North Dorset District Council

Level 1 Strategic Flood Risk Assessment

Final Report
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Contract

This report describes work commissioned by Christchurch and East Dorset Councils, on behalf of North Dorset District Council, by a letter dated 18th April 2017. Christchurch and East Dorset Councils' representative for the contract was Simon Trueick. Lucy Archer-Lock, Georgina Latus and Rachel Hopgood 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 North Dorset District Council.

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Executive Summary

Introduction

This Strategic Flood Risk Assessment replaces the Level 1 SFRA originally published by a consortium of five Councils (Bournemouth, Christchurch, East Dorset, North Dorset and Salisbury) in February 2008. The main purpose of the SFRA update is to provide a comprehensive and robust evidence base to support the production of the Local Plan and to support the selection of site allocations.

SFRA Objectives

The key objectives of the 2017 SFRA are:

- To provide up to date information and guidance on flood risk for North Dorset District Council, taking into account the latest flood risk information (including the probable impacts of climate change), the current state of national planning policy and legislation, and relevant studies.
- To provide a basis for applying the flood risk Sequential Test, and if necessary the Exception Test
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as part of the evidence base for the Local Plan.
- To identify the requirements for site-specific flood risk assessments and the application of Sustainable Drainage Systems (SuDS).

SFRA Outputs

- Assessment of all potential sources of flooding
- Assessment of the potential impact of climate change on flood risk
- An assessment of surface water management issues and the application of Sustainable Drainage Systems (SuDS)
- A review and update of new and amended data sources (e.g. Catchment Flood Management Plans, Preliminary Flood Risk Assessment, Updated Flood Maps and modelling, etc.)
- 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
- Mapping of location and extent of functional floodplain
- Mapping areas at risk from other sources including surface water and groundwater
- Mapping areas covered by an existing flood alert / warning
- Opportunities to reduce flood risk
- High-level screening of proposed development sites against flood risk information
- Flood defence infrastructure.

Summary of Level 1 Assessment

Sources of flood risk

- The historical flood record shows that North Dorset has been subject to flooding predominantly from fluvial, pluvial (surface water) and groundwater sources. Historic flood events in North Dorset have been recorded since 1900, the most significant of which include the events of March 1979, Autumn/Winter 2000, Winter 2013/14, and March 2017, causing widespread flooding and disruption.
- The key watercourses flowing through the district are the River Stour and its tributaries, which flow through from Wiltshire and South Somerset through the centre of the district towards East Dorset. Although these watercourses flow through predominantly rural areas, they also flow through several more urbanised areas and present a risk of fluvial flooding to the surrounding properties and highways.

- The fluvial flood risk across much of North Dorset is considered to be low, with most areas located in Food Zone 1. However, several significant and urbanised areas, such as Gillingham, Sturminster Newton and Blandford Forum, are located in the vicinity of the main watercourses and thus Flood Zone 3.
- Surface water flood risk to the district has been assessed based on national datasets. There is a significant surface water flood risk to properties and highways across North Dorset, particularly in the northern section of the district. Flow routes generally follow the existing or historical routes of watercourses, or the road network, and isolated ponding occurs in lower lying areas.
- Flood risk from groundwater has been assessed based on broad-scale soil mapping and groundwater susceptibility data. The susceptibility mapping shows large areas which have the potential for groundwater emergence at the ground surface, particularly in low-lying areas close to watercourses. However, a more detailed assessment would be required to accurately assess the likely locations and extent of groundwater flooding throughout North Dorset. Groundwater flooding has been recorded at numerous locations in the district. Groundwater inundation of public sewers has been experienced in Milborne St Andrew, Milton Abbas, Blandford St Mary, Charlton Marshall and Spetisbury.
- The extent of flood risk from the River Stour and its tributaries is expected to increase as a result of climate change. There are several small reaches of the defences along the Stour that provide a 1 in 100-year standard of protection to some areas. This standard of protection is likely to reduce as a result of climate change, increasing flood risk.
- The risk of flooding from reservoirs is expected to be low due to the standard of inspection and maintenance required under the Reservoirs Act 1975. In the unlikely event of reservoir breach, Environment Agency mapping indicates that areas close to the River Stour, its tributaries and floodplains in the northern half of the district would be the worst affected.
- Historical incidents of sewer flooding provided by Wessex Water indicate that there have been many approximately 140 incidents across North Dorset for foul and surface water sewers from 2004 onwards. These events were caused by inadequate hydraulic capacity, with the source of flooding predominantly from manholes in gardens and on paths/roads. This includes a number of events during Winter 2012/2013 and Winter 2013/2014. The incidents recorded by Wessex Water do not reflect sewer flooding caused by blockages.

Key policy documents

There are many relevant national and local policies which have been considered within the SFRA, such as the Catchment Flood Management Plan, River Basin Management Plan, the Preliminary Flood Risk Assessment, the Local Flood Risk Management Strategy and the Surface Water Management Plan. Other policy considerations have also been incorporated such as sustainable development principles, climate change and flood risk management.

Development and Flood Risk

The Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments 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 Dorset County Council and the Environment Agency.

Recommendations

Development control

Sequential approach to development

The National Planning Policy Framework supports a risk-based and sequential approach to development and flood risk in England, so that development is in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the district.

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

Site-specific flood risk assessments

Site specific FRAs are required by developers to provide a greater level of detail on flood risk 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. The assessment should also identify the risk of existing flooding to adjacent land and properties to establish whether there is a requirement to secure land to implement strategic flood risk management measures to alleviate existing and future flood risk.

Sequential and Exception tests

The Strategic Flood Risk Assessment has identified that areas of the district are at high risk of flooding from both fluvial and surface water sources. Therefore, a large number of proposed development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the National Planning Policy Framework. North Dorset District Council should use the information in this SFRA when deciding which development sites to take forward in their Local Plan.

It is recommended that the Council considers using the SFRA climate change maps when applying the Sequential Test for site allocations and windfall sites.

Developers should consult with Dorset County Council LLFA team, the Environment Agency and Wessex Water, where necessary, at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling including climate change allowances, and drainage assessment and design.

Council review of planning applications

The Council should consult the Environment Agency's 'Flood Risk Standing Advice for Local Planning Authorities', last updated 15 April 2015, when reviewing planning applications for proposed developments at risk of flooding.

Residual risk

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities regarding emergency plans in case of reservoir breach.

There is also a residual risk from breach of flood defences which will need to be considered in a site-specific flood risk assessment.

Drainage assessments and promotion of SuDS

Drainage strategies and Sustainable Drainage

Planners should be aware of the conditions set by the Lead Local Flood Authority for surface water management and ensure development proposals and applications are compliant with the Council's policy. These policies should also be incorporated into the Local Plan. Wherever possible, sustainable drainage (SuDS) should be promoted:

- 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, there may be a requirement for a form of pre-treatment prior to infiltration. Further guidance can

be found in the CIRIA SuDS manual on the level of water quality treatment required for drainage via infiltration

- Consideration must also be given to residual risk and maintenance of sustainable drainage and surface water systems
- SuDS proposals should contain an adequate number of treatment stages to ensure any pollutants are dealt with on site and do not have a detrimental impact on receiving waterbodies
- The promotion and adoption of water efficient practices in new development will help to manage water resources and work towards sustainable development and will help to reduce any increase in pressure on existing water and wastewater infrastructure

Safe access and egress

Safe access and egress will need to be demonstrated at all development sites; the development should be above the 1 in 100-year flood level, plus an allowance for climate change, and emergency vehicular access should be possible during times of flood. Finished Floor Levels should be above the 1 in 100-year (1% Annual Exceedance Probability) flood level, plus an allowance for climate change and the freeboard recommended under Environment Agency guidance.

Future flood management

- Development should take a sequential approach to site layout recognising that that the extent of areas at risk of flooding is anticipated to increase with climate change, especially in low-lying areas
- In some areas defences may be required to provide protection to existing properties and new development throughout its lifetime
- Upstream storage schemes are often considered as one potential solution to flooding. However, this is not a solution for everywhere. Upstream storage should be investigated fully before being adopted as a solution
- Floodplain restoration represents a sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state.

Use of Strategic Flood Risk Assessment data

Strategic Flood Risk Assessments are high-level strategic documents and, as such, do not go into detail on an individual site-specific basis. The Strategic Flood Risk Assessment has been developed using the best available information at the time of preparation.

The Strategic Flood Risk Assessment should be updated when new information on flood risk, new planning guidance or legislation becomes available. For example, the UK Climate Projections 2018 (UKCP18) will supersede the UKCP09 projections upon which current climate change allowances for planning are based. It is therefore possible that the allowances will be updated in future to reflect any changes.

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated information is available prior to commencing a detailed Flood Risk Assessment. It is recommended that the Strategic Flood Risk Assessment is reviewed internally on an annual basis, allowing a cycle of review, followed by checking with the above bodies for any new information to allow a periodic update.

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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
Brownfield	Previously developed parcel of land
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Defra	Department for Environment, Food and Rural Affairs
Designated Feature	A form of legal protection or status reserved for certain key structures or features that are privately owned and maintained, but which make a contribution to the flood or coastal erosion risk management of people and property at a particular location.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
DTM	Digital Terrain Model
EA	Environment Agency
EU	European Union
FEH	Flood Estimation Handbook
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.

Term	Definition
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
FZ	Flood Zones
Greenfield	Undeveloped parcel of land
Ha	Hectare
HELAA	Housing and Economic Land Availability Assessment. A technical piece of evidence to support local plans and Sites & Policies Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing and economic development land in the District which is suitable and deliverable.
Indicative Flood Risk Area	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.
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
mAOD	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.
NDDC	North Dorset District Council
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
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.
RFCC	Regional Flood and Coastal Committee
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.
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

Term	Definition
	denoting the average recurrence interval over an extended period of time.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SHLAA	Strategic Housing Land Availability Assessment - The Strategic Housing Land Availability Assessment (SHLAA) is a technical piece of evidence to support local plans and Sites & Policies Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing land in the District which is suitable and deliverable.
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SoP	Standard of Protection - Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event return period. For example, a flood embankment could be described as providing a 1 in 100-year standard of protection.
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.
uFMfSW	Updated Flood Map for Surface Water
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) 2017 document replaces the Level 1 SFRA that was published for a consortium of five Councils (North Dorset, East Dorset, Bournemouth, Christchurch, and Salisbury) in February 2008. The SFRA study area for this SFRA is shown in Figure 1-1. The main purpose is to provide a comprehensive and robust flood risk evidence base to support the production of the Local Plan and to support the selection of site allocations.

The key objectives of the 2017 SFRA are:

- to provide up to date information and guidance on flood risk for North Dorset District Council (NDDC), taking into account the latest flood risk information (including the probable impacts of climate change), the current state of national planning policy and legislation and relevant studies,
- to provide the basis for applying the flood risk Sequential Test, and if necessary the Exception Test,
- to provide a comprehensive set of maps presenting flood risk from all sources that can be used as part of the evidence base for the local plan, and
- identify the requirements for site-specific flood risk assessments and the application of Sustainable Drainage Systems.

1.2 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 the Level One SFRA requirements.

1.3 SFRA outputs

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

- Assessment of all potential sources of flooding
- Assessment of the potential impact of climate change on flood risk
- An assessment of surface water management issues and the application of Sustainable Drainage Systems (SuDS)
- A review and update of new and amended data sources (e.g. Catchment Flood Management Plans, Preliminary Flood Risk Assessment, Updated Flood Maps and modelling, etc)
- 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

- Mapping of location and extent of functional floodplain
- Mapping areas at risk from other sources including surface water, sewer, ground water, reservoir inundation
- Mapping areas covered by an existing flood alert / warning
- Opportunities to reduce flood risk
- High-level screening of areas of search for possible development, against flood risk information
- Flood defence infrastructure.

1.4 SFRA user guide

Table 1-1: SFRA report contents

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. Outlines cross-boundary issues and considerations.
4. Climate change	Outlines climate change guidance and the implications for North Dorset District Council, including information on the Climate Change Sensitivity Mapping included in Appendix E.
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 North Dorset	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting the district. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered. Outlines the flood warning service in North Dorset and provides advice for emergency planning, evacuation plans and safe access and egress.
7. 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.
8. Surface water management and SuDS	Advice on managing surface water run-off and flooding and the application of SuDS.
9. Strategic flood risk solutions	Overview of possible strategies to reduce flood risk
10. Summary	Review of the Level 1 SFRA.
11. Recommendations	Identifies recommendations for the council to consider as part of Flood Risk Management policy.
Appendix A: **Flood risk mapping**	Maps showing flood risk information from all sources
Appendix B: **Flood warning coverage**	Maps of flood alerts and flood warning coverage
Appendix C: **Historic flood events**	Heat map of flood history
Appendix D: Wessex Water Groundwater Sensitive Catchments	Mapping provided by Wessex Water showing areas where sewers have been subject to groundwater ingress. This can be used to identify areas which may be at risk from groundwater.
Appendix E: Climate change sensitivity mapping	Mapping of the Climate Change Sensitivity Buffer as described in Section 4.

1.5 Consultation

The following parties have been consulted during the preparation of this version of the SFRA:

- Environment Agency
- North Dorset District Council
- Dorset County Council
- Wessex Water
- Neighbouring local authorities
    - East Dorset District Council

1.6 Use of SFRA data

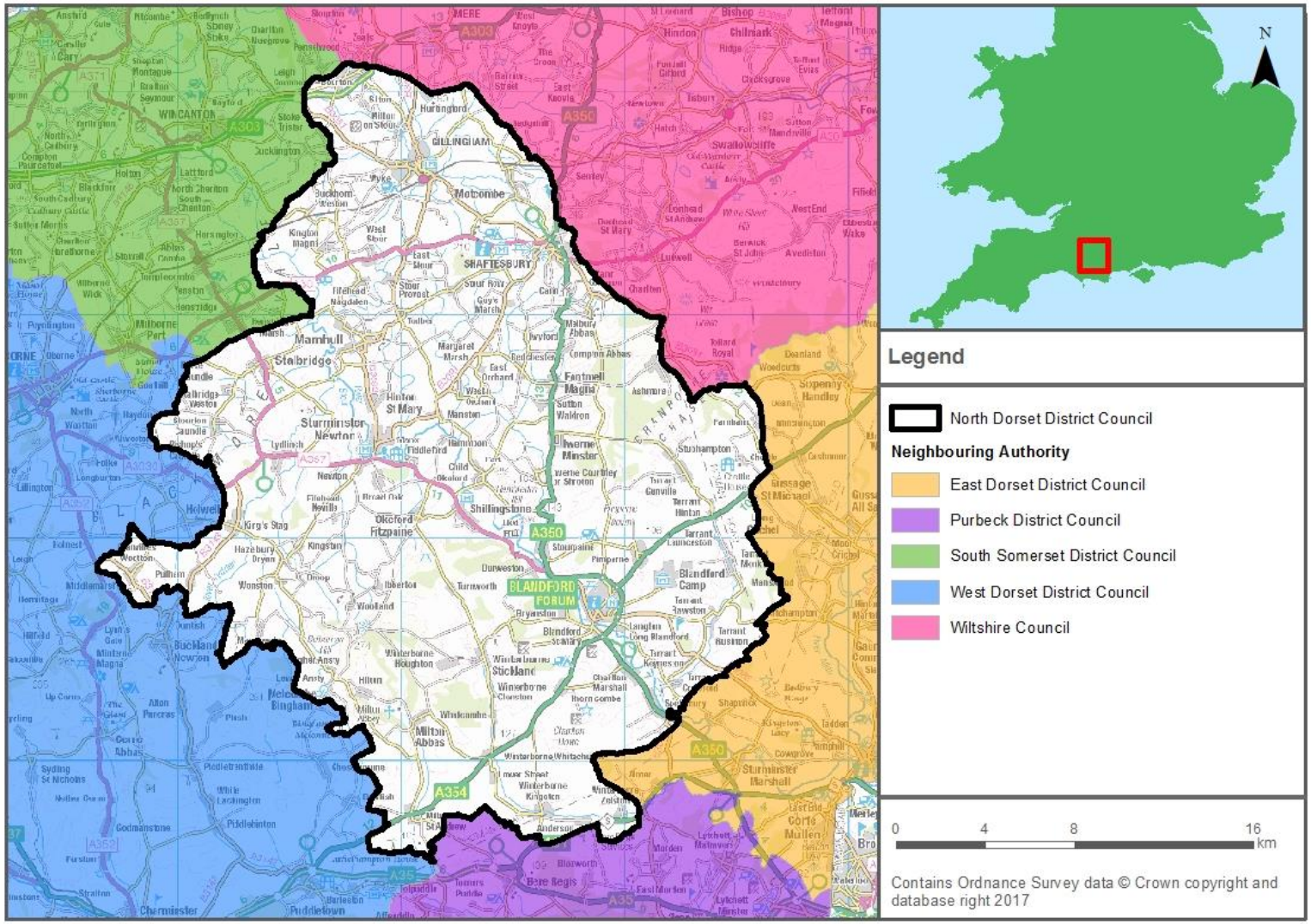
It is important to recognise that SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. The SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers,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

SFRAs should be a **'living document'**, and as a result should be updated periodically taking into account new information on flood risk, new planning guidance or legislation. New information on flood risk may be provided by North Dorset District Council, the Highways Authority, Dorset County Council, Bournemouth Water, Wessex Water and the Environment Agency. Such information may be in the form of:

- New hydraulic modelling results
- Flood event information following a flood event
- Policy/ legislation updates
- Environment Agency flood map updates
- New flood defence schemes etc.

The Environment Agency regularly reviews their 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. It is recommended that the SFRA is reviewed internally, in line with the Environment Agency's Flood Zone map updates to ensure latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking with the above bodies for any new information.

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.

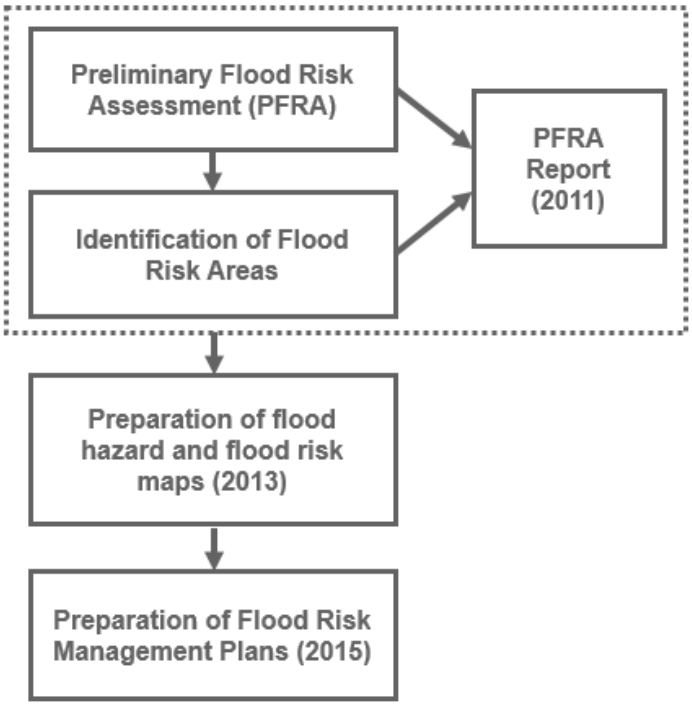
2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

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 LLFA is Dorset County Council. Detail on the responsibilities of LLFAs is provided in Section 2.8.

Figure 2-1 illustrates the steps that have / are being taken to implement the requirements of the EU Directive in the UK via the Flood Risk Regulations.

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 had the task of preparing a Preliminary Flood Risk Assessment (PFRA) report.

PFRAs report on significant past and future flooding from all sources except from Main Rivers and reservoirs, which are covered by the Environment Agency, and sub-standard performance of the adopted sewer network (covered under the remit of Wessex Water). PFRAs are a high-level screening exercise and consider floods which have significant harmful consequences for human health, economic activity, the environment and cultural heritage.

The **PFRA document** that covers the study area was published by Dorset County Council in July 2011.

The Regulations required the LLFA to identify significant Flood Risk Areas on a six year cycle, with the first reporting being performed in 2011. The threshold for designating significant Flood Risk Areas as first defined by Defra and the PFRA was the process by which these locations were identified. Of the ten national indicative Flood Risk Areas that were originally identified by Defra/Environment Agency, none encroach on the administrative areas of North Dorset District Council and Dorset County Council. Therefore, the indicative designations have been accepted.

Given that the local flood risks across North Dorset did not meet the national significance threshold set by Defra in 2011 or 2017, no additional Flood Risk Areas have been identified within the study area by Dorset County Council.

However, it should be noted that areas lying outside the national indicative Flood Risk Areas are still at risk of flooding from local sources in North Dorset. A definition of a "locally significant event" was therefore proposed by Dorset County Council and agreed by the South West Flood Managers Group as a consistent definition for identifying Flood Risk Areas in South West PFRAs and informing local flood risk management strategies across the South West region.

The process of review of the PFRAs was performed in 2017 and the Environment Agency issued guidance to Lead Local Flood Authorities in *Review of preliminary flood risk assessments (Flood Risk Regulations 2009): guidance for Lead Local Flood Authorities in England* (Environment Agency, January 2017). The January 2017 guidance provided templates to enable LLFAs to perform the review and also included updates to the locations of the Indicative Flood Risk Areas (*FRA*s) (showing locations predicted to be at significant local flood risk). The updated guidance did not identify new *FRA*s in North Dorset. The updated PFRA has not yet been published but further information on the PFRA update can be sought from Dorset County Council.

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, a Flood Risk Management Plan (FRMP) was prepared and published. The FRMP summarises the flooding affecting the area and describe the measures to be taken to address the risk in accordance with the Flood Risk Regulations. The final **South West River Basin District Flood Risk Management Plan** was issued in March 2016 and covers the period 2015 to 2021[1]. The FRMP draws on previous policies and actions identified in Catchment Flood Management Plans (Section 2.5.1) 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)[2] implements 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). Duties for LLFAs 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.

1 Environment Agency, (March, 2016), South West River Basin District Flood Risk Management Plan 2015 to 2021

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

2.2.5 Dorset Local Flood Risk Management Strategy (2014)

Dorset County Council is responsible for developing, maintaining, applying and monitoring a **LFRMS** for Dorset, which covers the study area. The Strategy is used as a means by which the LLFA co-ordinates flood risk management on a day to day basis. The LFRMS also sets out measures to manage local flood risk i.e. flood risk from surface water, groundwater and ordinary watercourses.

The following objectives proposed in the Strategy for managing are:

1. Understand the flood risk across Dorset
2. Manage the likelihood and impacts of flooding
3. Help Dorset's communities manage their own flood risk
4. Ensure flood risk is considered in local land development proposals
5. Improve flood prediction, warning, response and flood recovery.

The Strategy also sets out an action plan of how the LLFA intends to achieve these objectives. The Strategy should be updated regularly or when key triggers are activated. An example of a key trigger would be issues such as amendments to partner responsibilities, updates to legislation, alterations in the nature or understanding of flood risk or a significant flood event.

2.2.6 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. When considering planning applications, local planning authorities should consult the LLFA on the management of surface water in order to satisfy 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.

In March 2015 the LLFA was made a statutory consultee which came into effect on 15 April 2015. As a result, Dorset County Council will be required to provide technical advice on surface water drainage strategies and designs put forward for new major developments.

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.

Dorset County Council has provided Surface Water Management Proposal Information Requirements (2015)[3] for all major developments to ensure that the standard of Surface Water Management is appropriate. This document is outlined in Section 8.4.

2.2.7 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.

This 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.

The strategy encourages more effective risk management by enabling people, communities, business, infrastructure operators and the public sector to work together to:

[3] https://www.dorsetforyou.gov.uk/article/424485/Surface-Water-Planning

- ensure a clear understanding of the risks of flooding and coastal erosion, nationally and locally, so that investment in risk management can be prioritised more effectively;
- set out clear and consistent plans for risk management so that communities and businesses can make informed decisions about the management of the remaining risk;
- manage flood and coastal erosion risks in an appropriate way, taking account of the needs of communities and the environment;
- ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond effectively to flood forecasts, warnings and advice;
- help communities to recover more quickly and effectively after incidents.

The Strategy is reviewed every six years and is this due for re-issue in 2017. The reissued document has not been available within the timescales of this SFRA. It may therefore be necessary to update the SFRA, once this becomes available, to reflect any changes in the strategy for the area as this may affect strategic planning.

