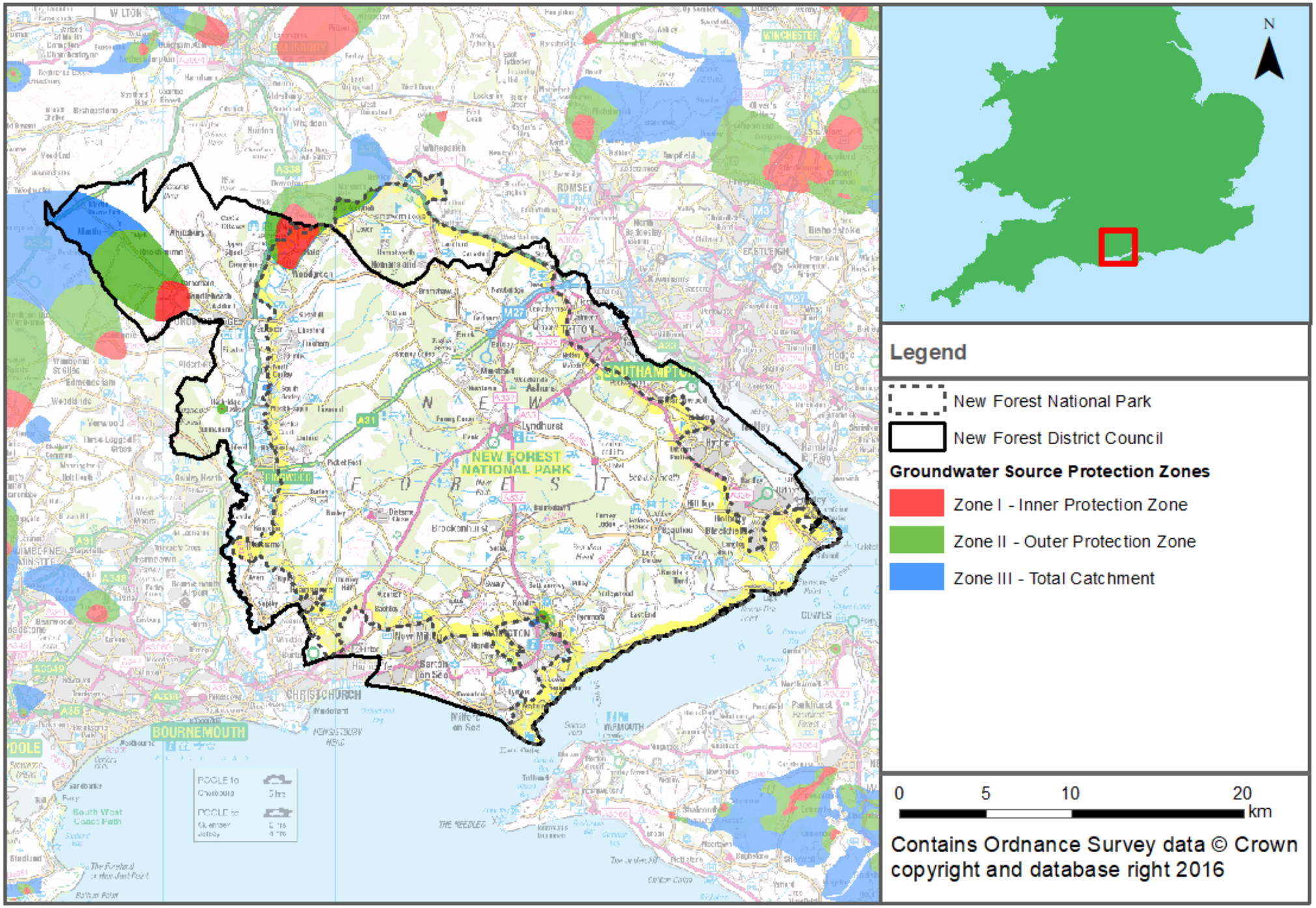
9.4.2 GSPZs in New Forest District and National Park

Two locations have been identified to be within GSPZs in the study area which are:

- Sandleheath, Rockbourne, Martin (Zone I, II and III)
- Hale (Zone I and II)

The GSPZs are shown in Figure 9-2.

Figure 9-2: Groundwater Source Protection Zones in New Forest District and National Park



9.5 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated to being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process. The definition of each NVZ is as follows:

- **Groundwater NVZ** – an area of land where groundwater supplies are at risk from containing nitrate concentrations exceeding the 50mg/l level dictated by the EU's Surface Water Abstraction Directive (1975) and Nitrates Directive (1991).
- **Surface Water NVZ** – an area of land where surface waters (in particular those used or intended for the abstraction of drinking water) are at risk from containing nitrate concentrations exceeding the 50 mg/l dictated by the EU's Surface Water Abstraction Directive (1975) and Nitrate Directive (1991).
- **Eutrophic NVZ** – an area of land where nitrate concentrations are such that they could/will trigger the eutrophication of freshwater bodies, estuaries, coastal waters and marine waters.

The locations of the NVZs in New Forest District and National Park are shown in Figure 9-3.

