Dorset Council Level 1 Strategic Flood Risk Assessment

Final Report

February 2023

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Revision History

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Contract

This report describes work commissioned by Steve Boyt, on behalf of Dorset Council, by an email dated 06 August 2021. Dularee Goonetilleke, Louise Goode, Peter Rook and Phil Emonson of JBA Consulting carried out this work.

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Purpose

This document has been prepared as a Final Report for Dorset Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared. JBA Consulting has no liability regarding the use of this report except to Dorset Council.

Acknowledgements

We would like to acknowledge the assistance of Dorset Council, the Environment Agency and Wessex Water in the production of the SFRA.

Carbon Footprint

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Executive summary

Introduction

This report is a Level 1 Strategic Flood Risk Assessment (SFRA) for Dorset Council and it will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk. This report provides a comprehensive and robust evidence base on flood risk issues to support the production of the new Local Plan.

Definition of the study area

Dorset Council's administrative area covers an area of approximately 3012km^2 and has a population of approximately 379,791 (2020 estimate by the Office of National Statistics). Dorset is bound by Bournemouth, Christchurch and Poole Council, East Devon District Council, South Somerset District Council, New Forest District Council and Wiltshire Council. Dorset's land use is predominantly agricultural interspersed with rural settlements. Larger urban areas include Blandford Forum, Gillingham and Sherborne to the North, Bridport and Lyme Regis in the west, Dorchester, Weymouth, and Swanage to the south, Shaftesbury to the north east and Wimborne Minster, Colehill, Ferndown and West Parley in the south east.

SFRA Objectives

This SFRA replaces a number of Level 1 SFRA that were prepared for the former district councils and county council prior to local government reorganisation in Dorset in April 2019. This study provides a comprehensive and robust evidence base to support the new Dorset Local Plan.

Key objectives of the 2022 SFRA are:

- To provide information and guidance on flood risk for Dorset Council, taking into account the most recent flood risk information and the future impact of climate change as well as the current state of national planning policy, legislation and relevant studies (this SFRA was finalised prior to the recently updated Planning Practice Guidance on 25 August 2022);
- To inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

How to use this document

SFRAs are high level strategic documents and, as such, do not go into specific detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation. This relates both to the current risk of flooding from rivers, the sea, ground water and surface water and where available the potential effects of future climate change.

This SFRA has incorporated the latest modelling provided by the Environment Agency. It should be noted that the Environment Agency's Flood Zones, on their Flood Map for Planning website, may differ to the maps in the SFRA for a short period of time whilst the Environment Agency incorporate the latest modelling. Other datasets used to inform this SFRA may also be periodically updated and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities. A breakdown of the sources of information used to produce this SFRA can be found in Appendix A.

Flood risk policy and strategy

Relevant regional policies have also been reviewed as part of the SFRA, such as the National Flood and Coastal Erosion Risk Management Strategy. Local Policies have also been assessed, for example the Dorset Council Local Flood Risk Management

Strategy and Preliminary Flood Risk Assessment. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

Planning policy for flood risk management

The **National Planning Policy Framework** (NPPF) and associated **National Planning Practice Guidance** (NPPG) have been reviewed in terms of their requirements as to how flood risk and surface water drainage should be managed through the planning system, and how these policies should be implemented. Proposed development sites at locations at risk of flooding will be required to satisfy the Sequential and, where necessary, Exception Tests in accordance with the NPPF. . Links are provided elsewhere in the SFRA to various guidance documents and policies published by other Risk Management Authorities such as the Lead Local Flood Authority and the Environment Agency.

Climate change

The interpretations of flood risk in the SFRA have considered the impacts of climate change on the Dorset Council area in the future. It should be noted that the UK Climate Change Projections 2018 (**UKCP18**) were published on 26 November 2018. The UKCP18 projections replace the UKCP09 projections as the official source of information on how the climate of the UK may change over the next 100 years.

The Environment Agency updated the climate change allowances for sea level rise in December 2019 to take account of the UKCP18 projections. Updated climate change allowances for peak river flows and peak rainfall intensity were published by the Environment Agency towards the end of July 2021. When undertaking an FRA, reference should be made to the most up to date climate change allowances provided by the Environment Agency. Where possible existing models have been updated to assess the impacts of climate change, using the most up-to-date data available.

Understanding flood risk in Dorset Council area

The key sources of flooding in the Dorset Council area have been explored in terms of their potential effects on preparing development plans (in particular the emerging Dorset Council Local Plan). This includes the factors that affect flooding such as topography, soils and geology. Some key findings from the SFRA are summarised below.

- There is a history of documented flood events, with the main sources being fluvial, tidal, groundwater and surface water.
- The main catchments in the SFRA area are for the rivers Stour, Frome, Avon, Piddle and Brit, Bride, Simene, Asker, Lodden, and Winterbournes. There are a number of smaller watercourses and tributaries that flow through the area.
- The Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) shows that a number of communities across Dorset are at risk of surface water flooding, most notably Dorchester, Bridport and Sherborne.
- Areas at risk of flooding are likely to become at increasing risk in the future and the frequency of flooding will increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change.