2.3 National Planning Policy and Guidance

The **National Planning Policy Framework** (NPPF)[4] 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 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 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. It should be noted that Flood Zones 1 to 3a **describe the** risk for a scenario where there are no flood risk management measures in place (such as flood defences), whereas Flood Zone 3b includes the presence of flood defences, on the basis that it is describing areas that can actually store water during a flood. The Flood Zones do not include an allowance for climate change. Table 3-1 summarises this information and also provides information on when an FRA would be required.

Table 3-1 and throughout this report. The Sequential and Exception tests are covered in greater detail in Section 3.

4 National Planning Policy Framework (Department for Communities and Local Government, March 2012)

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

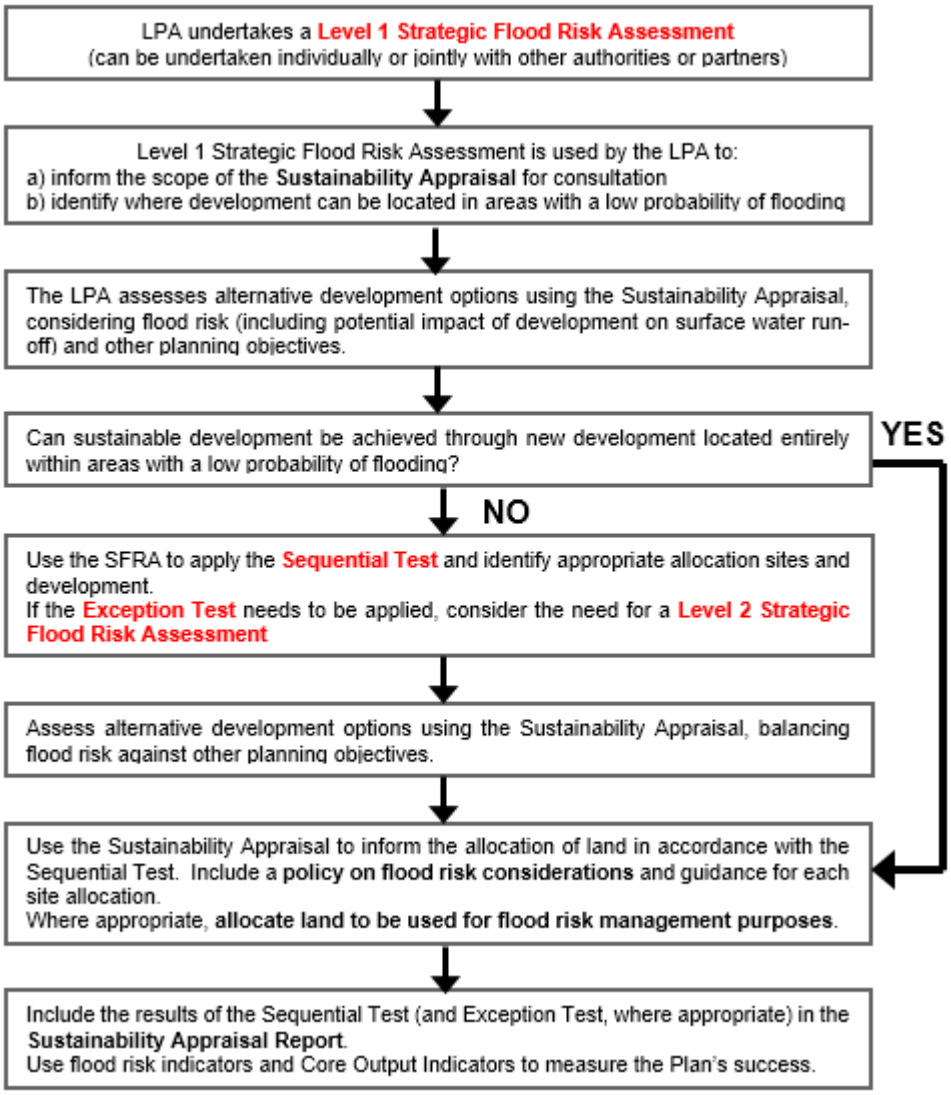
"The Exception Test, as set out in paragraph 102 of the NPPF, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

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)

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).

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 Water Cycle Studies

Climate change is predicted to present unprecedented new challenges, such as more frequent and extreme rainfall events and rising global temperatures, which are expected to exert greater pressure on the existing infrastructure. Planning for water management therefore has to take these potential challenges into account. A large number of new homes for instance may cause the existing water management infrastructure to be overwhelmed which would result in adverse effects on the environment, both locally and in wider catchments.

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.

Prior to this SFRA, there was no specific requirement for Dorset County Council to prepare or publish any water cycle studies for the study area[5]. However, a water cycle study may be recommended if there is a requirement for a SWMP and/or it is uncertain whether the environmental capacity of the water cycle to cope with future proposed development is adequate.

5 Dorset County Council, (December, 2010), Bournemouth, Dorset and Poole Level 1 SFRA for minerals and waste (Volume 1 SFRA Report – Section 4.8).

2.5 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.

2.5.1 Dorset Surface Water Management Plan (2012)

The Dorset SWMP[6] was prepared and published in 2012. It outlines the findings from the preparation and risk assessment stages of the SWMP process, and identifies the actions to be considered for the management of surface water in the highest priority locations within each Local Authority area.

Based on the analysis of historic data and modelled data available for North Dorset, the SWMP identified and recommended the following actions for the study area:

- Conduct a number of flood risk investigations in Milborne St Andrew given that this area is at risk of surface water and ground water flooding.
- Assess the damages and likely costs to determine whether an appropriate scheme to manage flood risk in Milborne St Andrew can be developed, and investigate other sources of funding if required.

It is understood that these works may have been completed.

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.

The six national policies are:

1. No active intervention (including flood warning and maintenance). Continue to monitor and advise.
2. Reducing existing flood risk management actions (accepting that flood risk will increase over time).
3. Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
4. Take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change).
5. Take action to reduce flood risk (now and/or in the future)
6. Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

2.6.1 Dorset Stour CFMP (2009)

The study area is covered by the **Dorset Stour CFMP**, which encompasses the River Stour and its tributaries to the confluence with the Dorset Stour at Christchurch Harbour.

The primary policy units for North Dorset are:

- Sub Area 4: Middle Stour, Tarrant, Winterborne and Allen.
- Sub Area 5: Blandford Forum
- Sub Area 6: Hambledon Hills

[6] Dorset County Council, (2012), Dorset Surface Water Management Plan: Strategic Assessment Report

- Sub Area 7: Upper Stour and Blackmore Vale
- Sub Area 8: Gillingham

Sub Areas 4, 5, 6 and 8 are covered by Policy Option 3, which is for areas of low to moderate risk where the Environment Agency are generally managing the existing flood risk effectively.

However, Sub Area 7 is covered by Policy Option 6, which is for areas of low to moderate flood risk where 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 proposed actions to implement these policies include:

- Develop a Blackmore Vale & Upper Stour Strategy to investigate locations for flood attenuation and wetland creation
- Develop Surface Water Management Plans or seek property resilience grants for Shillingstone.
- Develop a Surface Water Management Plan for Wincanton, and Sturminster Newton.
- Set up working groups to explore and encourage Agri-Environment and Woodland Scheme grants to help fund the change of land use and its management to increase water retention in the sub-catchment.
- Encourage and influence the uptake of Agri-environment schemes to provide better land use practice with respect to rainfall run-off.
- Continue to provide and strengthen development control advice, including the use of SuDS, through Local Development Framework policies to ensure no increase in runoff from new developments and seek opportunities to reduce runoff, where possible.
- Continue to provide Flood Warnings Direct service [note: this has now been replaced by the Flood Warning Service (FWS)], including installation of rainfall and river flow monitoring equipment.
- Continue practice and development of emergency response plans.
- Continue with existing level of maintenance, and assess potential for improving current defences, to retain standard of protection in the future, as part of the System Asset Management Plan.
- Install monitoring equipment to quantify rainfall and ground water flooding in sub-catchments.

2.7 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. North Dorset falls within the South West River Basin District.

The updated 2015 South West River RBMP identified a number of pressures on the water environment and significant water management issues.

The RBMP describes how development and land-use planning needs to consider a number of issues relevant to the RBMP including sustainable drainage systems, green and blue infrastructure, sewage treatment options (tertiary phosphate treatments), water efficiency measures, infrastructure and development locations and the reduction of nutrients from diffuse pollution. The RBMP provides a summary of measures to protect and improve the water environment in the river basin district.

2.8 Implications for North Dorset

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

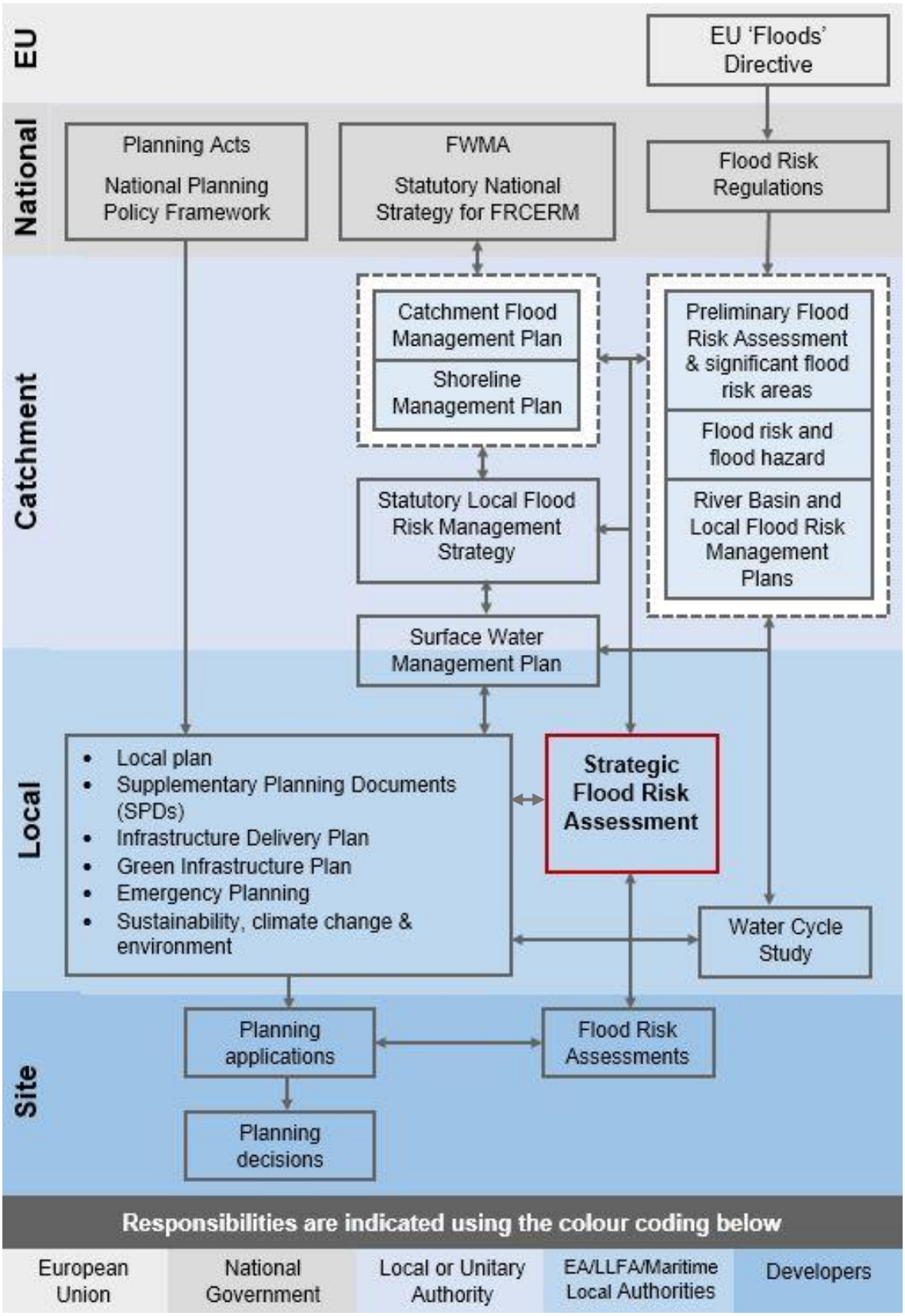
Table 2-1: Roles and responsibilities of Risk Management Authorities in North Dorset

Risk Management Authority (RMA)	Strategic Level Roles	Operational Level Roles
Environment Agency	National Statutory Strategy Reporting and supervision (overview role)	• Preliminary Flood Risk Assessment (per River Basin District)* • Managing flooding from main rivers and reservoirs and communication flood risk warnings to the public, media and partner organisations. • Identifying Significant Flood Risk Areas* • Preparation of Flood Risk and Hazard Maps • Preparation of Flood Risk Management Plans • Enforcement authority for Reservoirs Act 1975 • Managing RFCCs and supporting funding decisions, working with LLFAs and local communities. • Emergency planning and multi-agency flood plans, developed by local resilience forums
Lead Local Flood Authority (Dorset County Council)	Input to National Strategy. Formulate and implement Local Flood Risk Management Strategies	• Responsible for enforcing and consenting works for Ordinary Watercourses, risk assessing Ordinary Watercourses. • Managing local sources of flooding from surface water runoff and groundwater and carrying out practical works to manage flood risk from these sources where necessary. • Preparing and publishing a PFRA • Identifying Flood Risk Areas • Preparing Flood Hazard and Flood Risk Maps • Preparing Flood Risk Management Plans (where local flood risk is significant) • Investigating certain incidents of flooding in Section 19 Flood Investigations • Statutory roles in planning for surface water drainage. • Keeping asset registers of structures and features which have a significant effect on local flood risk. • Acting consistently with LFRMS in realising FRM activity and have due regard in the discharge of other functions of the strategy
Local Planning Authority (North Dorset District Council)	Input to National and Local Authority Plans and Strategy (e.g. North Dorset Local Plan – to develop a spatial strategy for growth within the area which accounts for flood risk)	• Preparation of a Local Plan to guide development. • The competent determining authority for planning applications which has the ultimate decision on the suitability of a site in relation to flood risk and management of surface water run-off. • Responsibilities for emergency planning as a responder to a flood event.
Water and wastewater providers (Wessex Water)	Input into Local Authority Plans and site-specific planning applications /decisions	• Maintain surface, foul and combined public sewers to ensure the area is effectively drained. • Assess whether the public system has the capacity to accept flows from a proposed development as part of their pre-application service • Comment on the available capacity of foul and surface water sewers as part of the planning application process. • Provide solutions that identify the necessary mitigation measures for drainage of proposed developments. • Providing consent, prior to commencing work, if installing water systems, or altering existing systems, is intended.

2.9 Key strategic planning links

Figure 2-3 outlines the key strategic planning links for flood risk management and associated documents. It shows how the Flood Risk Regulations and Flood and Water Management Act, have introduced a wider requirement for the mutual exchange of information and the preparation of strategies and management plans.

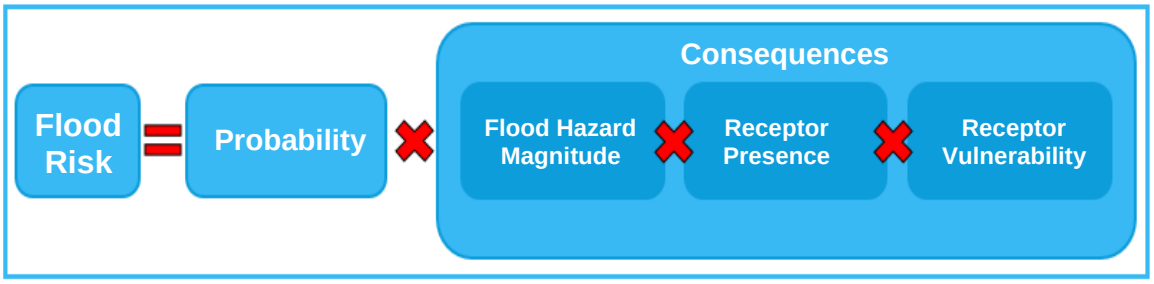
Figure 2-3: Strategic planning links and key documents for flood risk



3 The sequential, risk-based approach

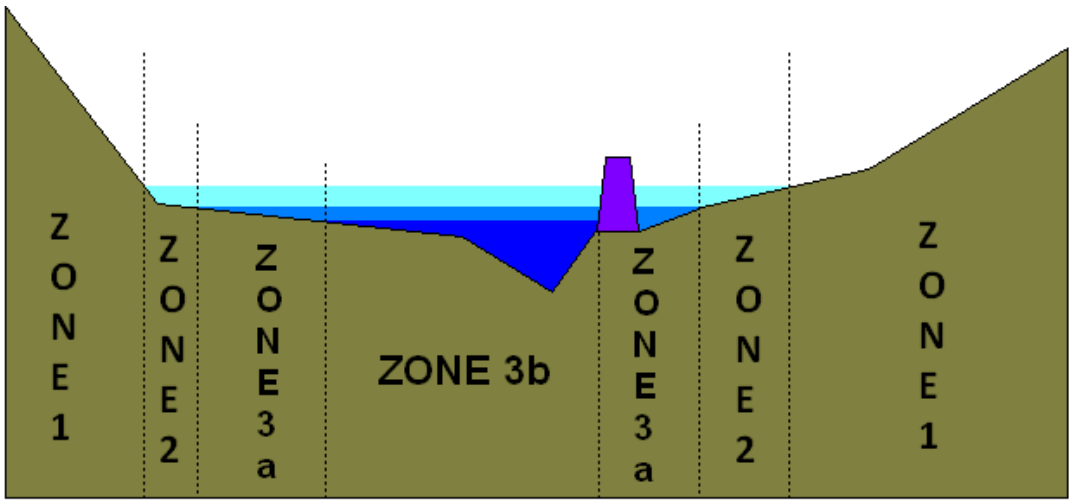
3.1 Flood risk and sequential approach overview

Flood risk is defined as the combination of the probability of a flood occurring with its potential consequences. It is often useful to express the definition as follows:



The sequential 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. This reduces receptor presence and vulnerability in areas where there is a high probability of flooding, reducing the risk. A concept diagram showing the classification of Flood Zones graphically is included in Figure 3-1.

Figure 3-1: Concept of 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) are too simplistic and a greater understanding of the scale and nature of the flood risks is required.

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. It should be noted that Flood Zones 1 to 3a describe the risk for a scenario where there are no flood risk management measures in place (such as flood defences), whereas Flood Zone 3b includes the presence of flood defences, on the basis that it is describing areas that can actually store water during a flood. The Flood Zones do not include an allowance for climate change. 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. The approach for identifying the functional floodplain is detailed in Section 5.2.1 of this SFRA report.
		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.

3.1.2 Surface water flood risk information

In 2016, the Environment Agency, working with LLFAs, produced the Risk of Flooding from Surface Water (RoFfSW) dataset. This superseded the previous Flood Map for Surface Water and Areas Susceptible to Surface Water Flooding maps. The RoFfSW is a national scale map and assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year. It is 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 RoFfSW 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 3-2).

Table 3-2: RoFfSW risk categories

Risk	Definition
High	Probability of flooding greater than 1 in 30 (3.3%) each year.
Medium	Probability of flooding between 1 in 100 (0.1%) and 1 in 30 (3.3%) each year.
Low	Probability of flooding between 1 in 1,000 (0.1%) and 1 in 100 (1%) each year.
Very Low	Probability of flooding of less than 1 in 1,000 (0.1%) each year

Although the RoFfSW 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 RoFfSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

The surface water map is available via the Long term flood risk information page on the government's **website**, and is also provided in Appendix A of this SFRA. In addition to showing the extent of surface water flooding, there are depth and velocity maps for each risk category. These maps should be used when considering other sources of flooding when applying the Sequential and Exception tests.

3.1.3 Groundwater flood risk information

Groundwater flood risk is often difficult to quantify and there is limited data available with which to assign a probability to a flood event and assess the risk. The risk of groundwater emergence is often assessed qualitatively based on soil conditions, topography and the location of nearby water sources to give an indication of susceptibility. Local borehole records and records of previous flood events can also be used to supplement this information and identify locations which are at risk.

For this SFRA, the BGS susceptibility to groundwater flooding dataset has been used, supplemented with flood history data where available. It is important to note that the BGS dataset maps susceptibility only and does not give an indication of the actual level of risk. Further information on the susceptibility dataset and its limitations can be found in Section 5.2.3.

3.1.4 Reservoir flood risk information

The risk of reservoir flooding is usually considered to be low. Whilst the consequences would be significant (with the potential for deep, fast-flowing water with little warning), the probability of reservoir breach is generally expected to be very low due to the inspection and maintenance regime required under the Reservoirs Act 1975.

Reservoir flood mapping usually considers the maximum area with the potential to flood from reservoir breach rather than quantifying the risk. Sites requiring an evacuation plan which lie within this area will need to consider the potential hazard to occupants in the plan and recommend mitigation for this where required. Other vulnerable sites, particularly those located immediately downstream of a reservoir may also need to mitigate this risk.

3.1.5 Sewer flood risk information

There is limited information with which to quantify sewer flood risk, especially as flooding can occur as a result of blockage or damage as well as through lack of capacity. Flood history data can be used to identify locations where there has previously been sewer flooding (either foul or surface water). This is a useful starting point in identifying areas where there may be a lack of sewer capacity or a recurring blockage issue. However, it should be remembered that sewer flooding could occur anywhere where there is a sewer system in place. Additionally, areas which have

previously flooded may no longer be at high risk if the underlying issue has been resolved. The sewerage undertaker for the area may be able to provide further information on where there are known issues.

Wessex Water is the statutory provider of wastewater services in the North Dorset area. Wessex Water has provided detailed of incidents of sewer flooding in the area to indicate possible areas of sewer incapacity. Flood risk has been reduced in some areas by flood alleviation schemes.

3.2 Applying the Sequential Test and Exception Test in the preparation of a Local Plan

3.2.1 The Sequential Test

When preparing a local plan, the local planning authority should demonstrate it has considered a range of site allocations, using SFRAs to apply the Sequential and Exception Tests where necessary.

The Sequential Test should be applied to the whole study area to increase the likelihood of allocating development in areas not at risk of flooding. It is recommended that the Council considers using the SFRA climate change maps when applying the Sequential Test for site allocations and windfall sites. 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) Availability Assessments (SHLAAs). The NPPG for Flood Risk and Coastal Change describes how the **Sequential Test should be applied in the preparation of a local plan** (Figure 3-2).

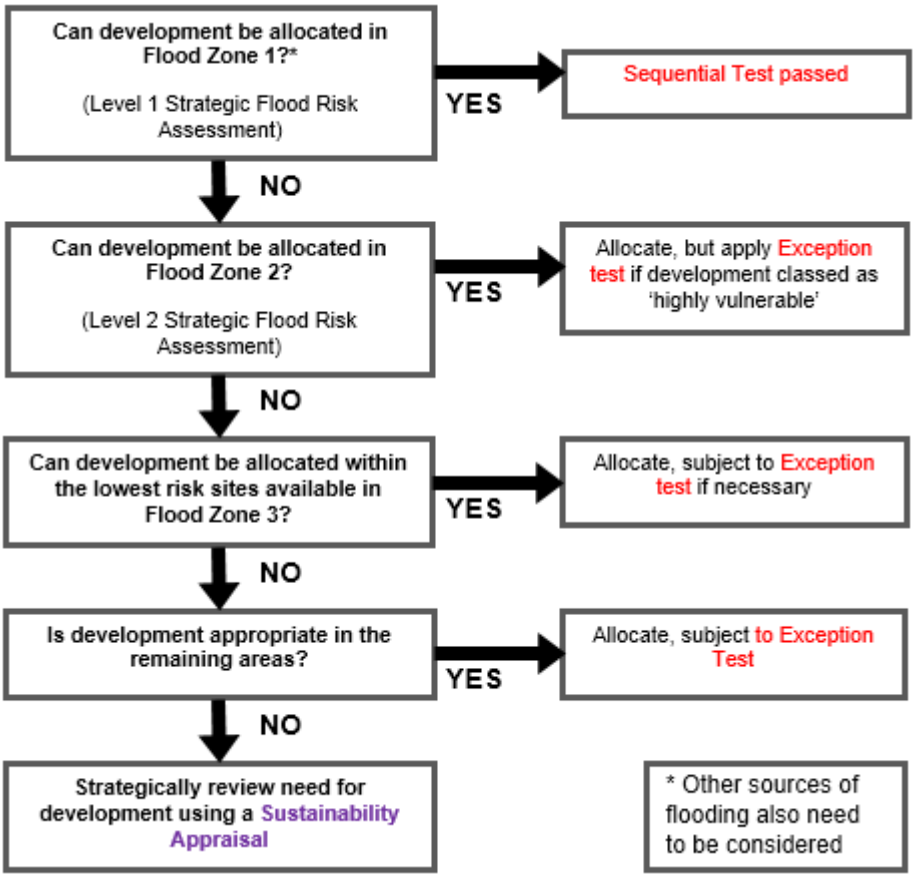


Figure 3-2: Applying the Sequential Test in the preparation of a local plan

3.2.2 The Exception Test

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 3-3).