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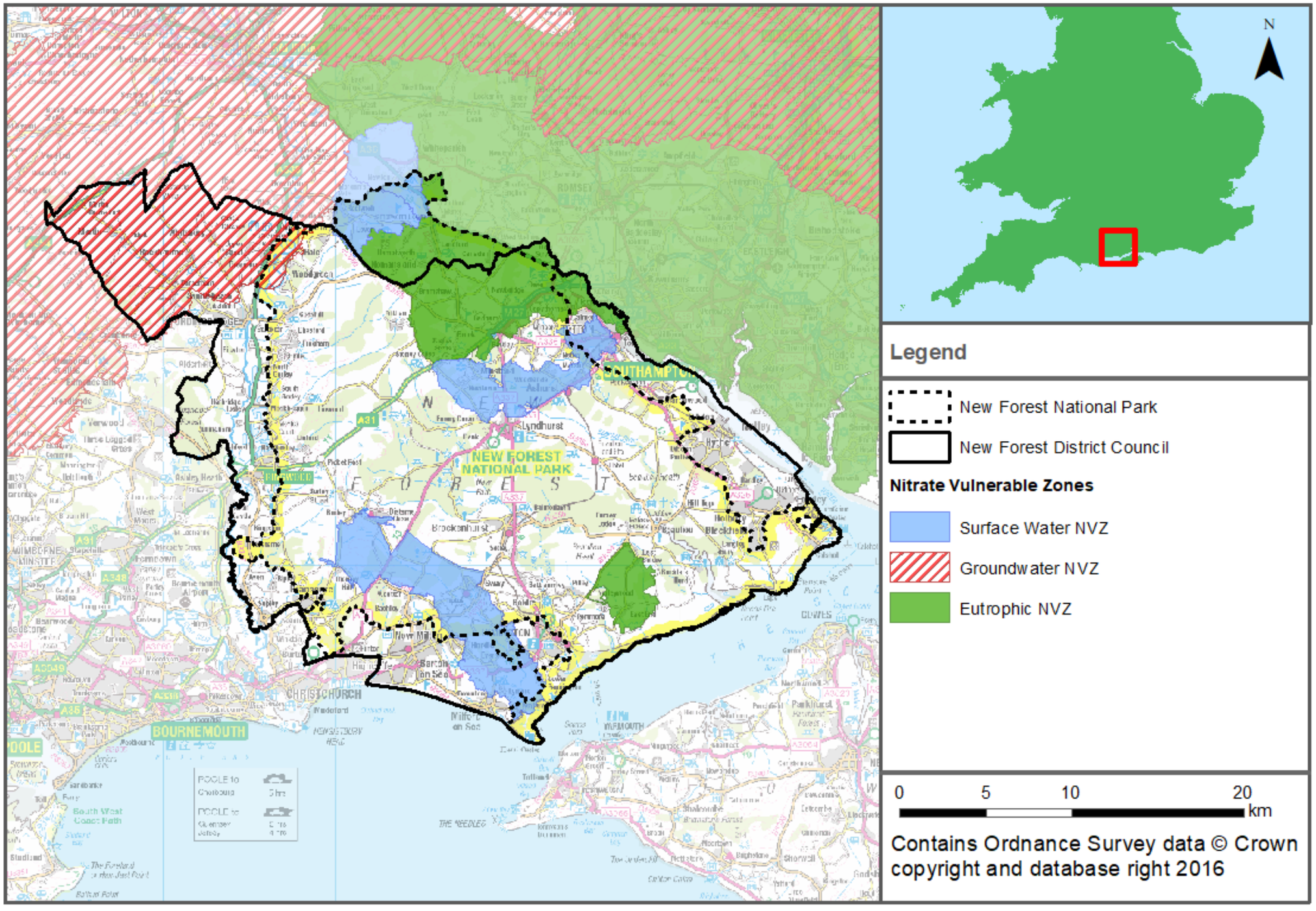
Figure 9-3: Nitrate Vulnerable Zones in the New Forest District and National Park



10 Flood warning and emergency planning

10.1 Flood emergencies

The evidence used to prepare this SFRA report demonstrates that New Forest District and National Park are affected by flood risk hazards and that particular communities are potentially vulnerable to flooding during events that exceed the design capacity of the defences, or from failure of those defences (residual risk).

Emergency planning is an option to help manage flood related incidents and is relevant in circumstances where there is a residual risk of flooding. Emergency planning is a core component of civil protection and public safety practices and seeks primarily to prevent, or secondly mitigate the risk to life, property, businesses, infrastructure and the environment. In the UK, emergency planning is performed under the direction of the 2004 Civil Contingencies Act (CCA).

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 these activities are already integrated in national building control and planning policies e.g. the NPPF.

Safety is a key consideration for any new development and includes the likely impacts of climate change and, where there is a residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels)[12] and for essential ancillary sleeping or residential accommodation for staff required by uses in this category [water-compatible development], subject to a specific warning and evacuation plan. Flood warning and evacuation plans may also be referred to as an emergency flood plan or flood response plan.

Emergency planning and flood risk management links

- 2004 Civil Contingencies Act: **http://www.legislation.gov.uk/ukpga/2004/36/contents**
- DEFRA (2014) National Flood Emergency Framework for England: **https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england**
- Government guidance for public safety and emergencies is available at: **https://www.gov.uk/topic/public-safety-emergencies/emergencies-preparation-response-recovery**

10.2 Existing Flood Warning Systems

The Environment Agency is the lead organisation for providing warnings of fluvial flooding (for watercourses classed as *Main Rivers*) and coastal flooding in England. The Environment Agency supplies Flood Warnings via the Floodline Warnings Direct (FWD) service, to homes and businesses within Flood Zones 2 and 3. The different levels of warning are shown in Table 10-1.

It is the responsibility of individuals to sign-up to this service in order to receive the flood warnings via FWD. Registration and the service is free and publicly available. 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 13 Flood Alert Areas and 16 Flood Warning Areas (FWAs) covering parts of New Forest District and National Park. Appendix G shows the FWA coverage for the study area.

12 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (056 Reference ID: 7-056-20140306) March 2014

Table 10-1: Environment Agency Warnings explained

Flood Warning Symbol	What it means	What to do
	**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 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 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
Warnings 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

10.3 Local arrangements for managing flood emergencies

10.3.1 New Forest District Council Emergency Response Plan (2015)

New Forest District Council have prepared an **Emergency Response Plan** which sets out to provide a plan for effective response to a wide range of emergencies. A quick guide to the Council's response to flooding is included within Part 2 of the document.

10.3.2 Hampshire and Isle of Wight Multi Agency Flood Plan: Part One (2015)

Part one of the Hampshire and Isle of Wight Multi Agency Flood Plan describes the management structures and actions of the local responders in response to a flooding event in the Hampshire and Isle of Wight Resilience Forum.

10.3.3 Hampshire and Isle of Wight Multi Agency Flood Plan Part Two (Response and Recovery) (2015)

Part two of the Flood Plan provides a summary of flood risks in each of the four Top Tier Local Authority areas.

10.3.4 Hampshire Council Flooding Advice

Further information about flooding during an emergency is provided on their **website**.

10.3.5 Wiltshire Council's Householders' Guide for Emergencies (2010)

Wilshire County Council have prepared a **Householders Guide For Emergencies** which prepares home owners for a variety of emergencies. A chapter which offers advice in a flooding emergency is included in the guide.

10.3.6 Wiltshire Council - What to do in a Flood

Wiltshire Council's **website** provides further information about what to do in a flood.

10.3.7 Local arrangements – sandbag policy

New Forest District Council does not provide sandbags for general issue to householders or businesses but sand and hessian or polypropylene bags can be bought from most builders' merchants.