- The JBA 5m Groundwater Flood Map shows that large areas of Dorset area at risk of groundwater flooding. This includes Dorchester, Wareham, Sherborne and Blandford Forum. However, it should be noted that many other smaller settlements are considered at risk of groundwater flooding and there have been a number of reported flooding incidents attributed to groundwater, most notably in Winterbourne Abbas.
- There is a potential risk of flooding from reservoirs, both within Dorset and outside the county. However, there are no records of flooding from reservoirs in the study area.

A summary of flood risk to individual settlements within Dorset can be found in Appendix C.

Flood alleviation schemes and assets

A number of Dorset's main rivers have flood defences along some of their lengths. According to data from the Environment Agency, the majority of fluvial defences within Dorset are classified 2-3, indicating good to fair conditions.

There are a number of alleviation schemes within Dorset. These include flood alleviation schemes primarily include actions to improve river structure resilience and increased coastal defence management. Known schemes within Dorset include:

- West Bay Coastal Defence Improvements;
- Lyme Regis Coastal Erosion Scheme;
- Swanage Flood Alleviation Scheme
- Blandford Forum;
- Wimborne;
- Weymouth;
- Lower Stour Strategy;
- Arne Moors Managed Realignment;
- Dorchester and Piddle Valley.

Cumulative impacts and strategic flood risk solutions

Under the NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.156), rather than just to or from individual development sites. An assessment of cumulative impacts on flood risk has been undertaken and can be found in Appendix D.

Consideration has been made to the potential for strategic flood risk solutions within Dorset and how these could potentially be implemented. Potential solutions include flood storage, natural flood management, promotion of SuDS and floodplain restoration.

Flood risk management requirements for developers

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 satisfies part 'b' of the Exception Test. Where appropriate this should include consideration of the cumulative effects of development on existing communities that might be relatively remote from proposed allocations in the emerging local plan.

Information which should be used to support the Sequential and Exception Tests for both Local Plans and Flood Risk Assessments has been documented, along with

guidance for planners and developers. Links are provided to various guidance documents and policies published by other Risk Management Authorities such as the Lead Local Flood Authority and the Environment Agency.

Surface water management and SuDS

Advice and guidance on managing surface water runoff and flooding throughout Dorset has been provided. This includes specific advice relating to the use of Sustainable Drainage Systems (SuDS), these are management practices which enable surface water to be drained in a more sustainable manner and mimic the local natural drainage. The inclusion of SuDS within developments is an opportunity to enhance ecological and amenity value, and promote Green Infrastructure, incorporating above ground facilities into the development landscape strategy. Proposals should have close regard to the appropriate guidance and requirements as set out in the Dorset Local Flood Risk Management Strategy.

Summary and recommendations

A number of recommendations have been made in this SFRA, it is anticipated that by implementing these recommendations, Dorset Council can:

- Develop new flood risk policy
- Reduce flood risk through allocating development appropriately and appropriate site design
- Promote SuDS to mimic natural drainage routes to improve water quality
- Reduce Surface Water Runoff from New Developments and Agricultural Land
- Enhance and Restore River Corridors and Habitat
- Mitigate Against Risk, Improved Emergency Planning and Flood Awareness

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Abbreviations

Abbreviation	Definition
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
EA	Environment Agency
EU	European Union
FCERM	Flood and Coastal Erosion Risk Management
FWA	Flood Warning Area
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.
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FSA	Flood Storage Area
FWMA	Flood and Water Management Act
Ha	Hectare
IDB	Internal Drainage Board
iFRA	indicative Flood Risk Area
JBA	Jeremy Benn Associates

Abbreviation	Definition
LFRMS	Local Food Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
m AOD	metres Above Ordnance Datum
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NRD	National Receptor Database
NRIM	National Reservoir Inundation Mapping
NVZs	Nitrate Vulnerability Zones
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
RoFfSW	Risk of Flooding from Surface Water (formerly known as the Updated Flood Map for Surface Water (uFMfSW))
SFRA	Strategic Flood Risk Assessment
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.
SPZ	(Groundwater) Source Protection Zone
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
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.
WFD	Water Framework Directive – Under the WFD, all waterbodies have a target to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline. River Basin Management Plans (RBMPs) set out the ecological objectives for each water body and give deadlines by when objectives need to be met.

Definitions

Term	Definition
Managed adaptive approach	A structured, iterative process of robust decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring.
Design flood	This is a flood event of a given annual flood probability, which is generally taken as: fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or;

Term	Definition
	tidal flooding with a 0.5% annual probability (1 in 200 chance each year), against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.
Exception Test	Set out in the NPPF, the Exception Test is a method used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The Exception Test is applied following the Sequential Test.
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 Map for Planning	The Environment Agency Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.
Flood Map for Planning	The Environment Agency Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.
Flood and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a River
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
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.
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.
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
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Term	Definition
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.
Sequential Test	Set out in the NPPF, the Sequential Test is a method used to steer new development to areas with the lowest probability of flooding.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
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.
Storm Surge	A rise in sea level as a result of wind and atmospheric pressure changes associated with a storm.
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.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

Advice to users has been highlighted in **purple boxes** throughout the document.