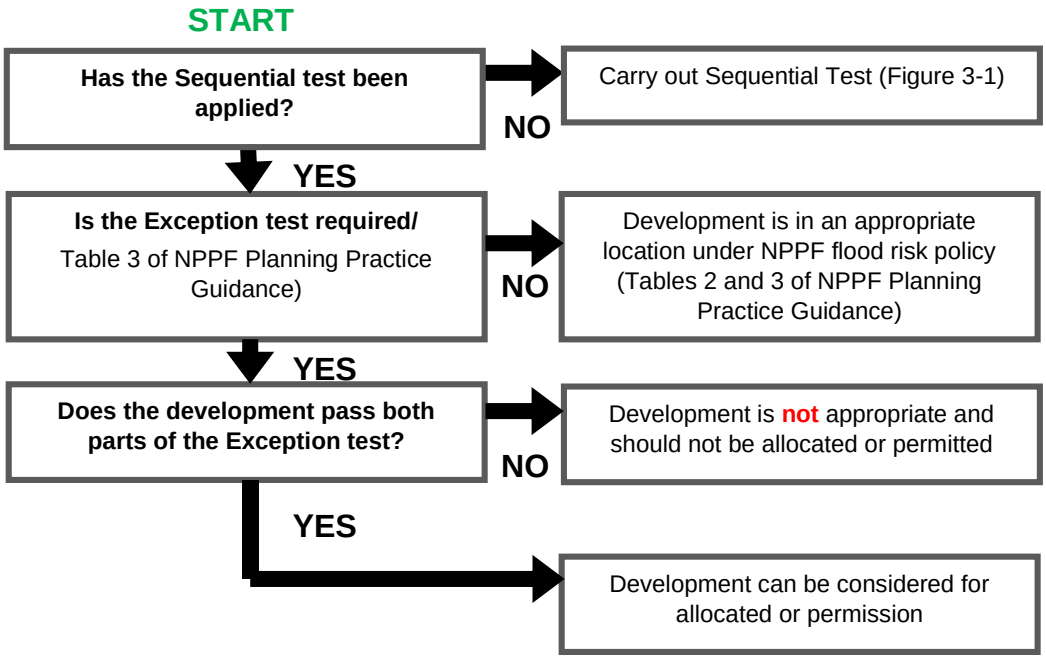


Figure 3-3: Applying the Exception Test in the preparation of a local plan

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

3.3.1 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.

North Dorset District Council, 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 been identified in development plans through 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 of flooding, areas with critical drainage problems and critical drainage areas.

3.3.2 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[7].

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[8]:

   - 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

3.4 Actual flood risk

If it has not been possible for all future development to be situated in Zone 1, and in areas at low risk from other sources of flooding, 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 risk management (such as 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 risk management measures (such as 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-year chance of flooding) in any year; and

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

- The level of protection afforded by existing flood risk management measures (such as 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 flood risk management measures (such as 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

7 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 037, Reference ID: 7-056-20140306) March 2014
8 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 038, Reference ID: 7-056-20140306) March 2014

by flood risk management measures (such as 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 and rate of rise 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.

3.5 Residual flood risk

Residual risk refers to the risks that remain after measures have been taken to alleviate flooding (such as flood defences). It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be

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

Should such events occur, it may result in rapid inundation of the local community behind the flood defences and may pose a risk to life.

There are several formal flood defences located within the study area. Such flood defences primarily include flood embankments, walls and gates in and surrounding the areas of Gillingham, Blandford Forum, and Winterborne Kingston.

There is also a potential residual risk from the reservoirs in and surrounding the district. The residual risk from these sources are discussed further in Sections 6.7 and 6.8

3.6 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.

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 to ensure flood risk is not exacerbated, and in many cases the development should be used to improve the flood risk.

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. The 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. Their allowances are based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere.

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

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, 70th and 90th percentiles respectively. The allowance category to be used is based on the vulnerability classification of the development and the flood zones within which it is located.

These allowances (increases) are provided, in the form of figures for the total potential changed 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**.

The allowances for the South West River Basin District are provided in Table 4-1. All watercourses in North Dorset lie within the South West River Basin District.

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

Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '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 current plausible climate projections and would not normally be expected for schemes of 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 intensities

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 4-2: 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 Using climate change allowances

To help decide which allowances to use to inform the flood levels in the SFRA, 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

4.7 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.

4.8 The impact of climate change in North Dorset

Hydraulic model results including the most recent climate change allowances are not available for any locations in North Dorset for the purposes of this SFRA. In some areas, detailed models using previous climate change allowances are available but these have not been updated for the new allowances as there is only limited coverage and significant updates to the modelling were outside of the scope of this study.

Instead, the impact of climate change has been assessed using the following approach:

- For fluvial sources, as no detailed modelling outputs including the updated climate change allowances are available for North Dorset, future Flood Zone 3 is approximated by the current Flood Zone 2 extent and a "climate change sensitivity buffer" has also been delineated using the method described in Section 4.8.1;
- For risk from other sources, no quantitative assessment has been undertaken.

This assessment has been undertaken for strategic planning purposes only and developers of individual sites will need to assess the potential impacts of climate change, on flood risk from all sources, in more detail.

A number of watercourses, including the River Stour, are included in the Environment Agency's fluvial flood zones. It is likely that flood risk from these sources will increase, including in developed areas such as Gillingham, where there are flat areas adjacent to watercourses initially indicated by a difference in extents between Flood Zone 2 and Flood Zone 3. Blandford Forum and Sturminster Newton may also experience increases in Flood Zone extent but this is likely to be smaller in scale due to the constrained nature of the floodplain. In Shaftesbury and Stalbridge the fluvial flood risk is low and is not expected to increase significantly due to climate change as both are located on high ground away from watercourses.

4.8.1 Climate change sensitivity mapping

As discussed above, "climate change sensitivity buffer" mapping has been produced for this SFRA and is included in Appendix E. This mapping provides indicative information on areas which may be sensitive to increases in fluvial flood risk as a result of climate change, based on their location in proximity to watercourses and floodplains and on local topography. This map is for planning only and should not be used for other purposes. It is important to note that the mapping process for these areas is based on spatial buffers only and the maps do not therefore reflect areas which will definitely be at increased risk in future. In some cases it is anticipated that further assessment will show no significant increase in risk to a site.

The "climate change sensitivity buffer" shown has been derived based on the existing Flood Zones and on watercourse centrelines. The following method has been used to map these areas:

- Where no Flood Zones exist, the buffer has been defined as the width of the furthest upstream Flood Zone 2 extent. Where this was not possible (no local Flood Zones) a horizontal buffer of 25m has been added to either side of the watercourse centreline.
- In areas where existing Flood Zone mapping is available, the buffer is based on "topographic sensitivity" and derived by comparing the existing Flood Zone extents and LIDAR.

    Where Flood Zone 2 and 3 are identifiably different in extent, the ground level at the extent of each Flood Zone was estimated from LIDAR. The two levels were then compared and the difference calculated, as shown in Figure 4-1. This difference was then added to the estimated Flood Zone 2 level to give the ground level from which the buffer extent was then delineated using LIDAR.

    - Where there is no significant difference between the Flood Zone 2 and 3 extents, the same process has been followed but a vertical increase of 1m has instead been added to the existing Flood Zone 2 estimated level to inform the buffer extent.

Applications within the climate change sensitivity buffer requiring site-specific flood risk assessments will need to evidence the anticipated effect of climate change on fluvial flood risk in order to demonstrate how flood risk will be managed over the development's lifetime. The type of evidence required will be proportionate to the degree of flood risk and appropriate to the scale, nature and location of the development.

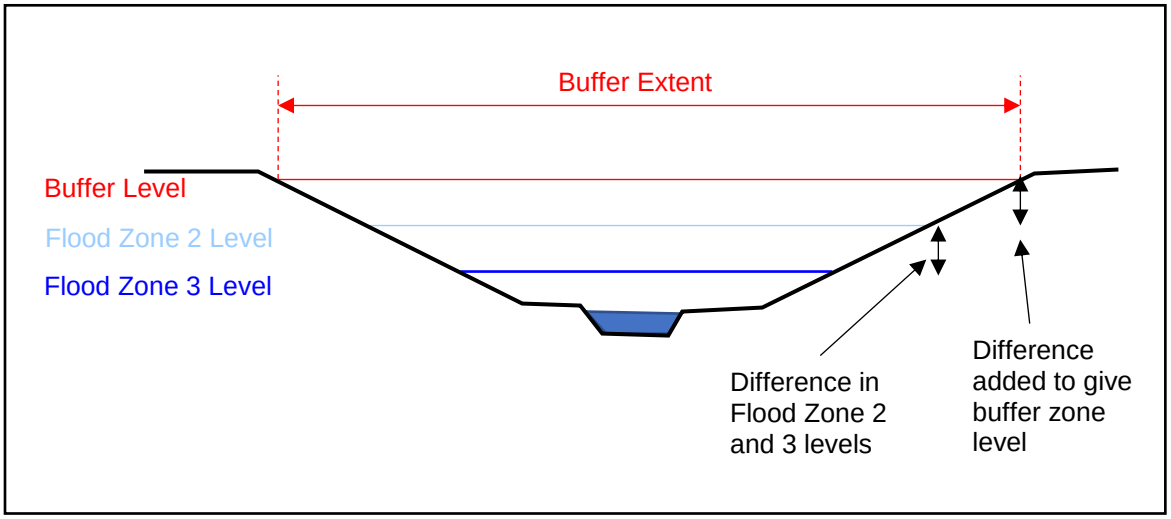


Figure 4-1: Delineation of the "climate change sensitivity buffer"

5 Methodology used in preparing the SFRA

5.1 SFRA Methodology

The flood risk from all sources to the study area has been assessed using the available data. The data and method used to assess flood risk from each source is detailed in Section 5.2. An overview of flood risk for the entire study area has been prepared in addition to a more detailed assessment of areas within North Dorset. Detailed mapping of the available flood risk data has also been prepared and is included in Appendix A.

5.2 Summary of SFRA mapping for all sources of flood risk

5.2.1 Fluvial

The assessment of fluvial flood risk has primarily been based on the Environment Agency's Flood Map for Planning which delineates Flood Zones 2 and 3. This mapping is based on broadscale modelled flood extents, supplemented with the outputs from detailed modelling studies where available, and is updated regularly by the Environment Agency. The Flood Map for Planning does not, however, separate Flood Zone 3a and Flood Zone 3b (the Functional Floodplain). For this strategic assessment, mapping of the Functional Floodplain has therefore been undertaken based on the following hierarchy, which has been agreed with the Environment Agency:

1. Where available, 1 in 20-year flood extents from detailed modelling (modelled with defences) has been used;
2. Where the 1 in 20-year extent is not available, the 1 in 25-year defended extent has been used;
3. Where neither the 1 in 20-year or the 1 in 25-year extents were available, the 1 in 100-year defended outline was used;
4. Where none of the data described above were available, the whole of Flood Zone 3 has been assumed to be Flood Zone 3b.

The Flood Zones, including Functional Floodplain, are defined in Section 3.1.1. It should be noted that the delineation of the entirety of Flood Zone 3 as Functional Floodplain is likely to be an overestimation in some locations as Flood Zone 3a takes no account of the presence of defences whereas Flood Zone 3b would not normally include land afforded some measure of protection by defences. The extents will thus potentially be most unrepresentative in areas with a relatively flat floodplain where defences are present, but Zone 3b has not been specifically modelled. Where development needs to be allocated in these areas, or where unallocated development is proposed, additional modelling may need to be undertaken to confirm the extents of the Flood Zone 3b. Consideration must also be given to the 'functionality' of the flood plain with respect to the presence of existing development and infrastructure.

5.2.2 Surface Water

Mapping of surface water flood risk in North Dorset has been taken from the Risk of Flooding from Surface Water (RoFfSW) dataset, published online by the Environment Agency. Further information on this dataset can be found in Section 3.1.2.

5.2.3 Groundwater

Mapping of groundwater flood risk has been based on the BGS susceptibility to groundwater flooding dataset, which was supplied by Dorset County Council, and on Wessex Water's dataset "Catchments in North Dorset affected by Groundwater Inundation". The BGS dataset is a national dataset on the susceptibility of groundwater flooding, covering England, Wales and Scotland. Based on geological and hydrogeological information, the digital data can be used to identify areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

The dataset has been generated using ESRI ArcMap software creating a GIS layer comprised of polygons that indicate the susceptibility to groundwater flooding. The susceptibility is split into three classes (A, B and C) of susceptibility to groundwater flooding. These are defined as follows:

- A: Limited potential for groundwater flooding to occur

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

Onshore areas outside of these classes are not considered to be prone to groundwater flooding based on the data used.

The dataset does not show the likelihood of groundwater flooding occurring and does not take account of the chance of flooding from groundwater rebound. It 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 susceptibility 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 exist.

Assessment of groundwater flood risk has also been based on historical records of groundwater flooding. It is important to note that, whilst these give an indication of areas where there may be an ongoing issue with groundwater flooding, there may be additional areas which are also at risk. The underlying geology and soils have also been used to provide an indication of the likelihood of groundwater flood emergence.

The Wessex Water dataset is based upon flood incidents since 2012 caused by high groundwater levels leading to inundation of sewers through infiltration. Wessex Water operate a rolling programme prioritising areas for investment through sewer survey and sealing. Proposed developments in these areas will require close consultation with Wessex Water.

The underlying soil conditions in North Dorset indicate that there is significant potential for groundwater emergence which may pose a flood risk. There is limited data available with which to assess the actual risk of flooding but flood history data has been used, where available, to supplement the susceptibility data and provide more detail on specific areas at risk.

5.2.4 Sewers

Sewer flooding is usually defined as flooding caused by a blockage or overflowing in a sewer or urban drainage system. Given that no local modelling of the sewer system has been undertaken, and it is often difficult to separate instances of sewer flooding from those caused by other sources of flooding, no consistent dataset defining the probability of sewer flooding currently exists. Assessment of the risk of flooding from sewers has therefore been undertaken based on records of historical sewer flooding incidents provided by Wessex Water. It is important to note that, whilst these records give an indication of areas where there may be on-going issues with sewer flooding, there may be additional areas which are also at risk.

Flood risk has been reduced in some areas by flood alleviation schemes. Wessex Water will continue to assess existing areas of incapacity via hydraulic modelling to prioritise investment. Drainage Area Plans and modelling exercises will be utilised to assess improvements required for development in the North Dorset area. The Wessex Area Sewerage Plan with web based interactive maps will be available for interrogation in 2018 and will provide further sewer capacity information based on a number of Wessex Water datasets.

5.2.5 Reservoirs

The risk of inundation as a result of reservoir breach or failure of a number of reservoirs within the area has been mapped using the outlines produced as part of the National Inundation Reservoir Mapping (NIRIM) study. This data has been supplied by the Environment Agency. The data shows the maximum extent of flooding in the event of reservoir failure.

5.2.6 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 Mapping of all sources of flood risk across the district. These are a series of maps that show all sources of flooding in North Dorset District, as well as other supporting map layers.
- Appendix B: Environment Agency Flood Warning coverage.

- Appendix C: Heat map of flood history.
- Appendix D: Wessex Water Groundwater Sensitive Catchments
- Appendix E: Climate change sensitivity mapping

5.3 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:

- **Dorset Stour Catchment Flood Management Plan (2012)**
- **Dorset County Council Local Flood Risk Management Strategy (2014)**
- **Dorset County Council Planning Application Advice for Surface Water (2016)**
- **Dorset County Council Surface Water Management Proposal Information Requirements (2015)**
- Dorset Surface Water Management Plan (2012) [not publicly available]

6 Understanding flood risk in North Dorset District

6.1 Historic flooding

Flood incident data provided by Dorset County Council and the Environment Agency provided information on historic flood events within North Dorset. In addition, a desk study of local policy documents and online news reports was undertaken to add further sources of information on historic flooding within the study area. As data was from multiple sources, the Source-Pathway-Receptor model was used to standardise the data. The Source-Pathway-Receptor model is helpful as it provides an understanding of the processes that influence flood risk, and makes it possible to identify methods to mitigate flood risk by addressing the source, blocking or altering the pathway, and even by removing the receptor.

- Source – the origin of flood water
- Pathway – a route of means by which a receptor can be affected by flooding
- Receptor – something that can be adversely affected by flooding

Historic flood records provided by the Environment Agency, Dorset County Council and Wessex Water identify the flood events known to have occurred between 1979 and 2017. The documented flood events show that the main sources of flooding in North Dorset come from fluvial, groundwater and surface water sources. Flooding is reported to have occurred in a number of locations across North Dorset, including Sturminster Newton, Milborne St. Andrew, Stourpaine, Winterborne Kingston and Blandford Forum. A heat map of the flood history in North Dorset is available in Appendix C..

6.2 Topography, geology and soils

The topography, geology and soils are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows rainwater to percolate through it (often referred to as the permeability), affects the extent and magnitude of overland flow and therefore the amount of run-off reaching a receiving watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone and flat ground may result in a more subdued runoff response to rainfall.

6.2.1 Topography

The topography of the study area can be seen in Figure 6-1 and is primarily comprised of higher elevations in the south west and north east with lower elevations in the central and north west areas of the district. In the south west, elevations reach approximately 275 metres Above Ordnance Datum (m AOD), with reasonably steep gradient slopes to central areas where the lowest elevations can be found in the vicinity of the River Stour.

6.2.2 Geology and soils

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.

The British Geological Survey website 1:625 000 scale mapping shows various types of bedrock underlying the district. In the south, the district is predominantly underlain by the White and Grey Chalk Subgroups, comprised of chalk. The north and west of the district are underlain by several bands of bedrock, including the:

- Kellaways Formation and Oxford Clay Formation,
- Corallian Group,
- West Walkton Formation, Ampthill Clay Formation and Kimmerdige Clay Formation,
- Gault Formation and Upper Greensand Formation,

These types of bedrock are comprised of varying combinations of mudstone, siltstone, sandstone and limestone. The permeable chalk formations indicate that the south of the district will have a slower response to rainfall and flood volumes are likely to be less critical. In areas of mixed geology, the local geology will influence the catchment response.

The Soilscapes website indicates that soils types also vary across the district. Soils in the south and east sections of the district are predominantly shallow lime-rich soils over chalk or limestone, whereas those in close proximity of the River Stour, are loamy and clayey floodplain soils with naturally high groundwater.

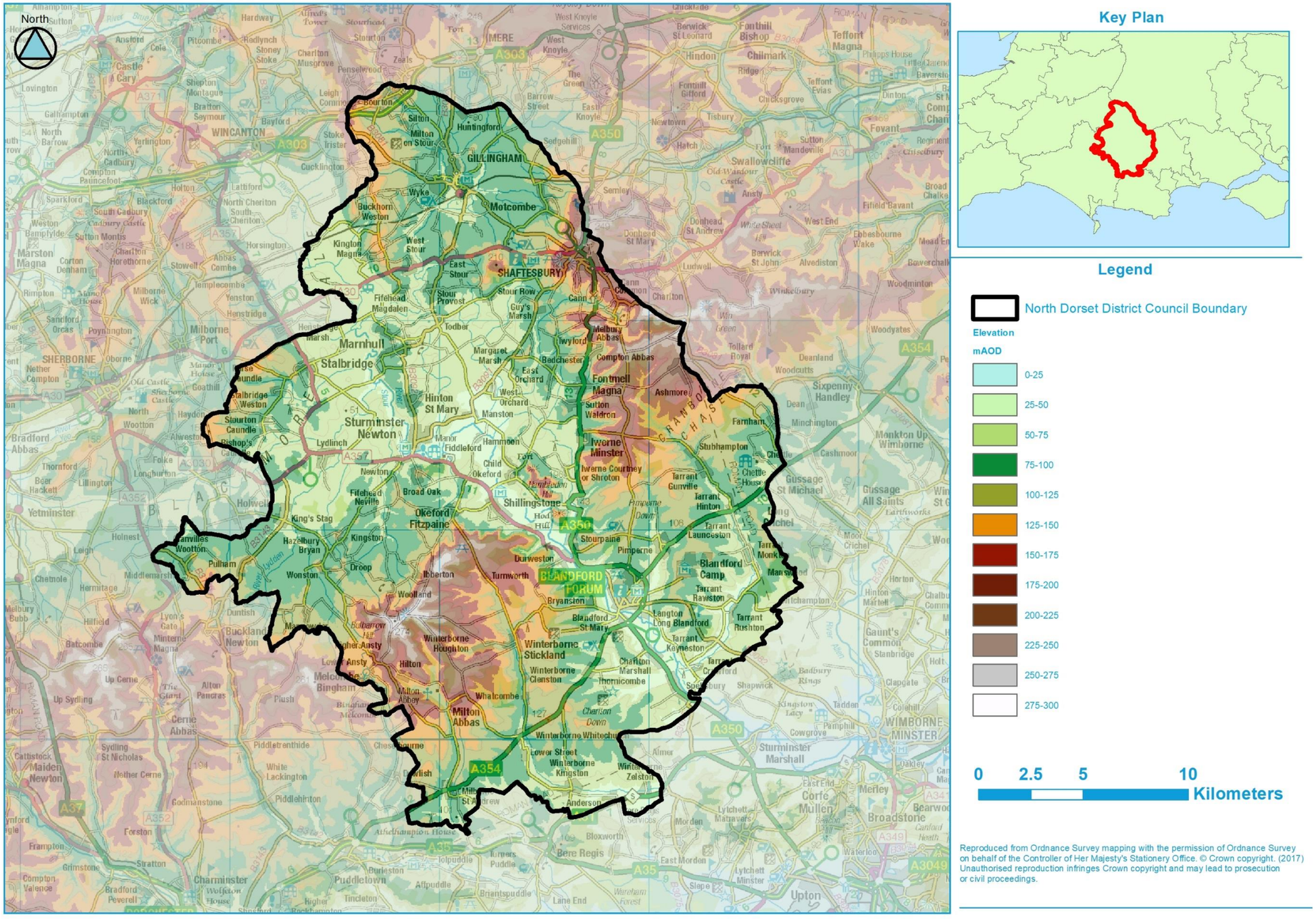
Soils in the north section of the district are slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils. However, it should be noted that isolated areas of freely draining, slightly acid and loamy soil types are also found across the district.

In urban areas, the permeability of the ground surface is reduced by the presence of impermeable surfaces such as roads and buildings. Urban creep in urban areas will increase surface water runoff from impermeable areas resulting in an increased risk of flooding and pollution. Sustainable Drainage Systems (SuDS) should seek to mimic natural arrangements as closely as possible to reduce flood risk and improve water quality.

The underlying geology and aquifer designation also has implications for what sustainable drainage solutions may be suitable for a site. For example, infiltration SuDS will depend on the permeability of underlying deposits. Further information on geology is available via the British Geological Society's **Geology of Britain website.**

The British Geological Society have also produced an **Infiltration SuDS map** which gives a preliminary indication of the suitability of the ground for infiltration SuDS.

Figure 6-1: North Dorset Topography



6.2.3 Hydrology

The principle watercourses flowing through the SFRA area are the River Stour and its tributaries. Tributaries of the River Stour includes other Main Rivers as well as smaller Ordinary Watercourses. A summary of the principal watercourses in the SFRA is provided in Table 6-1. Mapping indicating the location of the principal watercourses can be found in Appendix A.