10.4 Emergency planning and development

10.4.1 NPPF

The NPPF Flood Risk Vulnerability and Flood Zone 'Compatibility' table 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 (February, 2016). 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 areas of drainage critical problems highlighted in the relevant SWMPs.

The outputs of this SFRA should be compared and reviewed against any emergency plans and continuity arrangements within the New Forest District and National Park. This includes the nominated rest and reception centres (and perspective ones), so that evacuees are outside of the high risk flood zones and will be safe during a flood event.

10.4.2 Safe access and egress

The NPPF Planning Practice Guidance 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[13]. Access considerations should include the voluntary and free movement of people during a 'design flood' as well as for the potential of evacuation before a more extreme flood. The access and egress must be functional for changing circumstances over the lifetime of the development. The NPPF Planning Practice Guidance sets out that:

- Access routes should allow occupants to safely access and exit their dwellings in design flood conditions. In addition, vehicular access for emergency services to safely reach development in design flood conditions is normally required; and
- Where possible, safe access routes should be located above design flood levels and avoid flow paths including those caused by exceedance and blockage. Where this is unavoidable, limited depths of flooding may be acceptable providing the proposed access is designed with appropriate signage etc. to make it safe. The acceptable flood depth for safe access will vary as this will be dependent on flood velocities and risk of debris in the flood water. Even low levels of flooding can pose a risk to people in situ (because of, for example, the

13 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (Paragraph: 038 Reference ID: 7-038-20140306) March 2014

presence of unseen hazards and contaminants in floodwater, or the risk that people remaining may require medical attention).

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 New Forest District Council, New Forest National Park Authority 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.

10.4.3 Potential evacuations

During flood incidents, evacuation may be considered necessary. The NPPF Planning Guidance states practicality of safe evacuation from an area will depend on[14]:

1. the type of flood risk present, and the extent to which advance warning can be given in a flood event;
2. the number of people that would require evacuation from the area potentially at risk;
3. the adequacy of both evacuation routes and identified places that people could be evacuated to (and taking into account the length of time that the evacuation may need to last); and
4. sufficiently detailed and up to date evacuation plans being in place for the locality that address these and related issues.

The vulnerability of the occupants is also a key consideration. The NPPF and application of the Sequential Test aims to 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 NPPF Planning Practice Guidance 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[15]. 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 the **government website** for the criteria on when to following 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. The plans should show:

- single storey buildings or ground floors that do not have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- basement rooms have clear internal access to an upper level, e.g. a staircase; and
- occupants can leave the building if there is a flood and there is enough time for them to leave after flood warnings[16].

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.

10.4.4 Flood warning and evacuation plans

Flood warning and evacuation plans are potentially mitigation measures to manage the residual risk, as stated in the NPPF Planning Practice Guidance. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-

14 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 057, Reference ID: 7-057-20140306) March 2014
15 NPPF Planning Practice Guidance, Flood Risk and Coastal Change (Paragraph: 053 Reference ID: 7-053-20140306) March 2015
16 Environment Agency and DEFRA (2012) Flood Risk Assessment: Standing Advice

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 a flood plans for individuals, communities and businesses (see text box for useful links).

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

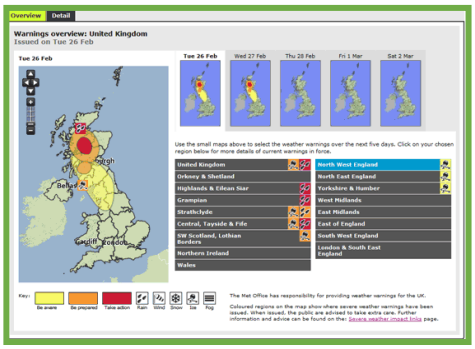
Once the emergency flood plan is prepared, it is recommended that it is distributed to emergency planners at New Forest District Council, New Forest National Park Authority and the emergency services. When developing a flood warning and evacuation plan, it is recommended that it links in with any existing parish / community level plan.

Guidance documents for preparation of flood response plans

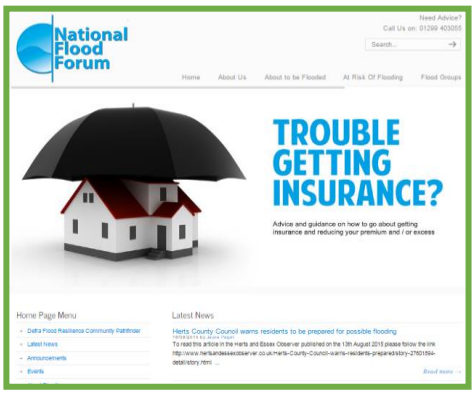
- **Environment Agency (2012) Flooding – minimising the risk, flood plan guidance for communities and groups**
- **Environment Agency (2014) Community Flood Plan template**
- **Environment Agency Personal flood plans**
- **Flood Plan UK 'Dry Run' - A Community Flood Planning Guide**

10.4.5 Other sources of information

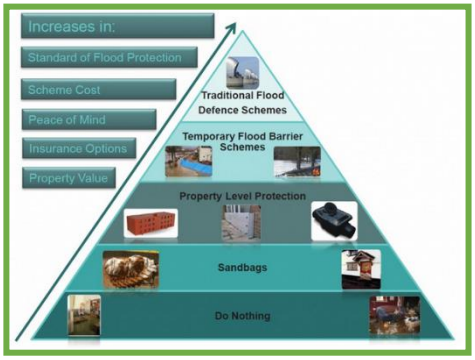
As well as being a **statutory consultee** for new development at risk of flooding, the Environment Agency can offer independent technical advice. The Environment Agency website contains a breadth of information on flood risk and there are numerous publications and guidance available. For example, the **"flooding from groundwater"** guide has been produced by the Environment Agency and Local Government Association to offer practice advice to reduce the impact of flooding from groundwater.



The Met Office provides a **National Severe Weather Warning Service** about rain, snow, wind, fog and ice. The severity of warning is dependent upon the combination of the **likelihood** of the event happening and the **impact** the conditions may have. In simplistic terms, the warnings mean: Yellow: Be Aware, Amber: Be Prepared, Red: Take Action. This service does not provide flood warnings. The Met Office provide many other services and products. For further information, please visit their **website**.



The **National Flood Forum** (NFF) is a **national charity**, set up in 2002 to support those at risk and affected by flooding. The NFF helps people to prepare and recover from flooding as well as campaigning on behalf of flood risk communities, including providing advice on matters such as insurance.



Individual property-level protection (PLP) measures are design to help protect homes and businesses from flooding. These include a combination of **flood resistance measures** - trying to prevent water ingress – and **flood resilience measures** - trying to limit the damage and reduce the impact of flooding, should water enter the building. It is important that any measures have the **BSI Kitemark**. This shows that the measure has been tested and ensures that it meets industry standards. Please visit the **Government website: "Prepare for flooding"** for more information.

11 Strategic Flood Risk Solutions

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the district. As described in Section 2.6, the study area lies within the **New Forest CFMP**, the **Hampshire Avon CFMP**, the **Test and Itchen CFMP** and the **Dorset Stour CFMP**. Policy options throughout the study area vary and should be referred to when formulating any strategic flood risk solutions. Specific 'actions' for flood risk management are described for each sub-area within the relevant CFMP.

Further detailed strategic information on proposed strategic measures and approaches are available in the **South East River Basin District FRMP** and the **South West River Basin District FRMP.**

The shoreline along the study are lies within the **Poole and Christchurch Bays SMP** and the **North Solent SMP** as described in Section 2.7. Within these two SMPs several plans are outlined and should be considered when formulating strategic flood risk solutions which involve the shoreline.

When considering strategic flood risk solutions, it is important not only to consider whether a solution provides the most effective way at removing parcels of land from a given magnitude event or Flood Zone, but must also consider many other factors, including:

- Whether the flood risk solution will make the development safe e.g. whether safe access and egress can be achieved
- How the flood risk solution will be managed and maintained for the lifetime of development
- The cost of implementing the solution (and maintaining it)
- Environmental implications of the flood risk solution (both during and after implementation)
- The WFD requirements and the impact proposals may have on water quality and quantity
- Alignment with the **South East river basin district RBMP** and the **South West river basin district RBMP** objectives and actions
- Whether an Environmental Permit is required from the Environment Agency or consent from the LLFA is needed.

The following sections outline different options which could be considered for strategic flood risk solutions.

11.1 Flood storage

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 additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. 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.

The construction of new upstream storage schemes as part of upstream catchment-based approaches within the study area would provide one potential strategic solution to flood risk. Watercourses which are rural in their upper reaches but have high levels of flood risk to urban areas in the downstream reaches are potential candidates, as the open land in the upper reaches can potentially provide the space for an attenuation area, providing benefit to the urban area downstream.

11.1.1 Promotion of SuDS

By considering SuDS at an early stage in the development of a site, the risk from surface water can be mitigated to a certain extent within the site as well as reduce the risk that the site poses to third party land. SuDS should be promoted on all new developments to ensure the quantity and quality of surface water is dealt with sustainably to reduce flood risk. The guidance produced by Defra and Hampshire County Council and Wiltshire Council as LLFAs (summarised in Chapter 9), should actively encourage developers to use the information to produce technically proficient and sustainable solutions for drainage.

11.2 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 watercourse and the floodplain. There are a number of culverted sections of watercourse located throughout the district which if returned to a more natural state would potentially reduce flood risk to the local area
- Apply the Sequential Approach to avoid new development within currently undefended floodplain.

For those sites considered within the Local Plan 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 in rural upper reaches of tributaries which flow through urban areas in the district, could potentially increase flooding within the urban areas. This will also negate any need to build flood defences within the sites. It is acknowledged that sites located on the fringes of urban areas within the district are likely to have limited opportunity to restore floodplain in previously developed areas.

11.2.1 Structure Removal and / or modification (e.g. Weirs), de-culverting

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 regimes, 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.

In the case of weirs, whilst 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 by lowering the weir crest level or adding a fish pass. This will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

With careful early planning, watercourses can be made a feature of the site and ownership and maintenance should be considered early. De-culverting of a watercourse, to open it up and make it a feature of the site to allow for flood storage and betterment downstream, should be considered for all sites with culverted watercourses within their boundary.

Further information is provided in the **Trash and Security Screen Guide 2009**, published by the Environment Agency/Defra, which should be used as evidence for any culvert assessment, improvement or structure retention.

11.2.2 Bank Stabilisation

It is generally recommended that bank erosion is avoided where possible and all landowners are encouraged to avoid using machinery and vehicles close to or within the watercourse.

There are a number of 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.

11.2.3 Bank removal, set back and / or increased easement

The removal or realignment of flood embankments and walls can allow the natural interrelationship between the river channel and the floodplain to be reinstated. This can be achieved at a small scale within urban areas providing pockets of attractive green spaces along rivers, whilst also improving floodplain storage within confined urban environments at times of flooding.

A detailed assessment would need to be undertaken to gain a greater understanding of the response to the channel modification, including flood risk analysis to investigate flood risk impacts.

An assessment of formal flood defences has been undertaken as part of this SFRA. All formal defences have a role in reducing flood risk, and therefore opportunities for bank removal, set back and / or increased easement will be limited. However, there may be informal artificial structures (embankments, walls) or defences within the district which are now redundant.

11.2.4 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.

The **New Forest CFMP** states that flooding from fluvial sources does not pose a significant risk to most of the New Forest catchment and therefore the EA are looking for opportunities to revert the catchment back to its natural state.

11.3 Natural flood management

Developments provide opportunities to work with natural processes to reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. Natural flood management requires integrated catchment management and involves those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies.

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 example. 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.

11.4 Flood defences

There are a number of formal flood and coastal defences present within the study area (see Section 7 for further information).

Flood mitigation measures should only be considered if, after application of the Sequential Approach, development sites cannot be located away from higher risk areas. If defences are constructed to protect a development site, it will need to be demonstrated that the defences will not have a resulting negative impact on flood risk elsewhere, and that there is no net loss in floodplain

storage. In circumstances where proposed development is located in areas benefitting from existing tidal or coastal defences consideration should be given to the arrangements to be put in place for the appropriate long term financial contribution to the maintenance of such assets.

11.5 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 and canals, and pathways, cycle routes and greenways
- Networks of "urban green" – private gardens, street trees, verges and green roofs.

The identification and planning of Green Infrastructure 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. Green infrastructure can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

The **PUSH Green Infrastructure Strategy** was prepared to identify the existing GI in the PUSH area and to consider what enhancements or introductions should be made, and to recommend how the strategy might be delivered.

11.6 Engaging with key stakeholders

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 their rights and responsibilities including maintaining river beds 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 publication '**Living on the Edge**'.