Table 6-1: Watercourses in the study area

Watercourse	Classification	Description
Fontmell Brook	Main River	The Fontwell Brook is named from Fontmell Magna, and flows in a south westerly direction until its confluence with the River Stour at Hammoon.
Pimperne Brook	Main River	Pimperne Brook rises north of Pimperne, and flows in a south westerly direction for 4.6km until its confluence with the River Stour south of Blandford Forum.
River Winterborne	Main River	The Winterborne River rises in Winterborne Houghton and flows east through the district towards Winterborne Stickland. The river than flows in a southern direction for approximately 8km towards Winterborne Kingston before flowing east and leaving the district new Winterborne Zelston.
Bere Stream	Main River/Ordinary Watercourse	The Bere Stream rises in Milborne St Andrew opposite Coles Lane. The river flows in a southerly direction for approximately 2.3km before leaving the district boundary.
River Cale	Main River/Ordinary Watercourse	The River Cale enters the district east of Horsington, and flows in a south easterly direction until its confluence with the River Stour approximately 8.9km downstream.
River Iwerne	Main River/Ordinary Watercourse	The River Iwerne rises at Iwerne Minster, and flows in a southerly direction. It is classed as a main river 0.5km upstream of its confluence from the River Stour at Stourpaine.
River Lodden	Main River/Ordinary Watercourse	The River Lodden enters the district boundary south of Barrow Street, flowing in a south westerly direction. After its confluence with Motcombe Stream it is classified as a Main River for 3.3km, until its confluence with the River Stour south of Gillingham.
River Lydden	Main River/Ordinary Watercourse	The River Lydden rises near Buckland Newton, reaching the district boundary 1.4km downstream. It flows in a north easterly direction until its confluence with the River Stour south of Pleck.
River Stour	Main River/ Ordinary Watercourse	The River Stour enters the district boundary at Bourton. It flows in a south easterly direction to Gillingham, and turns and flows in a south westerly direction to Marnhull. The River Stour then flows in a south easterly direction until Spetisbury where it leaves the district.
Shreen Water	Main River/Ordinary Watercourse	Shreen Water rises north of Mere, joining the district 3.8km downstream. It then flows in a southerly direction until Gillingham, where it joins the River Stour.
The Tarrant	Main River/Ordinary Watercourse	The Tarrant rises within the district north of Tarrant Gunvill and flows in a south easterly direction for 6.4km. It then turns to flow in a south westerly direction until its confluence with the River Stour at Tarrant Crawford.

6.3 Fluvial flood risk

Significant watercourses flowing through North Dorset include:

- River Stour
- River Lydden
- River Lodden
- Fern Brook
- River Cale
- River Winterborne

The primary source of fluvial flood risk in North Dorset is associated with the River Stour and its tributaries. The areas through which the River Stour and its tributaries flow are predominantly rural. However, these watercourses also flow through more urbanised areas such as Gillingham, Marnhull, Stalbridge, Sturminster Newton and Blandford Forum, and therefore present a high risk of flooding to the surrounding properties. The present day and future flood extents for the River Stour are likely to limit the scope of development in some areas within the district as development should be located outside of areas shown to be at risk, where possible, in accordance with the requirements of the Sequential Test.

Several reaches of the watercourses within the district are lined by formal flood defences, as detailed in Section 6.8. The implications of these defences on development are also summarised in Section 6.8.

A number of other watercourses, including the River Winterborne and Bere Stream, have also been identified as a potential source of fluvial flood risk in the south of the district. The Environment Agency's Flood Zones indicate that the present-day flood risk from these sources is less extensive than that from the River Stour. However, both the River Winterborne and Bere Stream present a risk of flooding to properties located between Winterborne Houghton and Winterborne Zelston, as well as Milborne St Andrew.

No data is available with which to undertake a detailed assessment of the likely effects of climate change on flood extent using the most recent climate change allowances and a "climate change sensitivity buffer" approach has been used, as described in Section 4. The risk of flooding from the aforementioned sources is anticipated to increase as a result of climate change where nearby properties are located at similar elevations to the watercourses. There may be a current and future risk of flooding of highways crossing the watercourse where they are low-lying. The climate change sensitivity mapping in Appendix E should be used to identify areas which may be sensitive to the effects of climate change on fluvial flood risk where further assessment should be undertaken.

Mapping indicating the fluvial flood risk for the borough, can be found in Appendix A.

6.4 Surface water flood risk

Surface water flooding (or 'pluvial' flooding) is often caused by intense short duration rainfall, and usually occurs in lower lying areas, often where the natural (or artificial) drainage system is unable to accommodate the volume of water. Surface water flooding can be linked to issues of poor drainage, drainage blocked by debris, extreme weather, urban creep and lack of sewer capacity.

The Risk of Flooding from Surface Water (RoFfSW) predominantly follows topographic flow paths of existing watercourses and dry valleys, notably the River Stour and its tributaries. Given that the tributaries of the River Stour are primarily located in the north of the district, the risk of surface water flooding is far more extensive in this area compared to that in the southern section of the district. Overland flow routes are primarily located along roads, and isolated ponding occurs in lower lying areas.

There are a large number of properties and roads shown to be at risk from surface water flooding in the present day. It is likely that this will further increase due to increased rainfall intensities as a result of climate change. Risk of flooding from surface water may limit the development potential of some areas unless appropriate mitigation measures can be implemented. There may, however, be potential for future development to reduce the current level of risk shown throughout the district, either by reducing impermeable surfaces or providing storage for surface water flows.

The RoFfSW mapping for the borough can be found in Appendix A.

6.5 Groundwater flood risk

Compared with other sources of 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 low lying valley areas, which can be susceptible to groundwater flooding caused by a high water-table in mudstones, clays and superficial alluvial deposits, very few records are available. Additionally, there is an increased of groundwater flooding where long reaches of watercourses are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas.

Mapping of the district has been provided showing the BGS susceptibility to groundwater flooding dataset. This dataset presents information on areas which may be susceptible to groundwater flooding due to their geology and topography but does not indicate the level of risk. The BGS susceptibility 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 the potential hazard from this source.

The mapping shows that the majority of the district has limited potential for groundwater flooding to occur. However, there are areas with the potential for groundwater flooding to occur at surface, particularly in the vicinity of the River Stour and its tributaries, such as the River Winterborne and River Lydden.

Flood history data collected for this SFRA indicates that there have been numerous flood incidents which were believed to be as a result of groundwater. This includes incidents in Tarrant Gunville, Stubhampton, Milborne St Andrew, Winterborne Kingston, Winterborne Stickland, Stourpaine and Spetisbury.

Wessex Water has provided additional mapping (Appendix D) indicating areas of risk of sewer flooding caused by high groundwater levels leading to inundation of sewers through infiltration. The data is used by Wessex Water to identify where mitigation measures are likely to be required for new development. It can also be used to identify areas which may be subject to wider groundwater flooding issues, alongside other flood history and susceptibility data.

Mapping of the borough showing the BGS susceptibility to groundwater flooding dataset can be found in Appendix A.

6.6 Flooding from sewers

Historical incidents of sewer flooding provided by Wessex Water indicate that there have been approximately 140 recorded incidents across North Dorset for foul and surface water sewers from 2004 onwards. These events were caused by inadequate hydraulic capacity during storm events or periods of high groundwater, with the source of flooding predominantly from manholes in gardens and on paths/roads. This includes a number of events during Winter 2012/2013 and Winter 2013/2014.

6.7 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. 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.

There is a residual risk of inundation to the district because of reservoir breach or failure of reservoirs both within and outside the district. Outlines from the Risk of Flooding from Reservoirs dataset (informed from the National Inundation Reservoir Mapping (NIRIM) study) show the worst-case inundation extents across North Dorset. Reservoir breaches would primarily affect the northern half of the district, including the River Stour corridor between Bourton and Sturminster Newton. Maps of the flood extent can be found on the **Environment Agency's 'Long term flood risk information' website.**

The Environment Agency 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.

6.8 Flood Defences

A high-level review of formal flood defences was carried out for this SFRA interrogating existing information that gives their condition and standard of protection. Details of the flood defence locations and condition were provided by the Environment Agency for the purpose of preparing this assessment. 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.

These types of defences and their location is summarised in the sections below.

6.8.1 Defence standard of protection and residual risk

One of the principal aims of the SFRA is to outline the present risk of flooding across North Dorset including consideration of the effect of flood risk management measures (including flood banks and defences). The modelling that informs 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, more detailed studies should be performed to seek to refine the current understanding of flood risk from all sources.

Consideration of the residual risk behind flood defences has been undertaken as part of this study. The residual risk of flooding in a flood event or from failure of defences should also be carefully considered. Developers should also consider the standard of protection provided by defences and residual risk as part of a detailed Flood Risk Assessment (FRA).

6.8.2 Defence condition

Formal structural defences are given a rating based on a grading system for their condition[9]. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-2. This detail, in addition to descriptions and standard of protection for each, were provided by the Environment Agency for the purpose of preparing this SFRA which reports on the standard of protection using this information.

Table 6-2: Defence asset condition rating

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

Source: Condition Assessment Manual – Environment Agency 2006

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future requires consideration as part of the risk based sequential approach and, in light of this, whether possible site options for development are appropriate and sustainable. In addition, detailed FRAs will need to thoroughly explore the condition of defences, especially where these defences are informal and demonstrate a wide variation of condition grades. It is important that all of these assets are maintained to a good condition and their function remains unimpaired.

A review of key defences across North Dorset District, their condition and standard of protection is included in the following sections. Formal flood defences within North Dorset District have been derived from the Environment Agency Spatial Flood Defences dataset. The type of flood defences in the district have been determined from the asset type field. This SFRA has not considered natural defences (i.e. naturally high ground).

6.8.3 Defences in North Dorset District

There are several areas with formal flood defences in North Dorset along the reaches of the River Stour, River Winterborne, River Iwerne.

Blandford Forum

Within Blandford Forum, raised flood defences are set back from the River Stour to protect certain areas from flooding. The location of these defences is displayed in Figure 6-2. Embankments and walls located on either side of the River Stour were built in 1986. The overall condition grade of these defences typically varies between 'Good' and 'Fair'.

The standard of protection afforded by the defences within Blandford Forum is 0.5% AEP (1 in 200-year flood event) to the north of the River Stour, and 1% AEP (1 in 100-year flood event) to the south. A small section of wall adjacent to East Street has a standard of protection of 50% AEP (1 in 2-year flood event) (Figure 6-3).

Environment Agency Flood Zones show Areas Benefitting from Defences (ABDs) in this area, indicating that the defences currently provide protection to some areas in the 1 in 100-year event, although there is a residual risk from defence breach. With climate change, the standard of protection provided is expected to decrease due to increased water levels and more frequent flooding.

[9] Condition Assessment Manual, Environment Agency (2006)

Figure 6-2: Location of defences within Blandford Forum

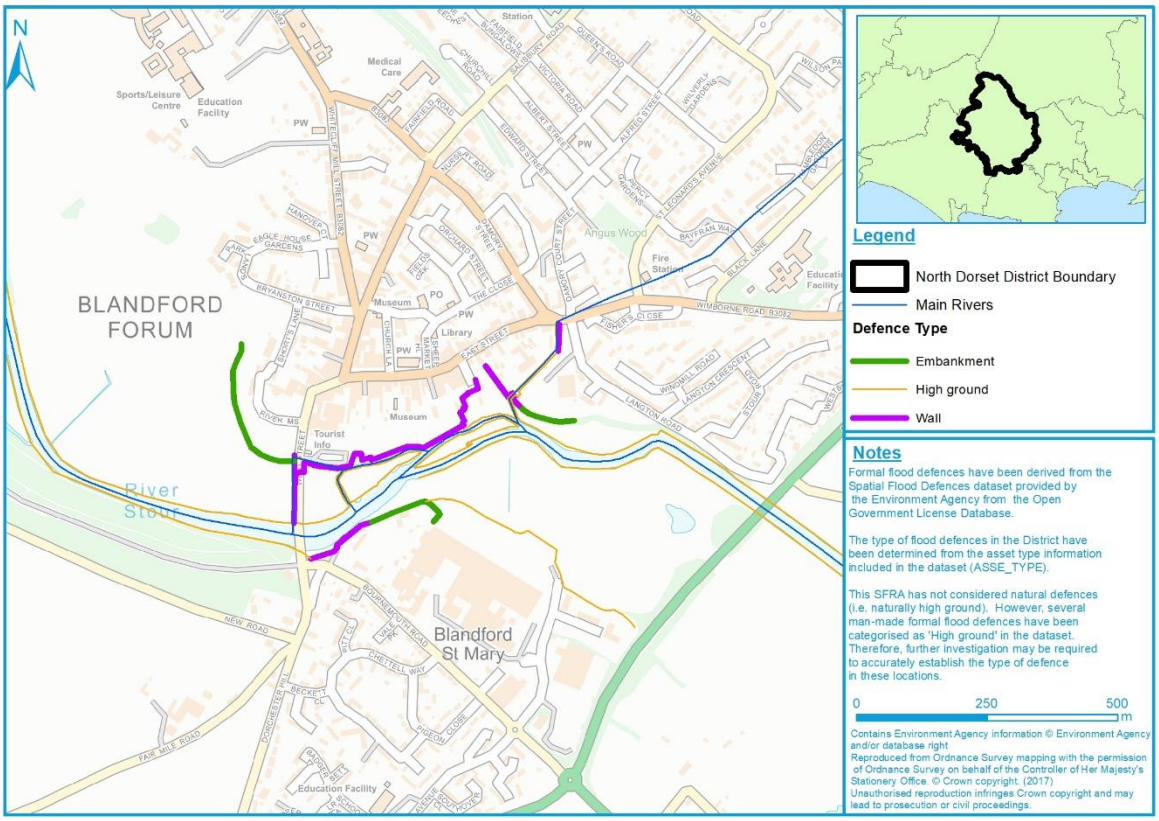
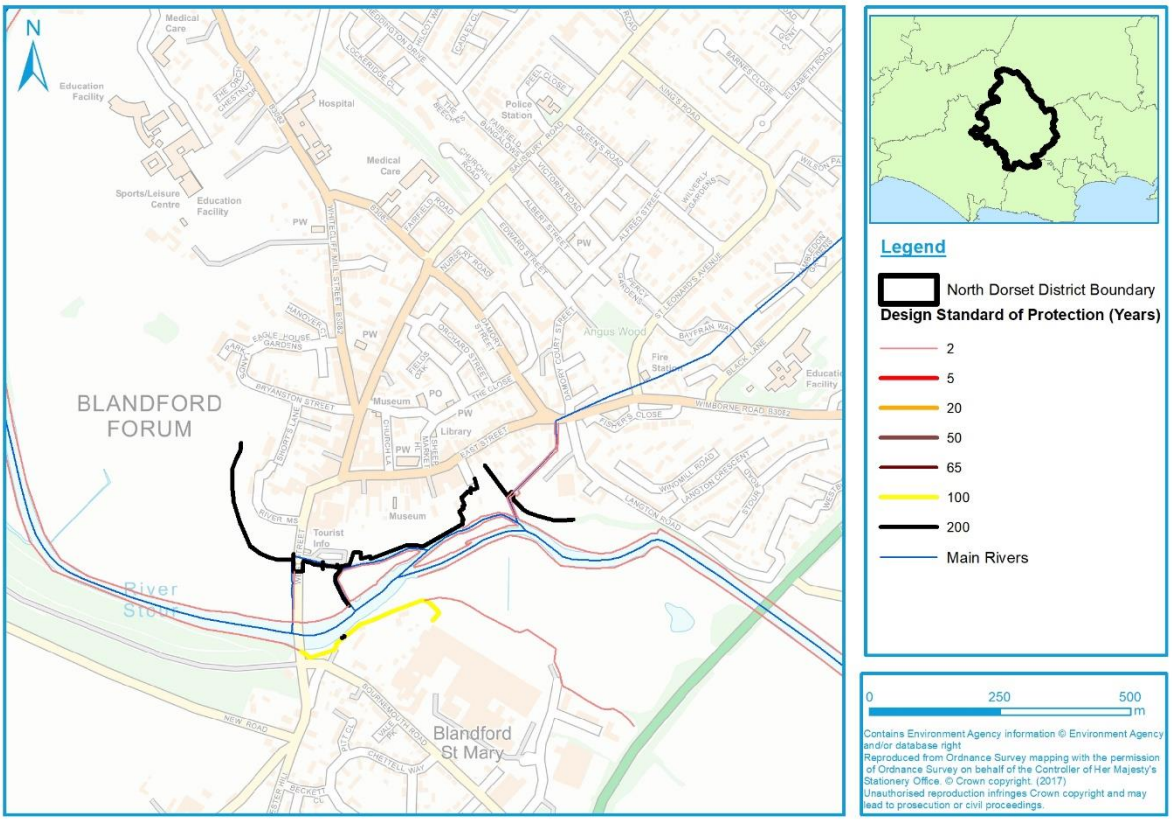


Figure 6-3: Design Standard of Protection for defences within Blandford Forum



Gillingham

Within Gillingham, there are a number of raised flood defences located along the banks of the River Stour and Shreen Water to protect areas from fluvial flooding. The location of these defences is shown in Figure 6-4 and the standard of protection is shown in Figure 6-5. To the east of Barnaby Mead, there are walls on both sides of Shreen Water. The walls were built in 1985 with a standard of protection of 1% (1 in 100-year flood event). The condition of these walls varies between 'Good' and 'Fair'.

A small wall is also located along the south bank of the River Stour, with a 4% AEP (1 in 25-year flood event) standard of protection and a 'Fair' condition rating.

Towards the south of Gillingham, there is an embankment adjacent to Brickyard Lane with a 50% AEP (1 in 2-year flood event) standard of protection and a 'Fair' condition rating.

Environment Agency Flood Zones show an ABD in this area, indicating that the defences currently provide protection to some areas in the 1 in 100-year event, although there is a residual risk from defence breach. With climate change, the standard of protection provided is expected to decrease due to increased water levels and more frequent flooding.

Figure 6-4: Location of defences within Gillingham

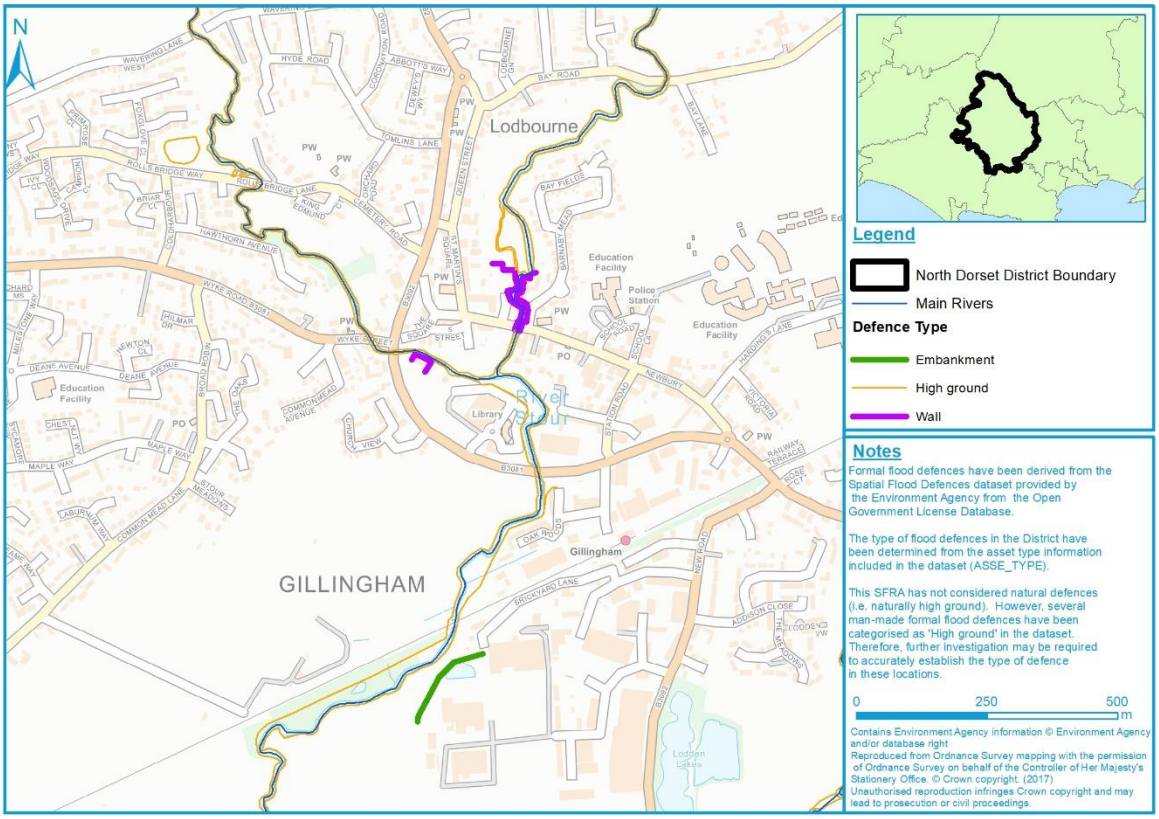
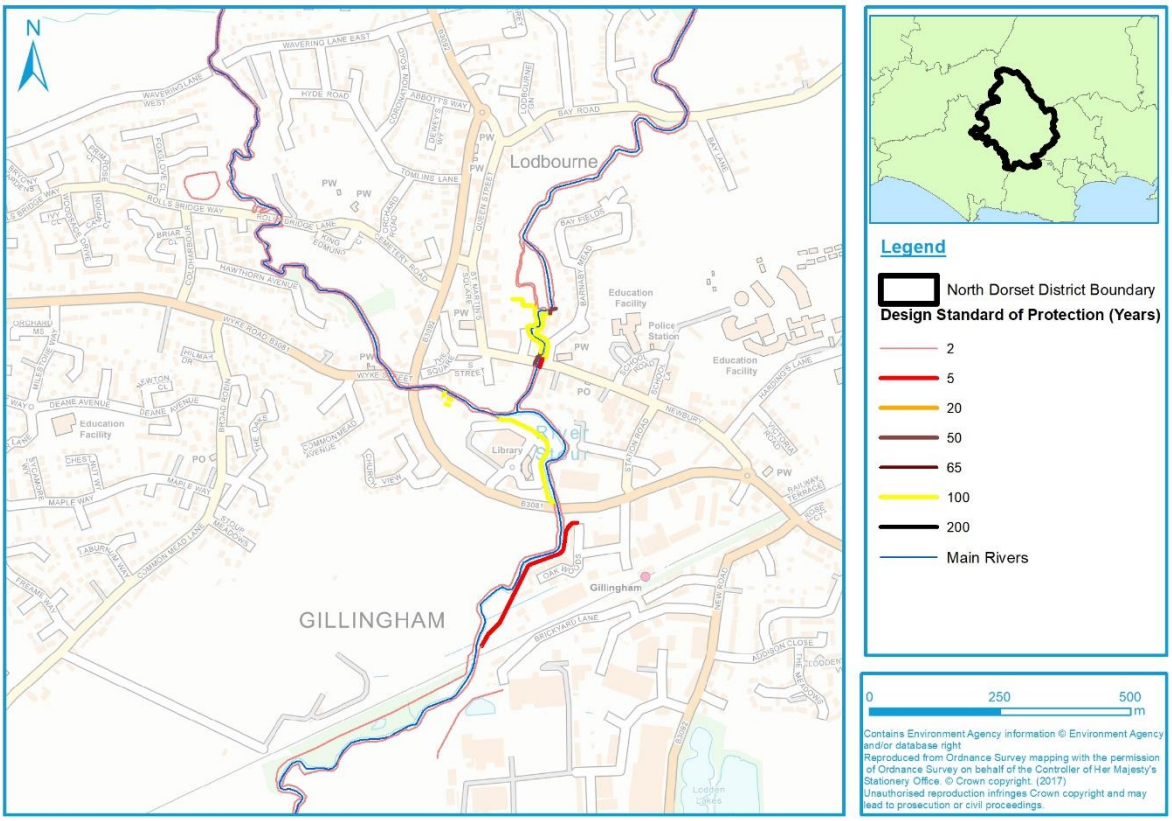


Figure 6-5: Design Standard of Protection for defences within Gillingham



Bourton

Within Bourton, there is a small length of wall adjacent to the River Stour at Bridge Street. This defence has a design standard of 50% AEP (1 in 2-year flood event) and a 'Good' condition rating.

The Environment Agency Flood Zones show no ABDs in the vicinity given the defences do not protect to a design standard of 1% AEP (1 in 100-year flood event). These defences may provide some protection to the surrounding area in smaller events. With climate change, the standard of protection provided is expected to decrease due to increased water levels and more frequent flooding.