12 Level 1 assessment of potential development sites

12.1 Introduction

A number of potential development sites were provided by New Forest District Council and New Forest National Park Authority. These sites were screened against a suite of available flood risk information and spatial data to provide a summary of risk to each site. Indication is provided on the proportion of a given site affected by levels and types of flood risk, along with whether historic incidences of flooding have occurred

The information provided is intended to enable a more informed consideration of the sites using the sequential approach.

12.2 Detailed site summary sheets

Phase 3 of the New Forest District Council & New Forest National Park Authority SFRA provides detailed summaries of the following sites:

New Forest District Council sites:

- Land at Pauletts Lane, Totton
- Land to the south of Bury Road, Marchwood
- Cork's Farm, north of Normandy Way, Marchwood
- Land to the east of Lower Pennington Ln, Lymington
- Land to the north and south of A337 Milford Road, Lymington
- Land to the north of Manor Road, Milford on Sea
- Land to the east of Everton Road, Hordle
- Land to the north and south of Hordle Lane, Hordle
- Land to the east of Brockhills Lane, New Milton
- Land to the south of Gore Road, New Milton
- Land to the north of Hightown Road, Ringwood
- Land to the south of Snails Lane, Blashford, Ringwood
- Land to the south of Derritt Lane, Bransgore
- Land to the south and north of Moortown Lane, Ringwood
- Land to the east of Puddleslosh Lane, Fordingbridge
- Land to the south of Fryern Court Road, Fordingbridge
- Land to the north of Station Road, Fordingbridge

New Forest National Park Authority:

- Land at St George's Church, Calshot Village
- Land at Uncle Tom's Cabin, Romsey Road, Cadnam
- Land to the south of Church Lane, Sway
- Land to the south of Fawley Power Station
- Lyndhurst Park Hotel
- Wharton's Lane, Ashurst
- Ashurst Hospital

Where available, the results from detailed hydraulic models were used in the assessment.

Where there are no detailed fluvial hydraulic models, 2D modelling was performed using JFlow+ to determine Flood Zone 3a, Flood Zone 3b and Flood Zone 2, and map the effects of climate change for Flood Zone 3a. Using this information combined with the RoFSW and extreme sea level data, detailed site summary tables have been produced for the specified sites.

12.2.1 Important note on Flood Zone within the summary tables

It is important to recognise that for the SFRA a number of different sets of data have been used to clarify the Flood Zones. Mapping shown in the detailed site summary sheets in Phase 3 of the SFRA may differ to the Environment Agency Flood Zones and 'Flood Map for Planning' (Appendix C of this report) as updated modelling has been prepared for Main Rivers previously based on JFlow generalised modelling, and also the flood risk from ordinary watercourses flowing through sites has been included in the site summary mapping.

12.2.2 Note on SuDS suitability

As part of the Phase 3 of the SFRA, an outline summary for the potential implementation of SuDS has been undertaken for each site. This is based on the Areas Susceptible to Groundwater flooding (AStGWF) map and the proximity of the site to a watercourse. This data was then collated to provide an indication as to whether infiltration can be utilised at the site. This assessment should not be used as a definitive guide as to which SuDS would be suitable but used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what SuDS techniques could be utilised on a particular development.

12.2.3 Overview site flood risk information

Table 12-1 provides summary information on flood risk for each of the sites considered as part of this SFRA. This information should be viewed in conjunction with the more detailed site summary sheets prepared as part of the Phase 3 SFRA assessment.

Table 12-1: Overview flood risk information for the Level 1 SFRA sites

Site name	Size (Ha)	Proportion of site shown to be at risk (%)											Site intersected by Risk of Flood from Reservoirs extent (yes/no)
		Present day (river and seas)				Future (rivers and sea) [Flood Zone 3a + 3b proportion]			Risk of Flooding for Surface Water			Highest AStGWF (proportion of 1km grid cell susceptible to groundwater	
		FZ3b	FZ3a	FZ2	FZ1	FZ3a Central allowance + 2115	FZ3a Higher allowance + 2115	FZ3a Upper End allowance +2115	30 yr	100 yr	1,000 yr		
Land at Pauletts Lane, Totton	88.61	6%	1%	1%	92%	7%	8%	8%	2%	1%	6%	*>= 25% <50%*	No
Land to the south of Bury Road, Marchwood	80.94	5%	4%	2%	89%	10%	10%	11%	3%	3%	13%	*>= 50% <75%*	No
Cork's Farm, north of Normandy Way, Marchwood	15.78	5%	3%	4%	88%	45%	45%	45%	1%	2%	3%	*>= 50% <75%*	No
Land to the east of Lower Pennington Ln, Lymington	7.66	0%	0%	0%	100%	0%	0%	0%	0%	0%	2%	*>= 50% <75%*	No
Land to the north and south of A337 Milford Road, Lymington	18.73	6%	2%	1%	92%	8%	8%	8%	1%	1%	2%	*>= 25% <50%*	No
Land to the north of Manor Road, Milford on Sea	8.67	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	*< 25%*	No
Land to the east of Everton Road, Hordle	8.36	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	*>= 50% <75%*	No
Land to the north and south of Hordle Lane, Hordle	18.61	2%	0%	0%	98%	2%	2%	2%	1%	1%	1%	*>= 75%*	Yes
Land to the east of Brockhills Lane, New Milton	10.89	3%	1%	1%	95%	5%	5%	5%	1%	0%	1%	*>= 50% <75%*	No
Land to the south of Gore Road, New Milton	10.95	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	*>= 25% <50%*	No
Land to the north of Hightown Road, Ringwood	28.16	64%	5%	4%	27%	70%	71%	73%	2%	1%	13%	*>= 75%*	No
Land to the south of Snails Lane, Blashford, Ringwood	8.83	0%	0%	6%	94%	5%	5%	7%	0%	0%	8%	*>= 75%*	No
Land to the south of Derritt Lane, Bransgore	11.56	39%	15%	17%	28%	57%	60%	69%	4%	3%	14%	*>= 75%*	No
Land to the south and north of Moortown Lane, Ringwood	52.52	6%	10%	9%	74%	22%	23%	28%	0%	0%	4%	*< 25%*	No
Land to the east of Puddleslosh Lane, Fordingbridge	47.44	7%	1%	1%	92%	8%	8%	9%	1%	2%	5%	*>= 75%*	Yes
Land to the south of Fryern Court Road, Fordingbridge	42.79	0%	0%	0%	100%	0%	0%	0%	0%	2%	6%	*< 25%*	No
Land to the north of Station Road, Fordingbridge	9.33	3%	0%	0%	96%	3%	4%	4%	1%	0%	1%	*< 25%*	No
Land at St George's Church, Calshot Village	2.55	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	*< 25%*	No
Land at Uncle Tom's Cabin, Romsey Road, Cadnam	0.87	36%	20%	8%	35%	61%	61%	64%	19%	13%	63%	*< 25%*	No
Land to the south of Church Lane, Sway	5.38	0%	0%	0%	100%	0%	0%	0%	0%	0%	1%	*< 25%*	No
Land to the south of Fawley Power Station	58.12	11%	13%	13%	63%	95%	95%	95%	0%	0%	4%	*>= 25% <50%*	No
Lyndhurst Park Hotel	1.61	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	*>= 50% <75%*	No
Wharton's Lane, Ashurst	2.64	0%	0%	0%	100%	0%	0%	0%	2%	0%	2%	*>= 50% <75%*	No
Ashurst Hospital	2.83	0%	0%	0%	100%	0%	0%	0%	0%	0%	5%	*>= 50% <75%*	No

13 Summary and recommendations

13.1 Overview

This Level 1 SFRA delivers a strategic assessment of risk from all sources of flooding in New Forest District and National Park. It also provides an overview of policy and provides guidance for planners and developers.

13.2 Sources of flood risk

- There have been several recorded flood incidents across the study area, from a combination of sources. The prominent source of flooding is fluvial with a significant influence from tidal conditions. More recent events, investigated by the LLFAs under Section 19 of the Flood and Water Management Act, indicates that flood events have been associated with exceedance of the capacity of the sewer network.
- There are several watercourses in the study area which are identified to contribute to fluvial flood risk. Flooding may not be from one watercourse alone. Often the combination of watercourses and the interaction of two or more sources of out of bank flow across the floodplain can have profound implications for the extent of the risk (e.g. Dockens Water and the River Avon).
- The study area is bound by Southampton Water and the Tidal River Test to the east and The Solent and Christchurch Bay to the south and as such there is a tidal flood risk. In addition, many river networks discharge into the sea. The combination of high tides and high river levels, can result in the tidal locking as the rivers are unable to discharge. There is also the possibility that tidal defences can fail or overtopped. The assessment of the 'residual' risk of defence failure should be considered on a site by site basis.
- Coastal erosion is a prominent process along much of the study area's coast. Defences form a very important aspect of the control of the physical coastline.
- The Risk of Flooding from Surface Water (RoFSW) dataset shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas.
- Groundwater flooding is an issue in the Avon Catchment at times of high water level in the watercourses.
- Historical incidents of flooding are detailed by Southern Water and Wessex Water. This database records incidents of flooding relating to public foul, combined or surface water sewers and identifies which properties suffered flooding. A total of 266 recorded flood incidents have been identified in the study area.
- There are no records of flooding from reservoirs impacting properties inside the study area.
- There are currently 13 fluvial Flood Alert Areas and 16 fluvial Flood Warning Areas in the study area.

13.3 Flood defences

There are a number of EA flood defences located throughout the study area. The standard of protection provided by these assets varies as does the condition.

13.4 Development and flood risk

The Sequential and Exception Test procedures for both Local Plans and FRAs have been documented, along with guidance for planners and developers. Links have been provided for various guidance documents and policies published by other Risk Management Authorities such as the LLFA and the Environment Agency.

13.5 Relevant studies

There are many relevant regional and local key studies which complement the SFRA and have been considered, such as the CFMPs, RBMPs, the PFRA, the SMPs and LFRMS. Other policy

considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

13.6 Recommendations

A review of national and local policies has been conducted against the information collated on flood risk in this SFRA. Following this, several recommendations have been made for the New Forest District Council and New Forest National Park Authority to consider as part of Flood Risk Management in the study area.

13.6.1 Development management

Sequential approach to development

The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within New Forest District and National Park.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site, for example by:

- Reducing volume and rate of runoff through the use of SuDS, as informed by national and local guidance
- Relocating development to zones with lower flood risk
- Creating space for flooding
- Green Infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

Site-specific flood risk assessments

Site specific FRAs are required by developers to provide a greater level of detail on flood risk and any protection provided by defences and, where necessary, demonstrate the development passes part b of the Exception Test.

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), inform development zoning within the site and prove, if required, whether the Exception Test can be passed. Where a site-specific FRA has produced modelling outlines which differ from the Flood Map for Planning then a full evidence based review would be required; where this is acceptable to the EA then amendments to the Flood Map for Planning may take place. Where the watercourses are embanked, the effect of overtopping and breach must be considered an appropriately assessed.

All new development within the 1% AEP flood extent including an allowance for climate change (for the lifetime of the development) must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage. Where proposed development results in a change in building footprint, the developer should normally ensure that it does not impact upon the ability of the floodplain to store or convey water, and seek opportunities to provide floodplain betterment. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided to ensure that the total volume of the floodplain storage is not reduced.

Planning applicants should also consult with the Environment Agency, relevant LLFA, and either Wessex Water or Southern Water at an early stage to discuss FRA and/or consent requirements.

At locations reliant on flood risk management measures to provide appropriate levels of safety for communities special consideration should be given to the assessment of residual risk, particularly in relation to tidal flooding and areas relying on pumped drainage systems. Where residual risks give rise to unsafe conditions consideration should be given to the introduction of additional measures or identification of tactical responses that can be conducted during an emergency.

Sequential and Exception Tests

The SFRA has identified that areas of study area are at high risk of flooding from both fluvial and surface water sources. Therefore, several proposed development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF. New Forest District Council and New Forest National Park Authority should use the information in this SFRA when deciding which development sites to take forward in their respective Local Plans.

Developers should consult with New Forest District Council, New Forest National Park Authority, the relevant LLFA, the Environment Agency and either Wessex Water or Southern Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

Review of planning applications

New Forest District Council and New Forest National Park Authority should consult the Environment Agency's 'Flood Risk Assessment: Local Planning Authorities', last updated 28 February 2017, when reviewing planning applications for proposed developments at risk of flooding. The Councils will consult the relevant statutory consultees as part of the planning application assessment and they may, in some cases, also contact non-statutory consultees (e.g. Wessex Water or Southern Water) that have an interest in the planning application.