Figure 6-6: Location of defences within Bourton

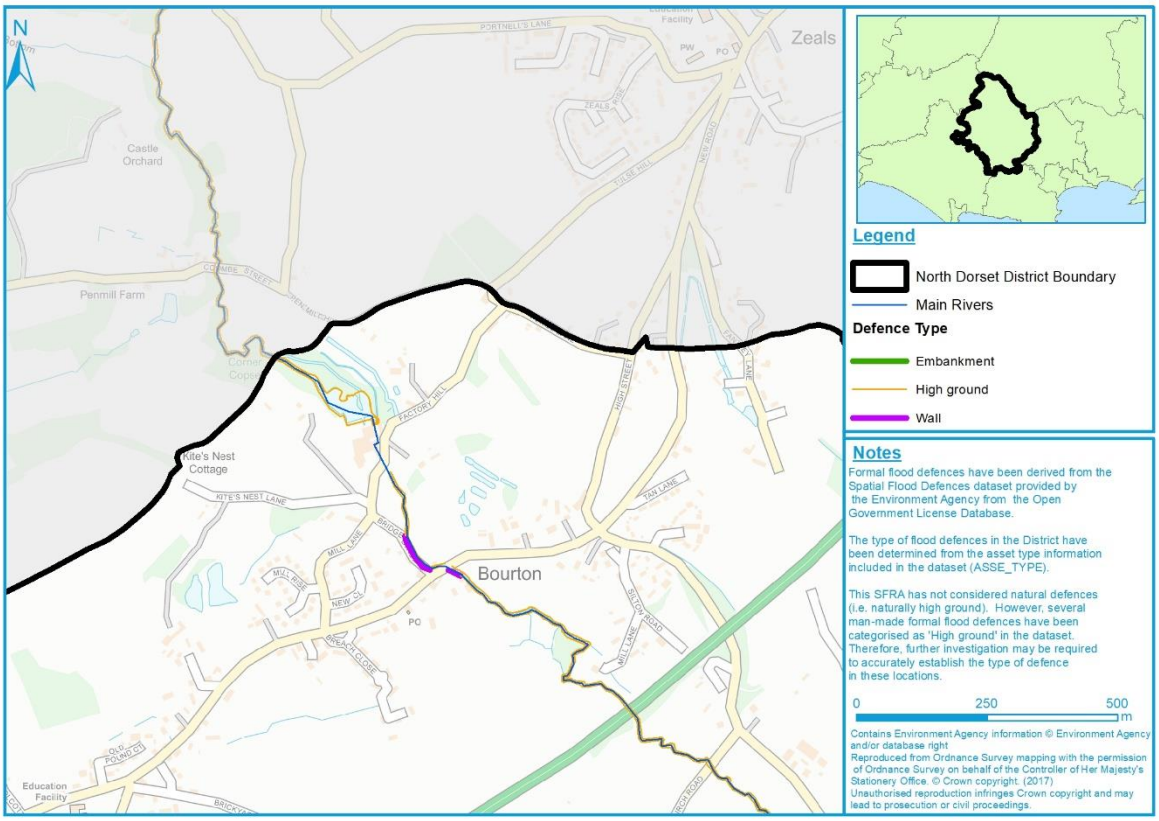
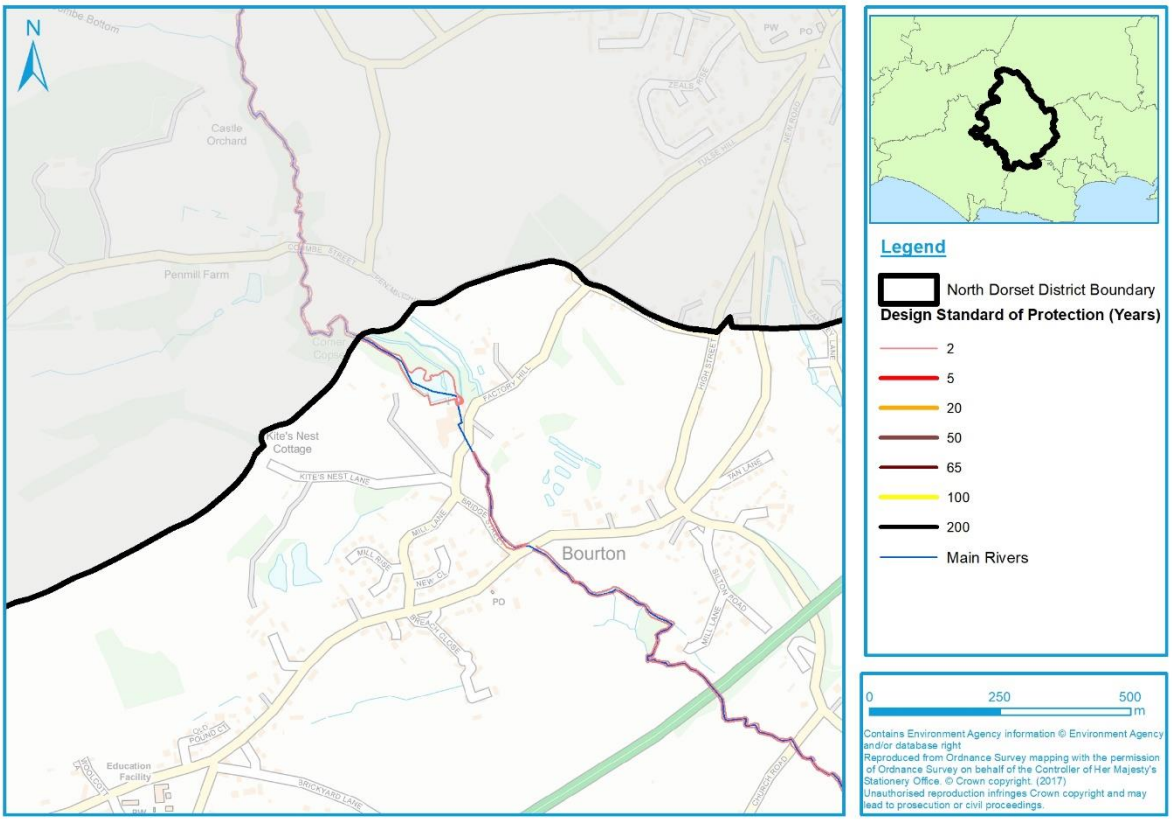


Figure 6-7: Design Standard of Protection for defences within Bourton



Winterborne Kingston

A number of flood defences are located along the south bank of the River Winterborne in Winterborne Kingston. These defences primarily consist of embankments (Figure 6-8) with a design standard of 50% AEP (1 in 2-year event) (Figure 6-9). The embankments have a condition of 'Fair' or 'Poor', meaning that defects are present that can significantly reduce the performance of the defence.

The Environment Agency Flood Zones show no ABDs in the vicinity given the defences do not protect to a design standard of 1% AEP (1 in 100-year flood event). These defences may provide some protection to the surrounding area in smaller events. With climate change, the standard of protection provided is expected to decrease due to increased water levels and more frequent flooding.

Figure 6-8: Location of defences within Winterborne Kingston

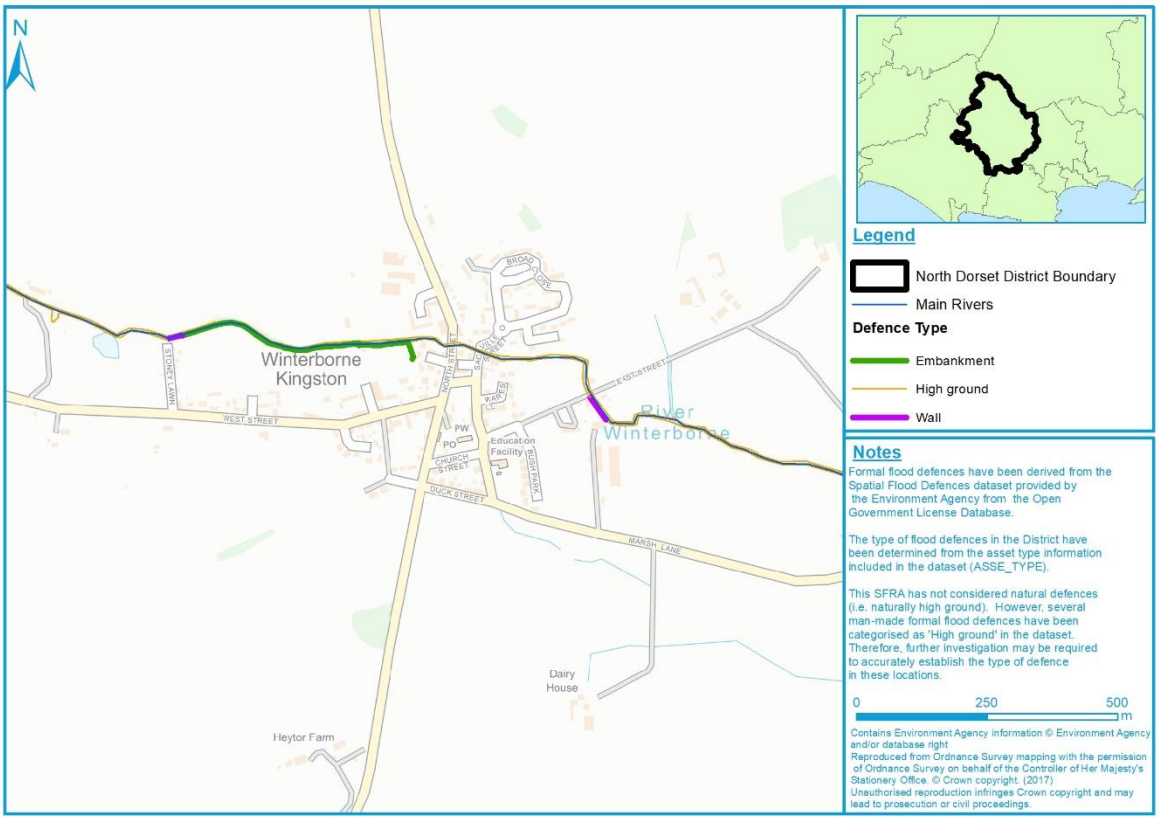
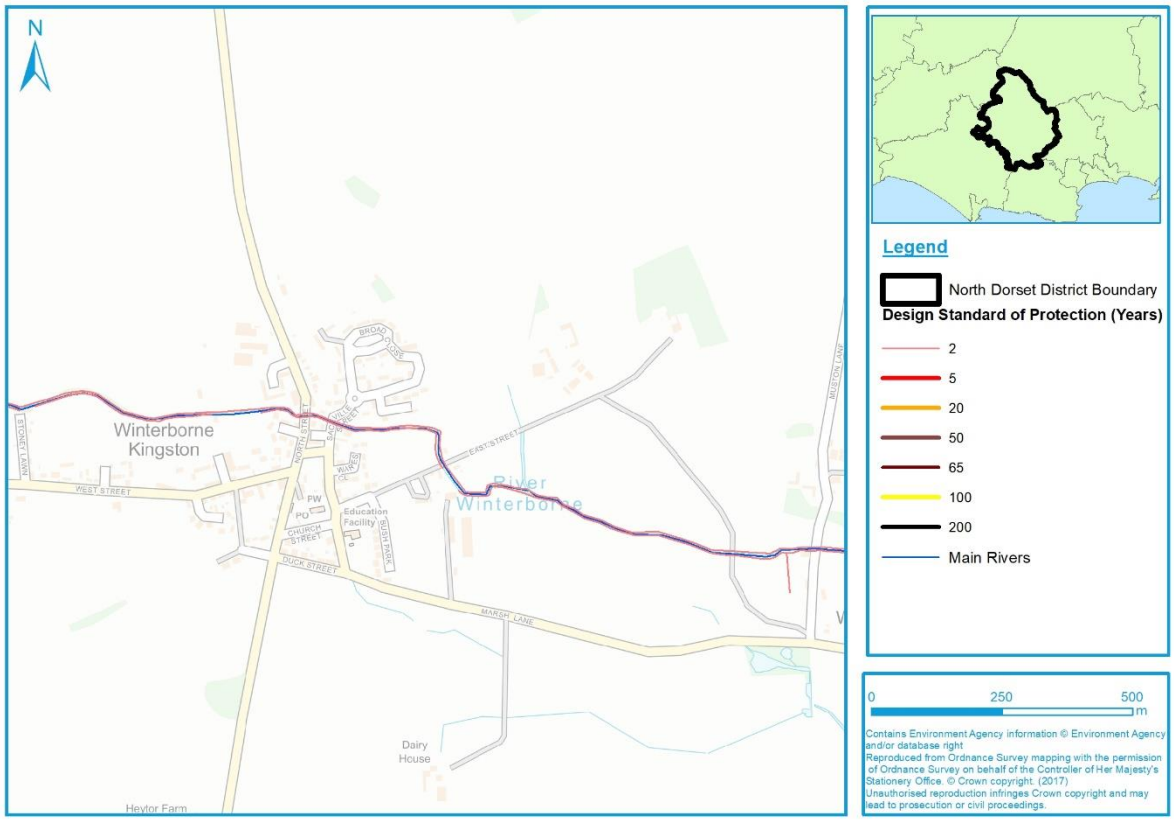


Figure 6-9: Design Standard of Protection for defences within Winterborne Kingston



Stourpaine

There is a small length of embankment located on either side of the River Iwerne just north of Havelins. The design standard is 5% AEP (1 in 20-year flood event) and the embankment has a 'Good' condition.

The Environment Agency Flood Zones show no ABDs in the vicinity given the defences do not protect to a design standard of 1% AEP (1 in 100-year flood event). These defences may provide some protection to the surrounding area in smaller events. With climate change, the standard of protection provided is expected to decrease due to increased water levels and more frequent flooding.

Figure 6-10: Location of defences within Stourpaine

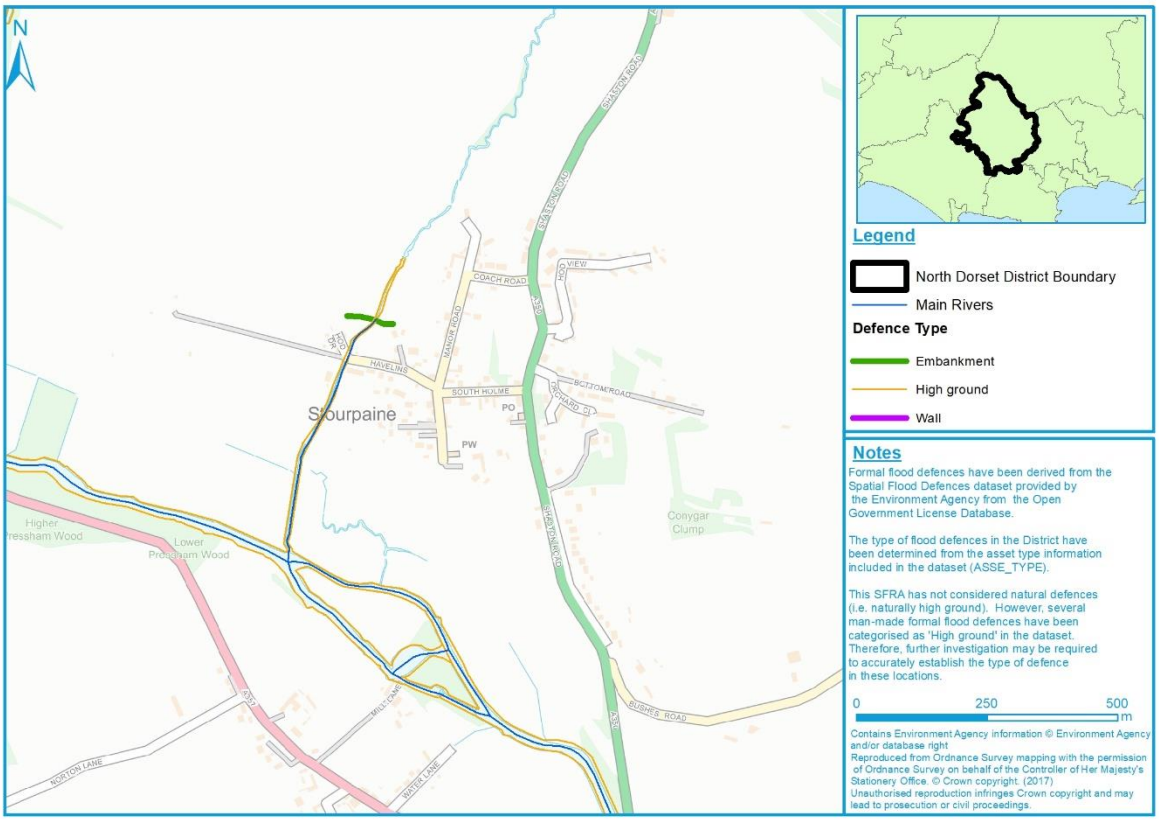
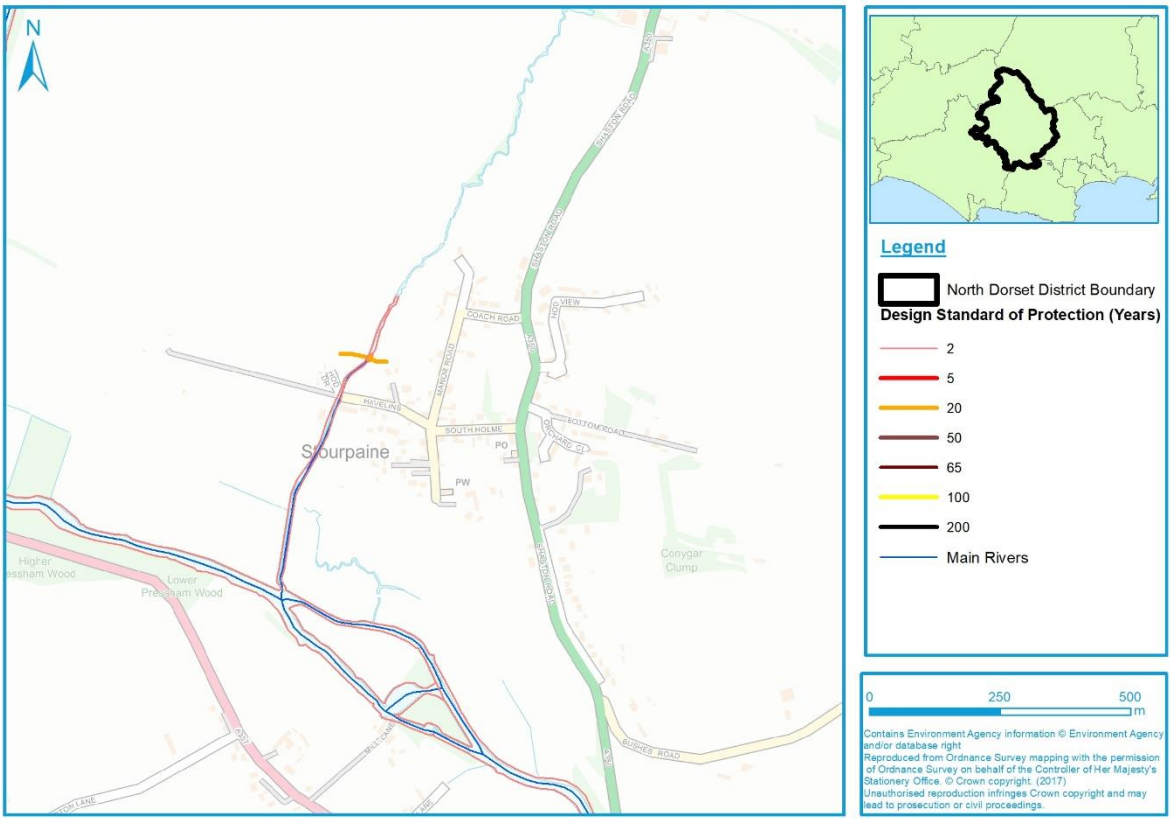


Figure 6-11: Design Standard of Protection for defences within Stourpaine



6.8.4 Other defence works

The Environment Agency's Flood and Coastal Erosion Management (FCERM) capital investment programme outlines how government investment will be managed to reduce risk and coastal erosion in England[10]. The programme lists FCERM projects that are planned to take place across the UK in the six years from April 2015.

In order to reflect the increasing certainty of development, all projects are categorised into one of three stages of FCERM programme:

- Construction programme – includes projects that are already in construction, fully funded projects that are due to start construction in the coming financial year, or projects scheduled to start construction in the coming financial year subject to securing other funding contributions;
- Development programme – includes projects in development with full funding packages agreed and expected to start construction in future year subject to approval of a full business case, or projects in development that are expected to start construction in future years subject to approval of a full business case and securing other funding contributions;
- Pipeline programme – includes projects proposals that are likely to qualify for some government funding before 2021 and have been given an indicative allocation. However, they have not yet identified sufficient contributions and/or do not have a sufficiently well-Developed case to enter the development programme at this stage.

Based on the information published by the EA, there are no FCERM projects within the development programme for North Dorset.

6.9 Flood warning and emergency planning

6.9.1 Emergency planning

Emergency planning is one option to help manage flood related incidents. From a flood risk perspective, emergency planning can be broadly split into three phases: before, during and after a flood. The measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding.

6.9.2 NPPF

In development planning, a number of emergency planning activities are already **integrated** in national building control and planning policies e.g. the NPPF Flood Risk Vulnerability and Flood Zone 'Compatibility' table seeks to avoid inappropriate development in areas at risk from all sources of flooding. However; safety is a key consideration for any new development and includes residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures.

The NPPF Planning Practice Guidance outlines how developers can ensure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test. As part of an FRA, the developer should review the acceptability of the proposed access in consultation with North Dorset District Council (where appropriate) and the Environment Agency.

There are circumstances where a flood warning and evacuation plan[11] is required and / or advised:

- 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) 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.

[10] Environment Agency, (April, 2017), Programme of flood and coastal erosion risk management schemes

[11] Flood warning and evacuation plans may also be referred to as an emergency flood plan or flood response plan.

- The **Environment Agency and DEFRAs standing advice** for undertaking flood risk assessments for planning applications states that details of emergency escape plans will be required for any parts of the building that are below the estimate flood level.

It is recommended that Emergency Planners at North Dorset District Council (where appropriate) are consulted prior to the production of any emergency flood plan.

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

- How to manage the consequences of events that are un-foreseen or for which no warnings can be provided e.g. managing the residual risk of a breach.
- Proposed new development that places additional burden on the existing response capacity of the Councils will not normally be considered to be appropriate.
- Developers should encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.
- The vulnerability of site occupants.
- Situations may arise where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where applicable, a site-specific Flood Risk Assessment to help develop emergency plans.

A number of additional emergency planning resources are available from:

- **2004 Civil Contingencies Act**
- **DEFRA (2014) National Flood Emergency Framework for England**
- **How to register with the Environment Agency's Flood Warnings Direct service**
- **National Flood Forum**
- **GOV.UK Make a Flood Plan guidance and templates**
- **FloodRe**
- **Dorset County Council Community Resilience Plans**

6.9.3 Flood warnings

Flood warnings can be received and, along with evacuation plans, can inform emergency flood plans or flood response plans. The Environment Agency is the lead organisation for providing warnings of fluvial flooding (for watercourses classed as Main Rivers) and coastal flooding in England. Flood Warnings are supplied via the Flood Warning Service to homes and business within Flood Zones 2 and 3 (replacing the Floodline Warnings Directive, FWD, service in April 2017).

Within the district, there are five flood alert areas (FAA) and twenty flood warning areas (FWA). These are shown in Appendix B.

6.10 Cross-boundary considerations

Several major watercourses, including the River Stour and its tributaries, flow through the study area. As the Stour flows south-east through the district, it is joined by several other Main Rivers before flowing through East Dorset and along the administrative borders of Christchurch and Bournemouth.

Similarly, the Bere Stream, which rises in North Dorset, flows in a southern direction along the administrative borders of West Dorset and Purbeck. There are also several small overland surface water flow routes crossing these boundaries.

Any scheme or development which occurs to affect the flow in these areas could also have a significant impact on flood risk in parts of North Dorset. Conversely, schemes or development constructed in North Dorset may have an effect on the surrounding areas of East Dorset, Bournemouth, Christchurch, West Dorset and Purbeck.

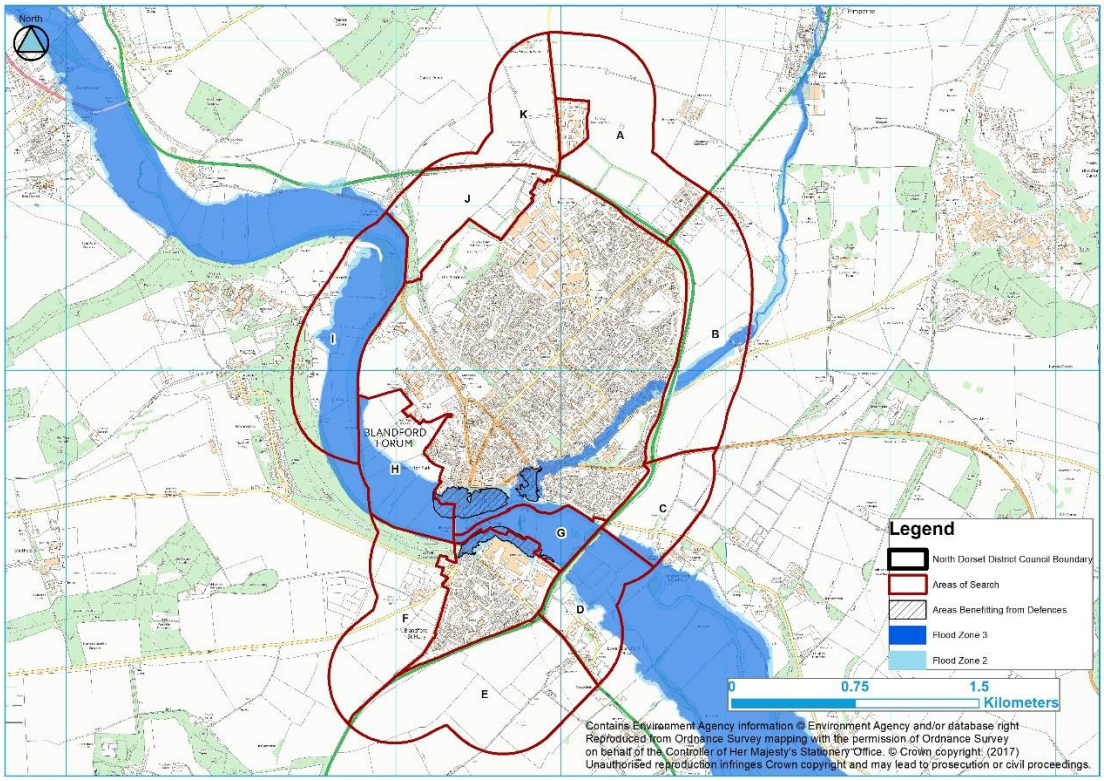
It is noteworthy that the River Stour and Shreen Water originate in Wiltshire, and the River Cale originates in South Somerset. Any development in areas of Wiltshire and South Somerset which

drain towards these watercourses may also have a significant impact on flood risk downstream in areas of North Dorset.

6.11 Summary of flood risk by location

This section summarises the flood risk from all sources at key locations within the study area. A high-level screening of flood zone extent in each of the “areas of search” identified by North Dorset Council, alongside areas of the Gillingham Strategic Site Allocation (SSA) has also been provided in Section 6.12 to help inform the Sequential Test. More detailed mapping of the study area can be found in Appendix A.

Blandford Forum

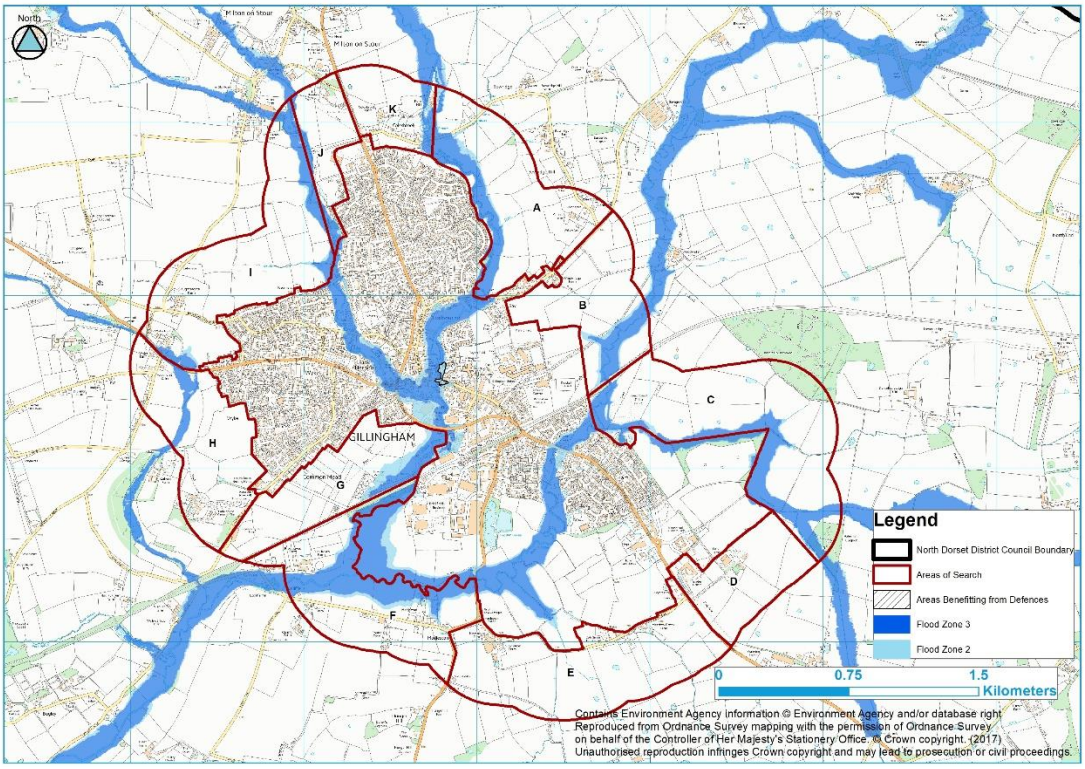


Flood risk summary

Flood history	There are a number of documented flood events in Blandford Forum, from 1966 to present, including several events in Stourpaine. The main sources of flooding are recorded as fluvial, surface water and groundwater, particularly flooding from the River Stour.
Fluvial flood risk	Fluvial flood risk in the north or central parts of Blandford Forum is considered to be low. However, the River Stour runs along the West and South fringes of the town, where it poses a significant fluvial flood risk to the land in its vicinity, with higher than 1% AEP risk of river flooding here. Furthermore, a tributary of the Stour runs through the east of the town exposing areas near this water course to a fluvial flood risk of greater than 1% AEP. The difference in extent between existing Flood Zones 2 and 3 is fairly small indicating limited increase in flood extent as a result of climate change, although there may be an increase in depth and frequency of flooding.
Tidal flood risk	Tidal flood risk in this area is considered to be negligible.
Surface water flood risk	Surface water flood risk is generally low in the 1% AEP event, although there are a number of overland flow routes along dry valleys and roads towards the River Stour, particularly downstream of where the Pimperne Brook enters the culvert near the A354. Some properties in roads off Black Lane are at risk of flooding. In the 0.1% AEP event, flood extents increase and a greater number of properties are at risk.
Groundwater flood risk	The susceptibility to groundwater flooding varies across Blandford Forum. To the north, there is limited potential for groundwater flooding to occur. In the vicinity of the River Stour, there is potential for groundwater flooding to occur at surface.

Blandford Forum	
Other sources of flood risk	Blandford Forum is outside of the maximum flood extent from reservoirs. Historical incidents of sewer flooding provided by Wessex Water indicate that instances of sewer flooding have been recorded in Blandford Forum, including events on Chapel Gardens, Langton Road and Market Place. Sewerage from Blandford Forum drains southwards through Charlton Marshall for treatment at Tarrant Crawford sewage treatment works. There have been sewer flooding issues within the southern extent of the sewer catchment with issues at Spetisbury, Shapwick and Sturminster Marshall. The risk of groundwater inundation of the sewer network leading to flooding in Shapwick and Sturminster Marshall has been reduced by a recent programme of sewer sealing and capacity improvements. Improvements to the sewer system in Spetisbury will be subject to prioritisation and capacity improvement works timed with upstream development.
Strategic flood risk considerations	
Development should be located outside of areas shown to be at current or future risk of flooding where possible. If there is a need to locate development in areas at risk it is likely that a Level 2 SFRA study will be required to provide evidence for the Exception Test. Further investigation into groundwater issues may be required to assist in locating development away from areas at risk. Defences are present in the area along the River Stour and are shown by the Environment Agency's Flood Map for Planning to provide a 1 in 100-year standard of protection to some areas. Regular inspection and maintenance will be required to maintain this standard of protection. In future, this standard of protection is likely to reduce as a result of increased water levels and frequency of flooding due to climate change and upgraded defences may be required. Any flood defence work should be undertaken in accordance with the Catchment Flood Management Plan for the area.	
Potential for use of Sustainable Drainage Systems	
Surface water flood risk is relatively low, but in areas that are at risk development in this area could provide opportunity to reduce this through reduction in impermeable surfaces and use of SuDS. Soil types in this area are variable with some freely-draining areas and some which are naturally wet and may have high groundwater levels. Mapping indicates there is a risk of groundwater emergence in the vicinity of the River Stour. This puts significant constraints on the use of infiltration SuDS in this area. The remainder of the area is largely shown as highly compatible for infiltration SuDS. There is some potential for ground stability geohazards shown throughout this area. The majority of the area is shown to have moderate susceptibility to groundwater contamination with an area of considerable susceptibility to the north east. There is also a Groundwater Source Protection Zone in the north of this area. Measures will need to be implemented to reduce the risk of mobilisation of pollutants and avoid contamination of this source.	

Gillingham

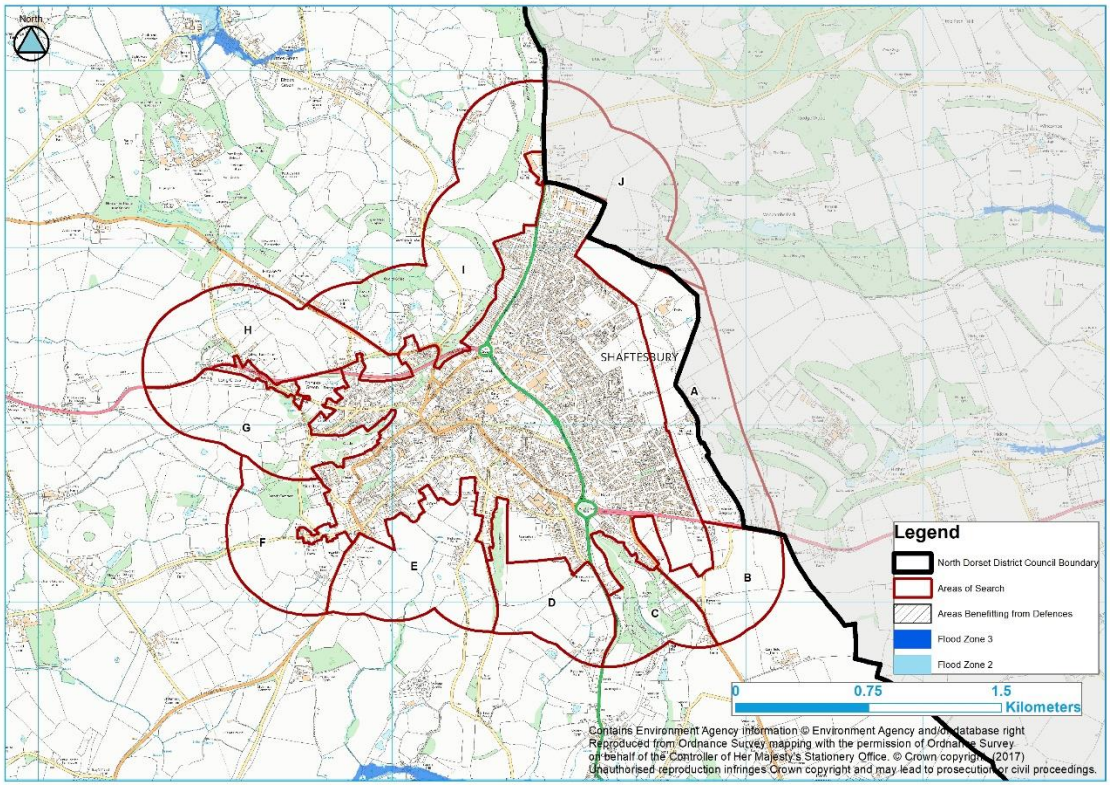


Flood risk summary

Flood history	There are several flood events recorded in Gillingham. These events are noted to have been due to a number of sources, including from overtopping of the River Lodden, Shreen Water and the River Stour.
Fluvial flood risk	The River Stour runs through the centre of Gillingham and poses a significant fluvial flood risk greater than 1% AEP to the land in its vicinity. Additionally the River Lodden poses an equal fluvial flood risk in its vicinity as it passes through the eastern fringe of the settlement. Areas of the town distant from the water courses have a low fluvial flood risk. Between Wavering Lane, Bay Road and the railway line there are several areas where flood extent would be expected to increase with climate change.
Tidal flood risk	Tidal flood risk in this area is considered to be negligible.
Surface water flood risk	The majority of surface water flood risk falls to areas in the vicinity of existing watercourses, notably the River Stour and tributaries (Shreen Water and Lodden Water). Some isolated ponding occurs along roads and open spaces. Additional risk is predominantly defined to roads in the 1% AEP event and above, increasing in the 0.1% AEP event.
Groundwater flood risk	BGS susceptibility data shows that there is potential for groundwater flooding to occur at the surface in the vicinity of the River Stour and other watercourses.
Other sources of flood risk	Within Gillingham, there is a risk of flooding from reservoirs for areas in proximity to the River Stour and Shreen Water. The maximum extent of flooding shown in Environment Agency mapping is similar in extent to the fluvial Flood Zones. Reservoir flooding is considered to be less likely to occur than

Gillingham	
	fluvial flooding, due to the inspection and maintenance regime required by the Reservoirs Act 1975. However, if it were to occur there may be limited warning time and it would be likely to pose a significant hazard. Historical incidents of sewer flooding provided by Wessex Water indicate that many instances of sewer flooding have been recorded in Gillingham, including multiple events on Oake Woods and Black Lawn. A sewer flooding alleviation appraisal for Oake Woods is underway in Wessex Water's flooding programme. No further flooding has been reported at Black Lawn since 2013.
Strategic flood risk considerations	
Development should be located outside of areas shown to be at current or future risk of flooding where possible. If there is a need to locate development in areas at risk it is likely that a Level 2 SFRA study will be required to provide evidence for the Exception Test. Defences are present in the area along the River Stour and Shreen Water are shown by the Environment Agency's Flood Map for Planning to provide a 1 in 100-year standard of protection to some areas. Regular inspection and maintenance will be required to maintain this standard of protection. In future, this standard of protection is likely to reduce as a result of increased water levels and frequency of flooding due to climate change and upgraded defences may be required. Any flood defence work should be undertaken in accordance with the Catchment Flood Management Plan for the area.	
Potential for use of Sustainable Drainage Systems	
There are areas shown to be at risk of surface water flooding and development in this area could provide opportunity to reduce this through reduction in impermeable surfaces and use of SuDS. BGS Infiltration SuDS mapping shows that the majority of the area is likely to be suitable for bespoke infiltration SuDS only. Some areas close to watercourses would have very significant constraints on infiltration SuDS. There is also some potential for ground stability geohazards in this area and the ground contamination susceptibility is shown as moderate.	

Shaftesbury

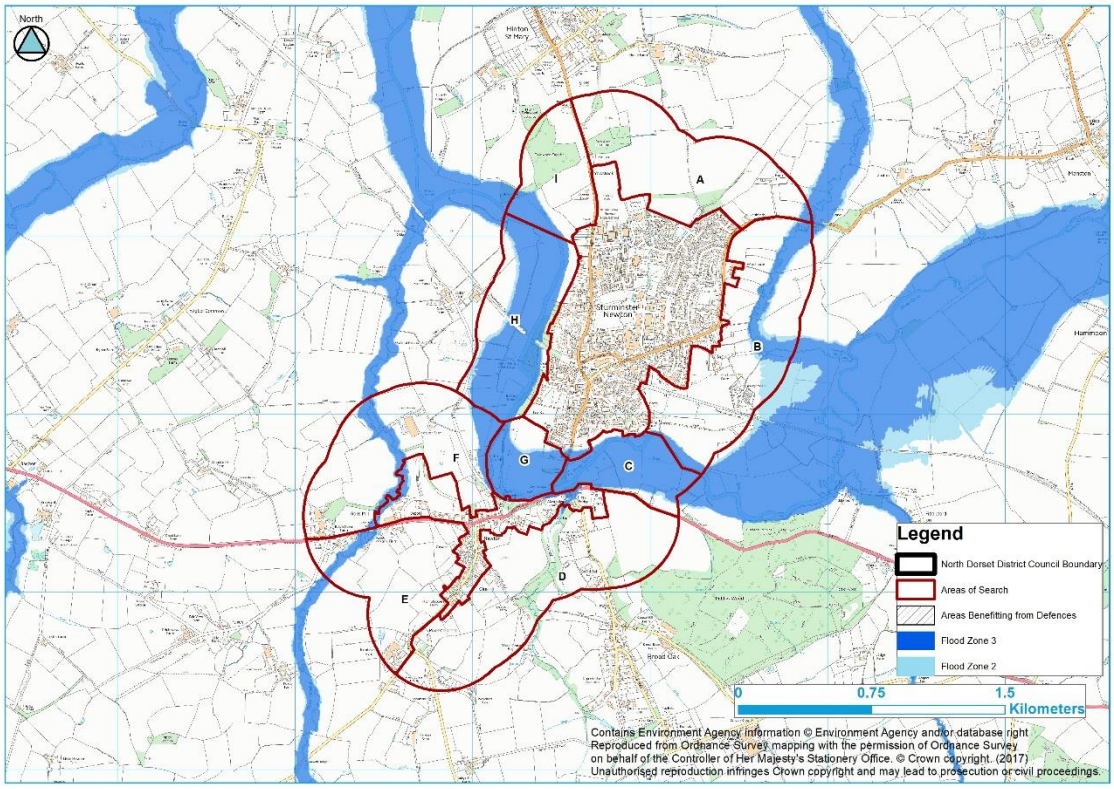


Flood risk summary

Flood history	There are four recorded flood events in Shaftesbury between 1979 and 1994. In 1990 inadequate drainage caused flooding. The Key Brook, Manston Brook and Ham Brook are also noted to have caused flooding in the other events.
Fluvial flood risk	The fluvial flood risk in Shaftesbury is considered to be low. The fluvial flood risk to existing development in Shaftesbury is not expected to significantly increase as a result of climate change, as it is located on high ground. The existing flood zone extents also indicate that watercourses on the outskirts are fairly constrained to narrow corridors meaning that flood extents in these areas are also not expected to increase significantly.
Tidal flood risk	The tidal flood risk in Shaftesbury is considered to be negligible.
Surface water flood risk	Surface water flood risk is largely confined to areas in close proximity of watercourses. A number of overland flow paths develop along dry valleys and roads such as Christy's Lane, St Georges Road, Fair Lane and Angel Lane in the 1% AEP event. In the 0.1% AEP event there is an increase in overland flow routes, and ponding occurs near to Indus Road.
Groundwater flood risk	The majority of Shaftesbury is shown to have limited potential for groundwater flooding to occur. There is potential for groundwater flooding of property situated below ground level and at the surface on the western edge of Shaftesbury, towards Enmore Green and other low-lying areas.

Shaftesbury	
Other sources of flood risk	Shaftesbury is outside of the maximum flood extent from reservoirs. Historical incidents of sewer flooding provided by Wessex Water indicate that several instances of sewer flooding have been recorded in Shaftesbury, including on Bleke Street, Butts Knapp and Long Cross. The 5 recorded incidents were all reported before 2014.
Strategic flood risk considerations	
Whilst the majority of Shaftesbury is located in Flood Zone 1, developments greater than 1 hectare located in Flood Zone 1 will still require a site-specific Flood Risk Assessment. The flood risk from all sources should also be assessed and mitigated. Development should also be located outside of any areas shown to be at current or future risk of flooding where possible.	
Potential for use of Sustainable Drainage Systems	
Surface water flood risk is relatively low, but in areas that are at risk development in this area could provide opportunity to reduce this through reduction in impermeable surfaces and use of SuDS. The majority of Shaftesbury is highly compatible for infiltration SuDS due to the relative permeability of soils and low risk of groundwater flooding. SuDS opportunities are reduced in areas with seasonally wet soils and impeded drainage, such as to the west of Shaftesbury and other low-lying areas. Mapping shows that there is potential for ground stability geohazards which would need to be investigated further. In western parts of Shaftesbury low susceptibility to ground contamination is shown, whilst other areas show moderate to considerable susceptibility. There is a Groundwater Source Protection Zone in this area. Measures will need to be implemented to reduce the risk of mobilisation of pollutants and avoid contamination of this source.	

Sturminster Newton

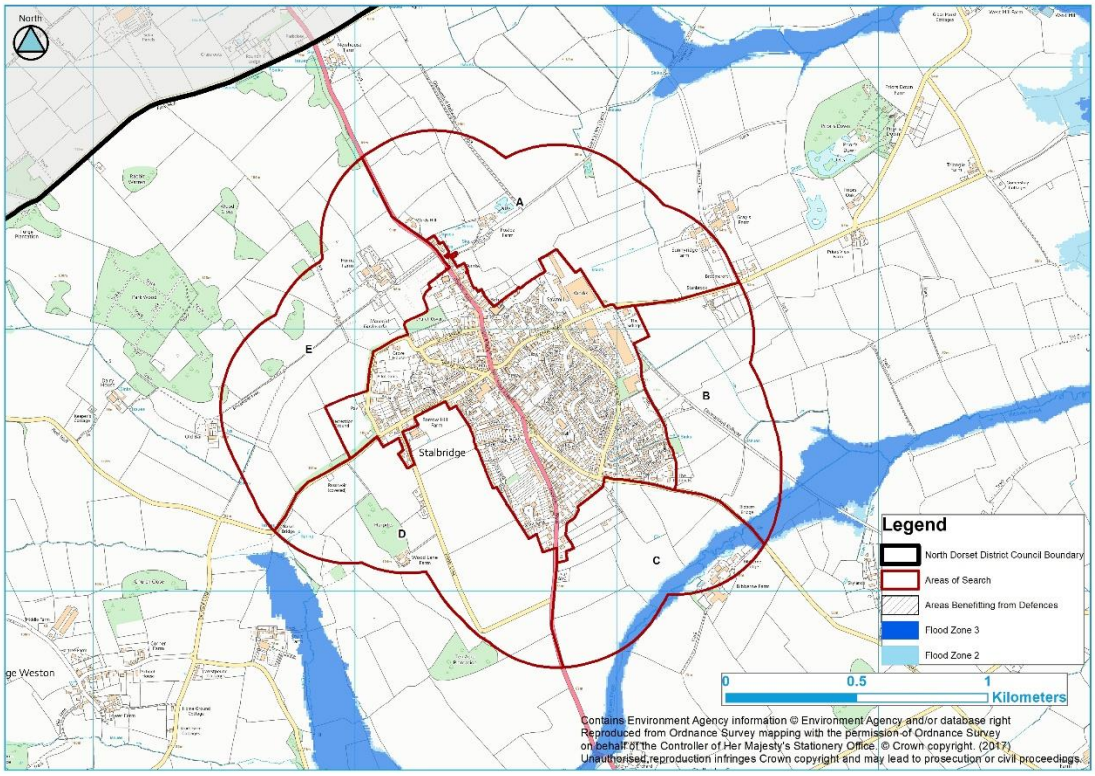


Flood risk summary

Flood history	There are a number of documented flood events in Sturminster Newton. The main sources of flooding are recorded as fluvial and surface water, including overtopping of the River Stour.
Fluvial flood risk	The River Stour surrounds the town of Sturminster Newton to the East, West and South. Here it poses a significant widespread flood risk of greater than 1% AEP for river flooding. However, the central and northern parts of the town where the majority of the properties are located has a low fluvial flood risk. With climate change there is potential for significant increases in flood extent near the confluence of Chivrick's Brook and the River Stour.
Tidal flood risk	The tidal flood risk in Sturminster Newton is negligible.
Surface water flood risk	The majority of surface water flood risk occurs in the vicinity of existing watercourses. There is one main overland flow route through the centre of the town towards a tributary of the River Stour, presenting a risk to properties in larger events.
Groundwater flood risk	A large area of Sturminster Newton is susceptible to groundwater flooding of property below ground level and/or at the surface. These areas are typically in the vicinity of the River Stour and other watercourses.
Other sources of flood risk	Sturminster Newton is outside of the maximum flood extent from reservoirs. There is a risk of flooding to the north of Sturminster Newton in the vicinity of the River Stour. Historical incidents of sewer flooding provided by Wessex Water indicate that instances of sewer flooding have been

Sturminster Newton	
	recorded in Sturminster Newton, including events on Penny Street and Musbury Lane.
Strategic flood risk considerations	
Development should be located outside of areas shown to be at current or future risk of flooding where possible. If there is a need to locate development in areas at risk it is likely that a Level 2 SFRA study will be required to provide evidence for the Exception Test. Further investigation into groundwater issues may be required to assist in locating development away from areas at risk.	
Potential for use of Sustainable Drainage Systems	
There are areas shown to be at risk of surface water flooding and development in this area could provide opportunity to reduce this through reduction in impermeable surfaces and use of SuDS. Opportunities for the use of infiltration SuDS vary throughout Sturminster Newton. There are very significant constraints on the use of infiltration SuDS where there are risks of groundwater emergence, i.e. in the eastern part of the town, including Lower Rixon and the industrial estate; on the western and eastern outskirts of the town, in proximity to the River Stour and tributaries. However, there are opportunities for the use of SuDS in the majority of the town, where there is limited potential for groundwater flooding, such as Rixon, which is shown as probably compatible for infiltration SuDS. There are opportunities for bespoke infiltration SuDS in other areas. There is potential for ground stability geohazards in some locations. Mapping shows moderate susceptibility to ground contamination throughout this area.	