Drainage strategies and SuDS

- Planners should be aware of the conditions and local requirements set by Hampshire County Council or the Wilshire County (the LLFAs), for surface water management for major and minor developments and ensure development proposals and applications are compliant with the LLFAs policy.
- Hampshire County Council provide a **check list** for developers to assist in providing the correct information for planning applications.
- **Hampshire County Council's Surface Water and Sustainable Drainage: Guidance for Developers, Designers and Planners** and **Wiltshire Council's Developers Guidance Note: Flood Drainage and SuDS** details the LLFAs expectation on the SuDS disposal destination and state that the drainage hierarchy is to be followed.
- All new development should aim to minimise areas of impermeable ground to reduce surface water runoff and SuDS should be used on all new development, unless it is proved unfeasible.
- It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water. A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- For proposed developments, it is imperative that a site-specific infiltration test is conducted early on as part of the design of the development, to confirm whether the water table is low enough to allow for SuDS techniques that are designed to encourage infiltration.
- Where sites lie within or close to Groundwater Source Protection Zones or aquifers, treatment steps may be required ahead of discharge to the ground, sewers etc . Development proposals at sites across the area should assess the pollution risk to receiving water-bodies, and include appropriate treatment steps ahead of any discharge to surface or groundwaters. The CIRIA SuDS manual provides further guidance on this issue. The LLFA have published information relating to infiltration tests within their guidance document.
- Consideration must also be given to residual risk and maintenance of sustainable drainage and surface water systems.

Residual risk

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse. Residual risks should be considered as part of site-specific Flood Risk Assessments

Further, any developments located within an area protected by flood risk management measures, where the condition of those defences is 'fair' or 'poor', where the standard of protection is not of the required standard or where the failure of the intended level of service gives rise to unsafe conditions should be identified.

Infrastructure and safe access and egress

Minimum finished floor levels for development should be above whichever is higher of the following:

- a minimum of 600mm above the 1% AEP fluvial event plus an allowance for climate change and an appropriate allowance for freeboard
- a minimum of 600mm above the 0.5% AEP tidal event plus an allowance for climate change and an appropriate allowance for freeboard
- 300mm above the general ground level of the site.

If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches.

Safe access and egress will need to be demonstrated at all development sites. Emergency vehicular access should be possible during times of flood.

Where development is located behind, or in an area benefitting from, defences, consideration should be given to the potential safety of the development, finished floor levels and for safe access and egress in the event of rapid inundation of water due to a defence breach with little warning.

Resilience measures will be required if buildings are situated in the flood risk area, and opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought.

Future flood management

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted.

The information provided in the SFRA should be used as a basis for investigating potential strategic flood risk solutions within the study area. Opportunities could consist of the following:

- Catchment and floodplain restoration;
- Flood storage areas;
- Opening up culverts, weir removal, and river restoration; and
- Green infrastructure

For successful future flood risk management, it is recommended that local planning authorities adopt a catchment partnership working approach in tackling flood risk and environmental management.

Requirement for Level 2 SFRA

This report fulfils Level One SFRA requirement. Following the application of the Sequential Test, where sites cannot be appropriately accommodated in Flood Zone 1, the two planning authorities may need to apply the NPPF's Exception Test. In these circumstances, a Level Two SFRA may be required, to consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

13.6.2 Technical recommendations

Potential modelling improvements

The Environment Agency regularly reviews its 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.

Updates to SFRAs

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.

This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

The Environment Agency 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. It should be noted that the Environment Agency's Flood Zones, on their Flood Map for Planning website, may differ to the maps in the SFRA for a short period of time, whilst new modelling is incorporated into the Environment Agency's flood maps.

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

Appendices

A Grid squares for appendix mapping

B Watercourses

C Flood Zones

The data displayed also includes the PUSH Level 1 SFRA study area as new information has since become available. Both data sets should be referred to within the PUSH Level 1 SFRA area.

C.1 Coastal Flood Zones

C.2 Fluvial Flood Zones

D Climate change fluvial flood risk mapping

The data displayed also includes the PUSH Level 1 SFRA study area as new information has since become available. Both data sets should be referred to within the PUSH Level 1 SFRA area.

D.1 Coastal climate change

D.2 Fluvial climate change

E Surface water flood risk mapping

The data displayed also includes the PUSH Level 1 SFRA study area as new information has since become available. Both data sets should be referred to within the PUSH Level 1 SFRA area.

F Areas susceptible to groundwater flooding

The data displayed also includes the PUSH Level 1 SFRA study area as new information has since become available. Both data sets should be referred to within the PUSH Level 1 SFRA area.

G Flood Alert and Flood Warning Areas

The data displayed also includes the PUSH Level 1 SFRA study area as new information has since become available. Both data sets should be referred to within the PUSH Level 1 SFRA area.

H Historic flood records

I Defences

J Data used to inform the SFRA

A list of data used to inform the SFRA is noted below, along with the data supplier. Comment is provided alongside each to inform which part of the SFRA this has been used for, along with any relevant comments regarding the data's age, quality or other important notes.

Data	Data Source	Phase of SFRA the data will inform	Data quality remark	Data quality comment
Areas Benefitting from Flood Defences	Open Data made available under the Data.gov.uk Spatial Data Catalogue, typically licenced under an Open Government Licence (OGL)	2, 3 and 4	Best available data	Estimated based on modelling of the 1% AEP fluvial / 0.5% AEP tidal event. Benefits in other magnitude events are not considered.
AONB		3	Definitive extent	-
Areas to benefit from New and Reconditioned Flood Schemes under the Medium-Term Plan (2014/15 – 2019/20)		2 and 3	Best available data	-
Environmentally Sensitive Areas		3	Definitive extent	-
Flood Alert Areas		2, 3 and 4	Definitive extent	-
Flood Warning Areas		2, 3 and 4	Definitive extent	-
Flood Zone 2		2, 3 and 4	Best available data	Flood risk from Main Rivers only. Based on modelling and therefore type of model, resolution, hydrology etc can all influence how reliable the predicted extents are.
Flood Zone 3		2, 3 and 4	Best available data	Flood risk from Main Rivers only. Based on modelling and therefore type of model, resolution, hydrology etc can all influence how reliable the predicted extents are.
Historic Flood Map		2, 3 and 4	Best available data	Quality of data reliant upon the quality of the original recorded information, which is not documented. Extents have been known to show inconsistencies previously (e.g. extending to ground higher than could have conceivably flooded).
LIDAR data		2 and 3	Best available data	Best available data at an SFRA area-wide scale required for modelling.
National Parks (England)		2, 3 and 4	Best available data	-
Nitrate Sensitive Areas		4	Best available data	-
Ramsar sites (England)		2	Definitive extent	-
Recorded Flood Outlines		2, 3 and 4	Best available data	Quality of data reliant upon the quality of the original recorded information, which is not documented. Extents have been known to show inconsistencies previously (e.g. extending to ground higher than could have conceivably flooded).
Shoreline Management Plan policy designations		3 and 4	Definitive extent	-
Source Protection Zones		4	Definitive extent	-
Spatial Flood Defences		2, 3 and 4	Best available data	-
Spatial Flood Defences (inc attributes)		2, 3 and 4	Best available data	-
Special Areas of Conservation		3	Definitive extent	-
Special Protection Areas		3	Best available data	-
SSSI		2 and 3	Best available data	-
Statutory (Sealed) Main Rivers		2, 3 and 4	Definitive extent	All Main Rivers should be captured, but sometimes the Main Rivers are misaligned from the channel location indicated by LIDAR/survey as they are informed from mapping.
Aquifer designation map (bedrock geology)	Open Data made available by NFNPA / NFDC under the Data.gov.uk Partner Data Catalogue	4	Best available data	-
Aquifer designation map (superficial deposits)		4	Best available data	-
Areas Susceptible to Groundwater Flooding 2010		2, 3 and 4	Best available data	Mapping only shows the proportion of a 1km grid cell which may be susceptible to flooding, not the locations within the grid cells, nor how susceptible the areas are. The dataset should be seen as indicative only.
Detailed River Network		2, 3 and 4	Best available data	Certain river may not be captured and the layer should not be considered as inclusive of all ordinary watercourses, many of which will not be included on here. The channels can be misaligned from the location indicated by LIDAR/survey as they are informed from mapping.
Groundwater Vulnerability		3 and 4	Best available data	-
Updated Flood Map for Surface Water (uFMfSW) Complex		2, 3 and 4	Best available data	-

Ordnance Survey mapping Vector Map Local	Directly from NFNPA / NFDC	2, 3 and 4	Best available data	-
Ordnance Survey mapping 1:25,000		2, 3 and 4	Best available data	-
Ordnance Survey mapping 1:50,000		2, 3 and 4	Best available data	-
LIDAR data – 1m resolution (2015), licensed by NFNPA. Originally commissioned by Amphibian & Reptile Conservation (ARC) as part of the New Forest Higher Level Stewardship scheme.		2 and 3	Uncertainties raised regarding data quality	On receipt, the ARC LIDAR data was compared against the Environment Agency's data to understand if differences in elevations are apparent across the SFRA area. Notable differences were observed for parts of the SFRA area (particularly to the north east) e.g. greater than ±0.1m difference, and the reasons for this could not be resolved. For all areas where Environment Agency data was available, the Environment Agency data was used in preference to the ARC LIDAR.
GIS layers of sites to be assessed		3	Definitive extent	-
Drainage Officer comments in relation to sites		3	Best available data	-
Information on emergency response procedures/ action plans (flood evacuation plans etc)		3 and 4	Best available data	-
Historic flooding information (GIS database records etc)		2, 3 and 4	Best available data	Information varies in detail and geographic context, as well as content on what caused flooding. For the purpose of the SFRA, this information was summarised to a level of detail suitable for inclusion within the SFRA. Where possible, this information was considered against other records of historic flooding to determine whether the same incidences of flooding are reported and if so, duplicate incidences removed.
Environment Agency hydraulic modelling inputs, outputs and reporting	Environment Agency	2, 3 and 4	Best available data	Concerns over some modelling studies have been raised by the Environment Agency. These were deemed not fit for the flood map and were not used to inform the SFRA. Refer to the modelling section for information on studies which were used. The data within the models (ground levels, defences, hydrology) was not be updated as part of the Level 1 SFRA. The information within these models may need to be updated if the modelling outputs are used to inform Level 2 SFRA analysis.
GPS survey data of the coastal defences between Lymington and Keyhaven		2	Best available data	Used to help inform whether the 20-year extreme levels would be expected to exceed defence heights. This analysis informed whether an area should or shouldn't be included within the Flood Zone 3b mapping prepared for the SFRA.
Reservoir inundation maps (flood extents) - Flood Risk from Reservoirs		2, 3 and 4	Best available data	-
North Solent Shoreline Management Plan		3 and 4	Standalone document	-
Poole & Christchurch Bays Shoreline Management Plan		3 and 4	Standalone document	-
Preliminary Flood Risk Assessment (2011)	Hampshire County Council	4	Standalone document	-
Local Flood Risk Management Strategy (2013)		4	Standalone document	-
Hampshire Groundwater Management Plan (2013)		4	Standalone document	-
SUDS / drainage guidance documentation		4	Standalone document	-
Asset register - features influencing management of water and/or flood risk within the SFRA area (FWMA Register)		3 and 4	Best available data	-
Historic Incidence mapping for sites		3	Best available data	Alongside other sources of historic data, this information was used to infer flood history at the sites considered witjin the SFRA
Historic flooding information (Flood Investigations)		2, 3 and 4	Best available data	Where possible, this information was considered against other records of historic flooding to determine whether the same incidences of flooding are reported and if so, duplicate incidences removed.
Preliminary Flood Risk Assessment (2011)	Wiltshire Council	4	Standalone document	-
Local Flood Risk Management Strategy (2014)		4	Standalone document	-
Wiltshire Groundwater Management Strategy (2016)		4	Standalone document	-
SUDS / drainage guidance documentation		4	Best available data	-
Level 1 SFRA (2016)	Partnership for Urban South Hampshire (PUSH)	2, 3 and 4	Standalone document	-
Green Infrastructure documentation		4	Best available data	-
Sewer Incident Report Form (SIRF) Data - Hydraulic Overload, Post Code Centroid	Southern Water	2, 3 and 4	Best available data	Data does not indicate individual properties flooded, but rather presents incidences of hydraulic overload on a 4- of 5-digit post code basis. Further information on the mechanisms of flooding are not reported.
Inadequate Capacity Incidents data	Wessex Water	2, 3 and 4	Best available data	Data does not indicate individual properties flooded, but rather presents incidences of inadequate capacity of the sewer system. Further information on the mechanisms of flooding are not reported.

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