Stalbridge



Flood risk summary

Flood history	There are three recorded flood events in Stalbridge. In February 2017, there was a recorded flood event caused by fluvial, groundwater and surface water sources. Bibbern Brook is noted to have caused flooding in 1979.
Fluvial flood risk	The fluvial flood risk at Stalbridge is low. The closest area at risk of fluvial flooding is to the south of the settlement, where Bibbern Brook passes, but is distant from any properties. Based on the assumption that future Flood Zone 3 has a similar extent to current Flood Zone 2, there is not expected to be a significant increase in flood extent in future.
Tidal flood risk	The tidal flood risk at Stalbridge is negligible.
Surface water flood risk	Surface water flood risk is greatest in the vicinity of existing watercourses, notably the Bibbern Brook and its tributaries just south of Stalbridge. Isolated pooling on roads and in gardens and open spaces occurs in the 1% AEP event. In the 0.1% AEP event, overland flow route present to the watercourses, including Station Road and Jarvis Way, but these are not just isolated to roads meaning some properties may be at risk.
Groundwater flood risk	The potential for groundwater emergence is shown to be low in large parts of this area. Towards the north, near Church Hill and Duck Lane, there is the potential for groundwater flooding to occur at the surface. There is limited potential for groundwater flooding to occur in the remainder of the western part of Stalbridge.
Other sources of flood risk	Stalbridge is outside of the maximum flood extent from reservoirs.

Stalbridge	
	Records of sewer flooding since 2004 have been provided by Wessex Water and no sewer flood incidents were recorded in Stalbridge in this data.
Strategic flood risk considerations	
Whilst the majority of Stalbridge is located in Flood Zone 1, developments greater than 1 hectare located in Flood Zone 1 will still require a site-specific Flood Risk Assessment. The flood risk from all sources should also be assessed and mitigated. Development should also be located outside of any areas shown to be at current or future risk of flooding where possible.	
Potential for use of Sustainable Drainage Systems	
Surface water flood risk is relatively low, but in areas that are at risk development in this area could provide opportunity to reduce this through reduction in impermeable surfaces and use of SuDS. Soil mapping shows a mixture of both seasonally wet and freely draining ground conditions in the area. The western half of Stalbridge is highly compatible for infiltration SuDS, where there is limited potential for groundwater emergence. Very significant constraints are shown in some areas such as on Church Hill. Mapping shows that there are opportunities for bespoke infiltration SuDS only in the eastern half of Stalbridge. There is a potential for ground stability geohazards shown throughout this area and moderate susceptibility to ground contamination hazards.	

6.12 High level screening of “areas of search”

A high level screening has been undertaken for the “areas of search” identified in the Local Plan as well as for the existing Gillingham Strategic Site Allocation (SSA). This is summarised in Table 6-3. For this assessment the percentage coverage in each area of the following flood risk data has been included to assist in the Sequential Test process:

- **Flood Zone 2 and 3** (see Section 3.1.1)
- **Watercourses** (see Section 6.2.3) – expressed as a “Y/N” value indicating the presence or absence of a watercourse rather than a percentage coverage
- **Climate change buffer** (see Section 4.8.1)
- **1 in 30-year, 1 in 100-year and 1 in 1,000-year surface water flood extent** (see Section 3.1.2) – note that, unlike the Flood Zones, these are expressed as the percentage coverage in each event and include the area covered by more frequent events (for example, the 1 in 100-year extent includes areas also covered by the 1 in 30-year extent)
- **BGS groundwater susceptibility data (areas with potential for groundwater flooding below ground and at the surface)** (see Section 5.2.3)

It is important to note that this screening is for “areas of search” which cover a wide area and are likely to encompass a number of development sites. Sequential Testing will still be required for the individual development sites in accordance with the National Planning Policy Framework (NPPF).

Table 6-3: High level screening of Flood Zones in the “areas of search” and Gillingham Strategic Site Allocation

Area	Current FZ 3 coverage	Current FZ2 coverage	Watercourse present?	Climate change buffer coverage	1 in 30-year surface water extent	1 in 100-year surface water extent	1 in 1,000-year surface water extent	Area with potential for groundwater flooding of property below ground	Area with potential for groundwater flooding to occur at the surface
Gillingham SSA - Land to the East of Ham	8%	2%	Y	17%	7%	9%	16%	15%	38%
Gillingham SSA - Land to the South of Ham	12%	2%	Y	29%	12%	15%	23%	17%	39%
Gillingham SSA - Land to the East of Lodden Lakes	32%	4%	Y	50%	23%	28%	36%	1%	45%
Gillingham SSA - Land to the South of Brickfields	42%	9%	Y	66%	25%	33%	47%	0%	46%
Blandford Forum A	0%	0%	N	0%	0%	0%	0%	0%	0%
Blandford Forum B	6%	2%	Y	12%	0%	3%	10%	12%	10%
Blandford Forum C	6%	1%	Y	13%	0%	1%	4%	14%	30%
Blandford Forum D	48%	3%	Y	62%	1%	4%	10%	1%	99%
Blandford Forum E	0%	0%	N	0%	0%	0%	1%	10%	2%
Blandford Forum F	1%	0%	Y	2%	0%	0%	3%	15%	6%
Blandford Forum G	96%	2%	Y	100%	9%	18%	35%	0%	100%
Blandford Forum H	57%	3%	Y	65%	1%	4%	19%	1%	98%
Blandford Forum I	66%	4%	Y	77%	0%	2%	26%	7%	83%
Blandford Forum J	1%	1%	Y	3%	0%	0%	1%	1%	3%
Blandford Forum K	0%	0%	N	0%	0%	0%	1%	0%	0%

Area	Current FZ 3 coverage	Current FZ2 coverage	Watercourse present?	Climate change buffer coverage	1 in 30-year surface water extent	1 in 100-year surface water extent	1 in 1,000-year surface water extent	Area with potential for groundwater flooding of property below ground	Area with potential for groundwater flooding to occur at the surface
Gillingham A	17%	3%	Y	29%	14%	19%	26%	7%	26%
Gillingham B	11%	4%	Y	28%	11%	14%	27%	17%	17%
Gillingham C	19%	2%	Y	34%	15%	20%	27%	13%	33%
Gillingham D	0%	0%	Y	1%	1%	1%	5%	2%	18%
Gillingham E	0%	0%	Y	19%	5%	8%	18%	21%	17%
Gillingham F	27%	4%	Y	46%	21%	25%	35%	2%	24%
Gillingham G	9%	6%	Y	25%	5%	8%	18%	4%	43%
Gillingham H	6%	0%	Y	16%	1%	2%	7%	8%	0%
Gillingham I	10%	2%	Y	21%	4%	7%	15%	15%	29%
Gillingham J	12%	1%	Y	27%	5%	7%	14%	0%	12%
Gillingham K	9%	2%	Y	18%	6%	10%	17%	0%	10%
Shaftesbury A	0%	0%	N	0%	1%	2%	6%	0%	0%
Shaftesbury B	0%	0%	N	0%	0%	0%	2%	0%	0%
Shaftesbury C	0%	0%	Y	7%	4%	5%	9%	2%	0%
Shaftesbury D	0%	0%	Y	4%	0%	1%	3%	7%	3%
Shaftesbury E	0%	0%	Y	8%	1%	2%	6%	11%	16%
Shaftesbury F	0%	0%	Y	4%	0%	1%	10%	25%	14%
Shaftesbury G	0%	0%	Y	3%	1%	1%	5%	17%	5%
Shaftesbury H	0%	0%	Y	8%	2%	4%	15%	18%	19%
Shaftesbury I	0%	0%	Y	5%	1%	3%	11%	8%	10%

Area	Current FZ 3 coverage	Current FZ2 coverage	Watercourse present?	Climate change buffer coverage	1 in 30-year surface water extent	1 in 100-year surface water extent	1 in 1,000-year surface water extent	Area with potential for groundwater flooding of property below ground	Area with potential for groundwater flooding to occur at the surface
Shaftesbury J	0%	0%	N	0%	0%	0%	2%	0%	0%
Stalbridge A	0%	0%	Y	5%	1%	2%	16%	3%	31%
Stalbridge B	3%	0%	Y	21%	3%	5%	23%	0%	5%
Stalbridge C	11%	2%	Y	22%	11%	14%	21%	4%	20%
Stalbridge D	0%	0%	Y	1%	0%	0%	1%	0%	0%
Stalbridge E	0%	0%	Y	3%	0%	1%	15%	0%	0%
Sturminster Newton A	1%	0%	Y	2%	1%	3%	9%	6%	29%
Sturminster Newton B	15%	7%	Y	33%	4%	7%	17%	20%	58%
Sturminster Newton C	84%	3%	Y	92%	13%	26%	63%	0%	90%
Sturminster Newton D	0%	0%	Y	6%	2%	3%	5%	4%	12%
Sturminster Newton E	5%	1%	Y	8%	3%	6%	11%	1%	19%
Sturminster Newton F	13%	2%	Y	19%	7%	11%	17%	8%	18%
Sturminster Newton G	77%	3%	Y	84%	13%	15%	52%	9%	79%
Sturminster Newton H	69%	4%	Y	82%	9%	22%	49%	21%	65%
Sturminster Newton I	14%	1%	Y	18%	1%	9%	13%	7%	14%

7 FRA requirements and flood risk management guidance

7.1 Over-arching principles

This SFRA focuses on delivering a strategic assessment of flood risk within North Dorset District. 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 with a particular flood vulnerability or even at all. Where the FRA shows that a site is not appropriate for a particular usage, proposed development with a lower vulnerability classification may be appropriate.

Flood Mapping included in this SFRA is a useful starting point when assessing flood risk to a proposed development and an assessment of flood risk at the site should demonstrate that this information has been considered. Where more recent or detailed information has been made available since the completion of this SFRA (e.g. updates to the Environment Agency's Flood Map for Planning), this should also be included. "Climate change sensitivity" mapping included in Appendix E should also be used to identify areas where additional evidence will be required demonstrating that the anticipated effects of climate change on fluvial flood risk have been considered, as detailed in Section 4.8.

7.2 Requirements for site-specific flood risk assessments

7.2.1 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 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.

Paragraph 068 of the NPPG Flood Risk and Coastal Change Planning Practice Guidance sets out a checklist for developers to assist with site specific flood risk assessments.

Site specific FRAs are required in the following circumstances:

- 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)
- Proposals of 1 hectare or greater in Flood Zone 1
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding
- Proposals of less than one hectare in Flood Zone 1 where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water)

7.2.2 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; and
- whether, if applicable, the development will be safe and pass the Exception Test.

FRAs for sites located in North Dorset should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and North Dorset District Council. 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); and
- **Site-specific Flood Risk Assessment: CHECKLIST** (NPPF PPG, 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.** In circumstances where an FRA is prepared for land that has not been allocated (windfall site) the assessment should include evidence that can be used to support an assessment that the application site proposals satisfy the requirements of the Sequential and Exception Tests. All FRA's for windfall sites should contain evidence that the extent of Flood Zones is correctly identified and that the anticipated effects of climate change on flood risk to the site have been assessed, particularly in circumstances where the sites contain smaller scale watercourses that would not have been mapped when collating national data.

7.3 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.

7.3.1 Site layout and design

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

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from areas at greatest risk of flooding, 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.

7.3.2 **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 high quality green and blue infrastructure.

The provision of a buffer strip can 'make space for water', allow additional capacity to accommodate climate change and ensure access to the watercourse and structures 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.

North Dorset District Council can use Section 106 agreements of the Town and Country Planning Act 1990 for planning the management of flood risk; in line with the 'Making Space for Water' concept, Section 106 agreements can be put in place to ensure new SuDS features will be maintained in the future. Regular maintenance is crucial to allow SuDS features to continue to perform as designed throughout their lifetime. A lack of maintenance is likely to result in a reduction in performance and an increase in flood risk.

Catchment and floodplain restoration

Floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

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

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

7.3.3 Raised floor levels

The raising of internal floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood.

The Environment Agency has developed a new fluvial freeboard guide SC120014/S[12] to replace the Fluvial Freeboard Guidance Note (report W187) published in 2000, incorporating advanced models, tools and methods, and reflecting the shift from flood defence to flood risk management. The guide is written to allow flood risk management authorities, developers and engineering consultants to identify and manage the uncertainty in their flood risk assessments and flood defence designs.

The guide methodology shifts from adding freeboard values to design defence crest levels, towards considering a range of possible management responses, and can be applied to all sources of flood risk rather than just fluvial sources.

The new guide should be used when:

- Planning a new development
- Appraising and designing a new flood scheme
- Assessing the standard of protection of an existing flood defence

The new guide addresses issues with the old guide to ensure:

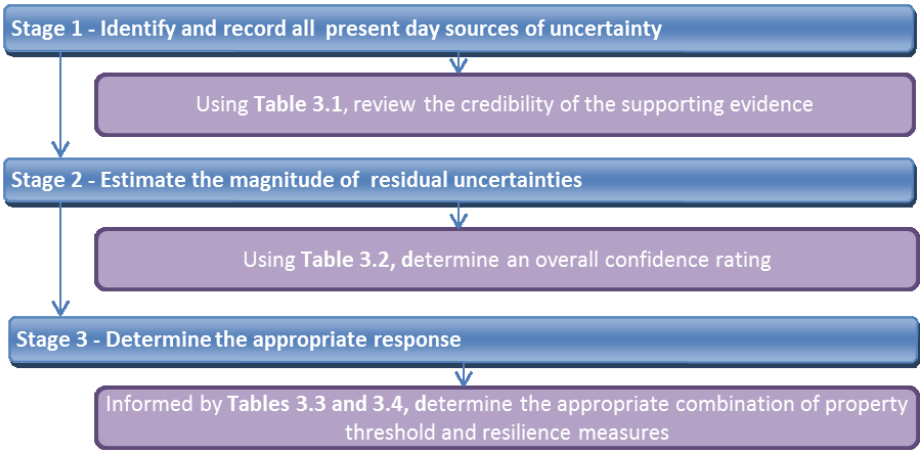
- There is a structured method for identifying uncertainties
- Factors of safety used in the design process are not duplicated

[12] Environment Agency, 2017. *Accounting for residual uncertainty: updating the freeboard guide. Report SC120014.*

- When managing uncertainty, users account for all appropriate actions across the source, pathway and receptor
- Uncertainties are identified, managed and tracked as a project moves towards design and delivery
- There is a hierarchy of methods to keep management of uncertainty proportional to the decision

There are 3 principal stages for the assessment as detailed in Figure 7-1.

Figure 7-1: Approach for development planning (Figure 3.1 of SC120014)



Using the guidance document, users should first identify and record all primary sources of uncertainty as listed in Table 3.1 of SC120014 (Figure 7-1). Stage 2 involves assigning an uncertainty score between 1 (highly likely to be locally reliable) and 10 (very unlikely to be locally reliable) to each source of uncertainty identified in Stage 1. For Stage 3, a confidence rating is then assigned based on the 2 highest scores identified from Stage 2 (Table 7-3). This is used to inform a recommended residual uncertainty allowance (Table 7-4). Case study examples are provided in the guidance document to show how to apply each stage in practice.

Table 7-2: Considerations for identifying primary sources of uncertainties in development planning (Table 3.1 of SC120014)

Consideration	Description
How appropriate is the flood risk analysis?	Does it contain the important local features such as culverts or de facto defences (that is, structures acting as but not designed as defences)? Is the analysis up-to-date? For example, does it incorporate local land use change or a new flood wall? The age of the analysis can be a factor.
How well is the floodplain modelled?	The type and resolution of the floodplain topography data are important as the floodplain could have important pathways or features such as drainage channels and road embankments which need to be resolvable. Examples of topographic survey include: synthetic aperture radar (SAR), light detection and ranging (LIDAR) and fast laser imaging mapping and profiling (FLI-MAP). Each survey and survey technique will have a different resolution. Selecting the right resolution is important.
How well has the potential for defence failure been modelled?	If flood defences or assets influence residual water levels at the site, the number and type of breaches will affect the confidence in the flood risk analysis. See Box 3.1 for exceptions when credible failures might not be considered.
What is the confidence in the hydrology?	This is the basis for deriving inflows for fluvial, surface run-off or groundwater sources (for example, length of records). Has a considered approach to the use of data and hydrological analysis been followed?

Consideration	Description
How good are the coastal/ estuarine/ tidal boundaries?	The boundaries form the basis for deriving nearshore conditions such as waves and sea level. Has a considered approach to the use to the selection of the boundary conditions been followed?
How have the fluvial threats been represented?	Assess the appropriateness of the modelling technique.
How have coastal threats been represented?	Assess the detail of wave overtopping and tidal inundation in comparison to the complexity of the site.
How has surface run-off been represented?	Assess the detail of the modelling in comparison to the complexity of the site.
How have groundwater hazards been represented?	Assess the detail of the modelling in comparison to the complexity of the site. Local policy may indicate when analysis is required.
What is the strength of the evidence?	How strongly does the evidence support/ validate flooding representation (for example, calibration of modelling against observed events)?

Table 7-3: Scoring matrix to derive confidence rating (from Table 3.3 of SC120014)

		Worst consideration 1 score				
		10	5	3	2	1
Worst Consideration 2 score	10	1 star			2 star	3 star
	5	1 star		2 star	3 star	4 star
	3	1 star	2 star	3 star	4 star	
	2	2 star	3 star	4 star		5 star
	1	3 star	4 star		5 star	

Table 7-4: Residual uncertainty allowance for development planning (from Table 3.4 of SC120014)

Confidence rating	Confidence description	Proportion of design flood depth [1]	Minimum depth (mm)
1 star	Very unlikely to be locally reliable	40%	900
2 star	Unlikely to be locally reliable	30%	750
3 star	Likely to be locally reliable	20%	600
4 star	Very likely to be locally reliable	10%	450
5 star	Highly likely to be locally reliable	5%	300

The allowance for climate change is not included in the residual uncertainty allowance. However, the residual uncertainty allowance can be added to the site deigns water level to consider an appropriate climate change allowance, and ensure a development is safe for its lifetime.

7.3.4 Development and raised defences

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

7.3.5 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 or storage 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.

Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should preferably be in the vicinity of the site and within the red line of the planning application boundary.

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 ensure that 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.

7.3.6 Developer contributions

In some cases, and following the application of the sequential and exception tests, 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). The LFRMS Action Plan reinforces that developers may be required to make necessary contributions to the cost of SuDS and flood risk management activities.

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRMGiA)[13] 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 should describe 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.

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

13 Principles for implementing flood and coastal resilience funding partnerships (Environment Agency, 2012)

flood risk, the Environment Agency request that developers contact them to discuss potential solutions.

Community Infrastructure Levy

The Community Infrastructure Levy (CIL) allows local authorities to raise funds from developers undertaking new building projects in their administrative area. The CIL rate is set locally, within a Charging Schedule. The CIL can be used for a variety of local infrastructure needs arising from new development in the district including flood defences. Further information on CIL can be found on the Councils **website**.

7.4 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 1 in 1,000-year 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, automatic airbrick replacements and covers for air vents can also be fitted to prevent the ingress 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.

7.5 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; and
- non-return valves to prevent waste water from being forced up bathroom and kitchen plugs, or lavatories.

7.6 Reducing flood risk from other sources

7.6.1 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 only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1 in 100-year plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off of the 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.

7.6.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. The development must improve the drainage infrastructure to reduce flood risk on site and the wider area. It is important that a drainage impact assessment shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

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

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

7.6.3 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of greenfield surface water drainage by encouraging water to flow along natural flow routes and thereby reduce runoff rates and volumes during storm events while providing some water treatment benefits. SuDS also have the advantage of providing effective blue and green infrastructure and ecological and public amenity benefits when designed and maintained properly.

The inclusion of SuDS within developments should be seen as an opportunity to enhance ecological and amenity value, and promote green infrastructure, incorporating above ground facilities into the development landscape strategy. 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 the Environment Agency and the Construction Industry Research and Information Association (CIRIA).

More detailed guidance on the use of SuDS is providing in Section 8.

8 Surface water management and SuDS

8.1 What 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.

8.2 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 or major commercial development should make provision for Sustainable Drainage Systems to manage run-off, where major development is defined as:

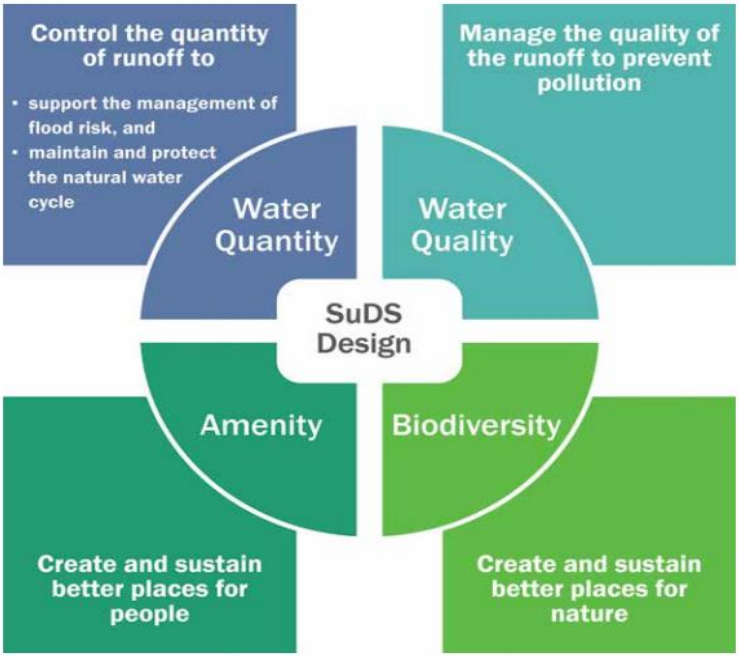
- residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known; and
- non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres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

The Local Planning Authority must satisfy themselves that clear arrangements are in place for future maintenance of the management arrangements and the LLFA (Dorset County Council), as statutory consultee is required to review the drainage and Sustainable Urban Drainage (SuDS) proposals to confirm they are appropriate.

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

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 8-1.

Figure 8-1: Four pillars of SuDS design



Source: The SuDS Manual (C753)

8.3 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 addition benefits such as:

- 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.

If 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.

8.3.1 Types of SuDS System

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage (Table 8-1). Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds and wetlands and these do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA) e.g. the **CIRIA SuDS Manual C753 (2015).**

Table 8-1: 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	✓		

8.3.2 Treatment

A key part of the four pillars of SuDS is to provide the maximum improvement to water quality through the use of the "SuDS management train". To maximise the treatment within SuDS, CIRIA recommends[14] 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.

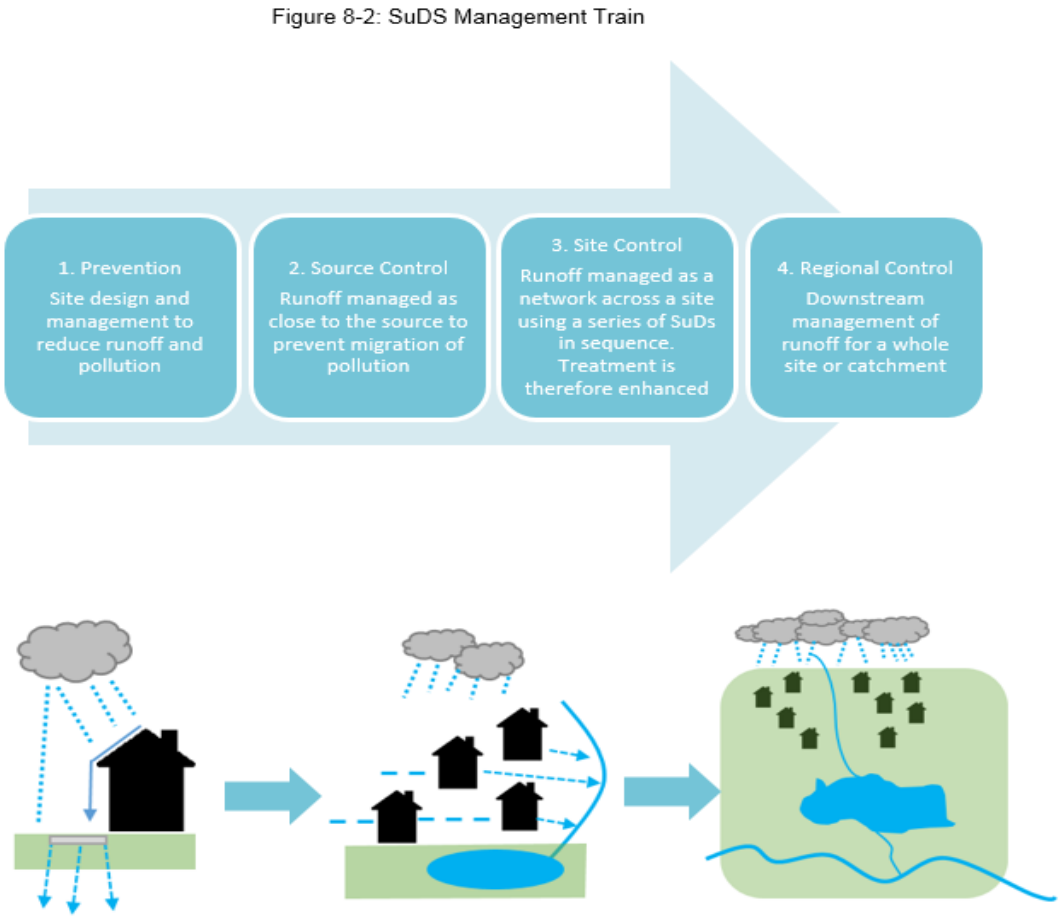
8.3.3 SuDS Management

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 8-2). The number of treatment

14 C753 CIRIA SuDS Manual (2015)

stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered.

Figure 8-2: SuDS management train



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

8.3.4 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 8-2 details some possible constraints and how they may be overcome.

Table 8-2: Example SuDS design constraints and possible solutions

Considerations	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used 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 dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.
Open space in floodplain zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Facts such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	Local Planning Authority should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for on-going maintenance over the development's lifetime.

For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is 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 protection zones (GSPZs) or aquifers, further restrictions may be applicable and guidance should be sought from the LLFA and the Environment Agency.

8.3.5 Infiltration SuDS mapping

BGS Infiltration SuDS mapping has been supplied by Dorset County Council for use in this SFRA. This mapping has been produced to indicate which areas are likely to have ground conditions which are compatible with the use of infiltration SuDS. The Infiltration SuDS map is split into two map series:

- **Infiltration SuDS Map: Summary** which provides screening data on the suitability of each area for infiltration SuDS
- **Infiltration SuDS Map: Detail** which gives more detailed information on the properties of the sub-surface

The Summary map has been used for the purposes of this SFRA and is included in Appendix A.

This is split into four sets of mapping:

- **Infiltration constraints summary layer** which indicates whether there is significant potential for any of the following hazards: soluble rock hazards, landslide hazards, shallow mining hazards (non-coal), made ground or persistently shallow groundwater.

- **Drainage summary layer** which provides an overview of the extent to which the ground will drain.
- **Ground stability summary layer** which provides an overview of the potential for ground instability as a result of infiltration.
- **Groundwater protection summary layer** which provides an overview of sub-surface factors that may impact infiltration SuDS in respect of protecting groundwater quality.

This mapping should be used for strategic purposes only and is not considered to be a replacement for a soakaway test or a site investigation in determining site-specific ground conditions. It should also be noted that whilst the mapping may show that an area is unlikely to be suitable for infiltration SuDS, other types of SuDS should still be considered. For example, features can be lined to prevent infiltration to the ground.

8.4 Sources of SuDS guidance

Dorset County Council has provided **Surface Water Management Proposal Information Requirements** (2015)[15]. These are required for all major developments, and can be incorporated into a Flood Risk Assessment for a site if this is also required. Major developments are defined in Article 2(1) of the Town and Country Planning, Development Management Procedure, England Order 2010, and includes those which have:

- At least 10 houses
- A site area greater than 0.5 hectare where the number of houses is unknown
- A building or buildings with a floor space greater than 1,000m²
- A building or buildings with a site area greater than 1 hectare

The document summarises the minimum information required for outline planning in four broad categories:

- Drainage Catchment Plan
- Site Characteristics Assessment
- Surface Water Management Design Details
- Management Plan

It is recommended that the developers utilise the information within the document when producing a Surface Water Management Proposal.

8.4.1 C753 CIRIA SuDS Manual (2015)

The **C753 CIRIA SuDS Manual** (2015)[16] 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.

8.4.2 Surface Water Advice Note – Using SuDS on new developments (June 2015)

When considering SuDS as part of a major planning application, local planning authorities need to satisfy themselves that the minimum standard of operation is appropriate for SuDS, and ensure through the use of planning conditions that clear arrangements are in place for their ongoing maintenance over the lifetime of the development.

[15] https://www.dorsetforyou.gov.uk/article/424485/Surface-Water-Planning

[16] C753 CIRIA SuDS Manual (2015): http://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

The NPPF expects local planning authorities to give priority to the use of SuDS in determining planning applications. Where SuDS are used, it must be established that these options are feasible, can be adopted and properly maintained and would not lead to any other environmental problems. This is a material planning consideration for all major applications as of the 6 April 2015 and should therefore be given full consideration in an application.

8.4.3 Non-Statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance has been developed by Defra to sit alongside PPG to provide non-statutory standards as to the expected design and performance for SuDS.

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

The LPA will make reference to these standards when determining whether proposed SuDS are considered reasonably practicable.

8.4.4 Surface Water Management plan

The Dorset SWMP[17] was prepared and published in 2012. It outlines the findings from the preparation and risk assessment stages of the SWMP process, and identifies the actions to be considered for the management of surface water in the highest priority locations within each Local Authority area.

Based on the analysis of historic data and modelled data available for North Dorset, the SWMP identified and recommended the following actions for the study area:

- Conduct a number of flood risk investigations in Milborne St Andrew given that this area is at risk of surface water and ground water flooding.
- Assess the damages and likely costs to determine whether an appropriate scheme to manage flood risk in Milborne St Andrew can be developed, and investigate other sources of funding if required.

8.5 Other surface water considerations

8.5.1 Groundwater Vulnerability Zones

The Environment Agency have published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise the underlying bedrock. The maps show the vulnerability of groundwater at a location based on the hydrological, hydrogeological and soil properties within a one-kilometre grid square.

Two maps are available:

- **Basic groundwater vulnerability map:** this shows the likelihood of a pollutant discharged at ground level (above the soil zone) reaching groundwater for superficial and bedrock aquifers and is expressed as high, medium and low vulnerability
- **Combined groundwater vulnerability map:** this map displays both the vulnerability and aquifer designation status (principal or secondary). The aquifer designation status is an indication of the importance of the aquifer for drinking water supply.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas.

8.5.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency defines Groundwater Source Protection Zones in the vicinity of groundwater abstraction points. These areas are defined to protect areas of groundwater that are

[17] Dorset County Council, (2012), Dorset Surface Water Management Plan: Strategic Assessment Report

used for potable supply, including public/private potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks. The Groundwater SPZ 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. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75. Individual source protection areas will still be assigned to assist operators in catchment management
- **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). In the future this zone will be incorporated into one of the other zones, SPZ 1, 2 or 3, whichever is appropriate in the particular case, or become a safeguard zone

The location of Groundwater SPZs in relation to the district are shown in Figure 8-3. Although the majority of the district is located outside of a Groundwater Source Protection Zone, there are several Groundwater SPZs across the district. These are located to the east of Shaftesbury and Blandford Forum, and in the south of the district near Spetisbury and Milborne St Andrew.

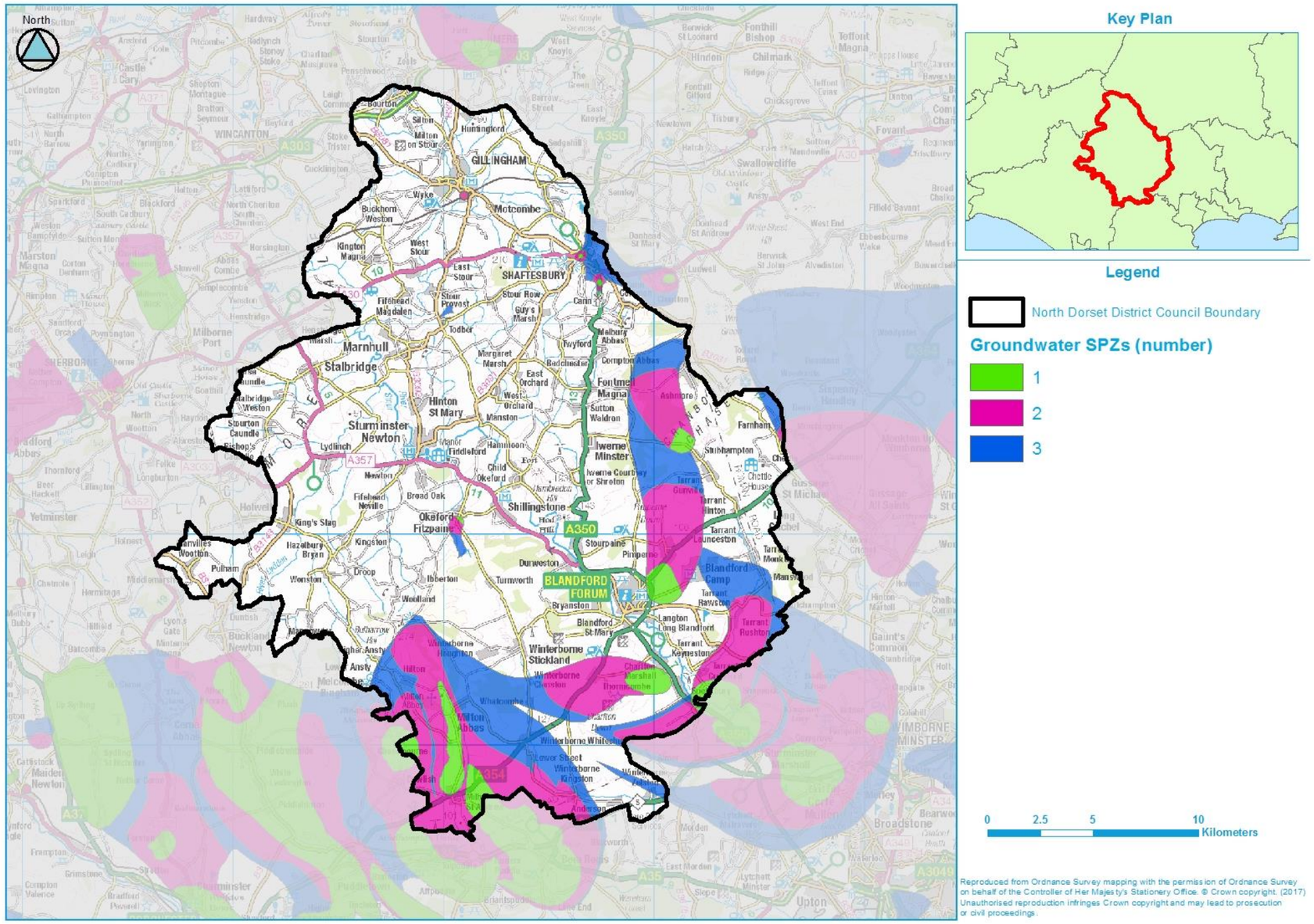
Depending on the nature of the proposed development and the location of the development site with regards to the SPZs, restrictions may be placed on the types of SuDS appropriate to certain areas. For example, infiltration SuDS are generally accepted within Zone 3, whereas in Zones 1 or 2, the Environment Agency will need to be consulted and infiltration SuDS may only be accepted if correct treatments and permits are put in place. Any restrictions imposed on the discharge of site generated runoff by the Environment Agency will be determined on a site by site basis using risk-based approach.

8.5.3 Nitrate Vulnerable Zones

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

Nitrate Vulnerable Zones were assessed using the proposed 2017 Nitrate Vulnerable Zones (England) 2017 to 2020, published in December 2016 by the Environment Agency on behalf on the Secretary of State for Environment, Food and Rural Affairs. These are available to view on the Environment Agency's **Interactive Maps**. The mapping shows that there are several NVZs (surface water, groundwater and eutrophic NVZ areas) within the district, predominantly to the south and east.

Figure 8-3: Groundwater Source Protection Zones



9 Strategic flood risk solutions

9.1 Introduction

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the district. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies set out by North Dorset District Council.

9.2 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this 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[18]:

- 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.

9.2.1 Promotion of SuDS

Surface water flood risk is present in the area. 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. Regionally 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. Given the various policies and guidance available on SuDS, developers should use this information to produce technically proficient and sustainable drainage solutions that conform with the non-statutory standards for SuDS (2015).

9.3 Catchment and floodplain restoration

Compared to flood defences and flood storage, floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

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

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

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

9.3.1 Upstream natural catchment management

Opportunities to work with natural processes to reduce flood and erosion risk as well as benefit the natural environment and reduce costs of schemes should be sought, through integrated catchment management. It also requires partnership working with neighbouring authorities, organisations and water management bodies.

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

18 http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter10.aspx?pagenum=2

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.

9.3.2 Structure removal and / or modification (e.g. weirs)

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

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

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.

9.3.3 Bank stabilisation

Bank erosion should be avoided and landowners encouraged to avoid using machinery and vehicles close to or within the watercourse.

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

9.3.4 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.

9.4 Flood defences

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 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.

10 Summary

10.1 Overview

This SFRA 2017 document replaces the Level 1 SFRA published in 2008. This Level 1 SFRA delivers a strategic assessment of risk from all sources of flooding in North Dorset. It also provides an overview of policy and provides guidance for planners and developers.

10.2 SFRA summary

10.2.1 Sources of flood risk

- The historical flood record shows that North Dorset has been subject to flooding predominantly from fluvial, pluvial (surface water) and groundwater sources. Historic flood events in North Dorset have been recorded since 1900, the most significant of which include the events of March 1979, Autumn/Winter 2000, Winter 2013/14, and March 2017, causing widespread flooding and disruption.
- The key watercourses flowing through the district are the River Stour and its tributaries, which flow through from Wiltshire and South Somerset through the centre of the district towards East Dorset. Although these watercourses flow through predominantly rural areas, they also flow through several more urbanised areas and present a risk of fluvial flooding to the surrounding properties and highways.
- The fluvial flood risk across much of North Dorset is considered to be low, with most areas located in Food Zone 1. However, several significant and urbanised areas, such as Gillingham, Sturminster Newton and Blandford Forum, are located in the vicinity of the main watercourses and thus Flood Zones 2 and 3. The extent of the Flood Zones are anticipated to increase with climate change.
- Surface water flood risk to the district has been assessed based on national datasets. There is a significant surface water flood risk to properties and highways across North Dorset, particularly in the northern section of the district. Flow routes generally follow the existing or historical routes of watercourses, or the road network, and isolated ponding occurs in lower lying areas.
- Flood risk from groundwater has been assessed based on broad-scale soil mapping and groundwater susceptibility data. The susceptibility mapping shows large areas which have the potential for groundwater emergence at the ground surface, particularly in low-lying areas close to watercourses. However, a more detailed assessment would be required to accurately assess the likely locations and extent of groundwater flooding throughout North Dorset. Groundwater flooding has been recorded at numerous locations in the district.
- The extent of flood risk from the River Stour and its tributaries is expected to increase as a result of climate change. There are several small reaches of the defences along the Stour that provide a 1 in 100-year standard of protection to some areas. This standard of protection is likely to reduce as a result of climate change, increasing flood risk.
- The risk of flooding from reservoirs is expected to be low due to the standard of inspection and maintenance required under the Reservoirs Act 1975. In the unlikely event of reservoir breach, Environment Agency mapping indicates that areas close to the River Stour, its tributaries and floodplains in the northern half of the district would be the worst affected.
- Historical incidents of sewer flooding provided by Wessex Water indicate that there have been many recorded incidents across North Dorset for foul and surface water sewers from 2004 onwards. These events were caused by inadequate hydraulic capacity, with the source of flooding predominantly from manholes in gardens and on paths/roads. This includes a number of events during Winter 2012/2013 and Winter 2013/2014.

10.2.2 Key policies

There are many relevant regional and local key policies which have been considered within the SFRA, such as the CFMPs, RBMPs, the PFRA and LFRMS. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

10.2.3 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.

11 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 Council to consider.

11.1 Development management

11.1.1 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 the district.

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
- High quality green and blue infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using current Flood Zones 2 and 3 as public open space

11.1.2 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. The assessment should also identify the risk of existing flooding to adjacent land and properties to establish whether there is a requirement to secure land to implement strategic flood risk management measures to alleviate existing and future flood risk. Any flood risk management measures should be consistent with the wider catchment policies set out in the CFMP, FRMPs and LFRMS.

11.1.3 Sequential and Exception tests

The SFRA has identified that some areas of North Dorset are at high risk of flooding, predominantly from fluvial, pluvial (surface water) and groundwater sources. The high-level screening of the “areas of search” included in Section 6.11 can be used as a starting point to assess which areas are at highest risk but further assessment should be undertaken at a site scale. The Council should use the information in this SFRA when deciding which development sites to take forward in their Local Plan.

It is recommended that the Council considers the anticipate effects of climate change when applying the Sequential Test for site allocations and consideration of windfall sites.

Developers should consult with Dorset County Council, the Environment Agency and Wessex Water at an early stage to discuss flood risk, including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.

11.1.4 Council review of planning applications

The Council should consult the Environment Agency’s ‘Flood Risk Standing Advice (FRSA) for Local Planning Authorities’, last updated 15 April 2015, when reviewing planning applications for proposed developments at risk of flooding. When considering planning permission for developments, planners may wish to consider the following:

- Will the natural watercourse system which provides drainage of land be adversely affected?

- Will a minimum 8m width access strip be provided adjacent to the top of both banks of any Main River (5m for Ordinary Watercourses, 20m for Commissioner watercourses and 9m for IDB watercourses), for maintenance purposes and is appropriately landscaped for open space and biodiversity benefits?
- Will the development ensure no loss of open water features through draining, culverting or enclosure by other means and will any culverts be opened up?
- Have SuDS been given priority as a technique to manage surface water flood risk?
- Will there be a betterment in the surface water runoff regime; with any residual risk of flooding, from drainage features either on or off site not placing people and property at unacceptable risk?
- Is the application compliant with the conditions set out by the LLFA?
- Has an appropriate assessment of the anticipated effects of climate change, and any flood risk mitigation required as a result of this, been made?

11.1.5 Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFA for surface water management and ensure development proposals and applications are compliant with the Council's policy. These policies should also be incorporated into the Local Plan. Wherever possible, SuDS should be promoted:

- 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 SPZs or aquifers, there may be a requirement for a form of pre-treatment prior to infiltration. Further guidance can be found in the CIRIA SuDS manual on the level of water quality treatment required for drainage via infiltration, and the LLFA's SuDS guidance and requirements
- Consideration must also be given to residual risk and maintenance of sustainable drainage and surface water systems
- SuDS proposals should contain an adequate number of treatments stages to ensure any pollutants are dealt with on site and do not have a detrimental impact on receiving waterbodies
- The promotion and adoption of water efficient practices in new development will help to manage water resources and work towards sustainable development and will help to reduce any increase in pressure on existing water and wastewater infrastructure

11.1.6 Cumulative impact of development and cross-boundary issues

The cumulative impact of development should be considered at the planning application and development design stages and the appropriate mitigation measures undertaken to ensure flood risk is not exacerbated, and in many cases the development should be used to improve the flood risk.

Several major watercourses, including the River Stour and its tributaries, flow through North Dorset before flowing through surrounding areas. Any scheme or development which occurs to affect the flow in downstream areas could also have a significant impact on flood risk in parts of North Dorset. Conversely, schemes or development constructed in North Dorset may have an effect on the surrounding areas of East Dorset, Bournemouth, Christchurch, West Dorset and Purbeck.

The River Stour and Shreen Water originate in Wiltshire, and the River Cale originates in South Somerset. Any development in areas of Wiltshire and South Somerset which drain towards these watercourses may also have a significant impact on flood risk downstream in areas of North Dorset.

11.1.7 Residual risk

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities regarding emergency plans in case of reservoir breach.

There is also a residual risk from breach of flood defences which will need to be considered in a site-specific flood risk assessment.

11.1.8 Safe access and egress

Safe access and egress will need to be demonstrated at all development sites and emergency vehicular access should be possible during times of flood. Finished Floor Levels should be updated using the Environment Agency's new fluvial freeboard guide SC120014/S[19]. The guide methodology shifts from adding freeboard values to design defence crest levels, towards considering a range of possible management responses, and can be applied to all sources of flood risk rather than just fluvial sources.

11.1.9 Future flood management

- Development should take a sequential approach to site layout, recognising that the extent of areas at risk of flooding is anticipated to increase with climate change especially in low-lying areas
- In some areas defences may be required to provide protection to existing properties and new development throughout its lifetime
- Upstream storage schemes are often considered as one potential solution to flooding. However, this is not a solution for everywhere. Upstream storage should be investigated fully before being adopted as a solution
- Floodplain restoration represents a sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state.

11.2 Technical recommendations

11.2.1 Potential modelling improvements

- The Environment Agency's Flood Zone maps do not cover every watercourse (for example if <3km^2 in catchment area). Hydraulic modelling of these watercourses may be required at site-specific assessment stage to better understand the risk. If a watercourse or drain is shown on OS mapping but it not covered by a Flood Zone, this does not mean that there is no potential flood risk.
- The SFRA has identified a number of watercourses in North Dorset for which no detailed modelling is available. Detailed hydraulic modelling of these watercourses may be required at site-specific assessment stage in order to better understand the risk.
- Locations where surface water flooding is the predominant flood risk could be investigated further by use of surface water hydraulic modelling. Similarly, for any locations which suffer from sewer flooding or sewer capacity issues, this data can be incorporated into hydraulic models to more accurately represent the surface water system.
- There is limited available data on flood risk from groundwater, although it is known that groundwater poses a significant flood risk in North Dorset. It may therefore be necessary to undertake further detailed investigation to determine the flood risk from this source to existing or future development.

11.2.2 Updates to SFRA

It is important to recognise that the SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding and the potential impacts of climate change.

[19] Environment Agency, 2017. *Accounting for residual uncertainty: updating the freeboard guide. Report SC120014.*

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

The Environment Agency are also due to update their National Flood and Coastal Erosion Risk Management Strategy for England and the implications resulting from the update will need to be considered when this information is available.

The new climate change projections, UK Climate Projections 2018 (UKCP18), are due to be published in 2018. Following publication of the projections, it is likely that Environment Agency will update their guidance on climate change allowances to be used for planning. Once published, this should be reviewed by the council and consideration given to updating the SFRA to reflect any changes.

The SFRA should be periodically updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by authorities including North Dorset District Council, Dorset County Council (in its role as LLFA), the Highways Authority, Wessex Water and the Environment Agency. It is recommended that the SFRA is reviewed internally on an annual basis, allowing a cycle of review, followed by checking with the above bodies for any new information to allow a periodic update.

Appendices

A Flood Risk Mapping

B Flood warning coverage

C Historic Flood Events

D Wessex Water Groundwater Sensitive Catchments

E Climate Change Sensitivity Mapping

Offices at
Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
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