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

(National Planning Policy Framework, paragraph 156)

Dorset Council became a unitary authority in 2019, following an amalgamation of the former Dorset County Council and its districts, with the exception of Bournemouth, Poole and Christchurch, which formed the new Bournemouth, Christchurch and Poole (BCP) authority. This SFRA provides a comprehensive and robust evidence base to support the preparation of Dorset Council's new Local Plan and its decisions on planning applications.

Changes have been made to legislation, planning policy and guidance since the previous SFRAs were prepared for the former Local Planning Authorities in Dorset. This includes changes to the Flood Risk Regulations (2009), Flood and Water Management Act (2010), the National Planning Policy Framework (NPPF) (2012), and the Climate Change Act (2008). Recent guidance from April 2015 also outlines the role of Lead Local Flood Authorities (LLFAs), Local Planning Authorities (LPAs) and the Environment Agency with regard to SuDS.

An updated Level 1 SFRA is required in order to support the development of the new Local Plan and future selection of site allocations, as well as for use in future development management and policy decisions. The Level 1 SFRA will combine flood data from all key Risk Management Authorities (RMAs). RMAs are authorities that are responsible for flood and coastal erosion risk management. These include:

- The Environment Agency
- Lead Local Flood Authorities
- District and Borough Councils
- Coast protection authorities
- Water and sewerage companies
- Internal Drainage Boards
- Highway Authorities.

Key objectives of the 2021 SFRA are:

- To provide information and guidance on flood risk for Dorset Council, taking into account the most recent flood risk information and the future impact of climate change as well as the current state of national planning policy, legislation and relevant studies;
- To provide the basis for applying the flood risk Sequential Test, and determine if the Exception Test is needed within a Level 2 SFRA;
- To inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

1.2 Local Plan

The emerging **Dorset Council Local Plan** (2021-2038) (https://www.dorsetcouncil.gov.uk/planning-buildings-land/planning-policy/dorset-council-local-plan) will update the local planning policy framework currently set by the adopted West Dorset, Weymouth and Portland Local Plan (2015), the North Dorset Local Plan (2016), the Christchurch and East Dorset Local Plan Part 1 – Core Strategy (2014) and the Purbeck Local Plan Part 1 (2012). The emerging local plan includes strategies to support delivery of the development needed (including new homes) up to 2038. This plan will also establish a planning framework for future development, identifying land at lowest flood risk which can be safely allocated for new developments of homes, employment uses and associated infrastructure.

1.3 Levels of SFRA

The **National Planning Practice Guidance** (NPPG) (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Strategic-Flood-Risk-Assessment-section) identifies the following two levels of SFRA:

- **Level 1**: where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to inform the application of the Sequential Test.
- **Level 2**: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all necessary development, creating potentially triggering the need to apply the National Planning Policy Framework's (NPPF) Exception Test.

This Level 1 SFRA is intended to aid Dorset Council in applying the Sequential Test for their site allocations in the emerging local plan and identify where the application of the Exception Test may be required via a Level 2 SFRA. This SFRA will also provide the basis for assessing flood risk when the council considers planning applications (site specific Flood Risk Assessments may also be required as part of this process).

A Level 2 SFRA may be required if either:

- it is not possible to allocate all land for development outside flood risk areas;or
- there is reason to believe that the LPA may receive high numbers of applications in flood risk areas on sites not identified in the Local Plan.

In these circumstances the Level 2 SFRA should include: the detailed nature of the flood characteristics within a Flood Zone,an assessment of other sources of flooding and consideration of 'actual' flood risk with respect existing defences, safe access and egress, residual risk etc.

1.4 SFRA outputs

- Identification of policy and technical updates.
- Identification of any strategic flooding issues which may have cross-boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewers, groundwater, reservoirs and canals.
- Review of historic flooding incidents.
- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.

- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.5 SFRA study area

Dorset Council's administrative area covers approximately 3012km^2 and has a population of approximately 379,791 (2020 estimate by the Office of National Statistics).

Dorset is bound by Bournemouth, Christchurch and Poole Council, East Devon District Council, South Somerset District Council, New Forest District Council and Wiltshire Council.

Dorset's land use is predominantly agricultural interspersed with rural settlements. Larger urban areas include Blandford Forum, Gillingham and Sherborne to the north, Bridport and Lyme Regis in the west, Dorchester, Weymouth Swanage to the south, Shaftesbury to the north east and Wimborne Minster, Colehill, Ferndown and West Parley in the south east.

Figure 1-1 and Figure 1-2 show the study area and the neighbouring Local Authorities.

Dorset is covered by Wessex and South West Water as a water and sewerage provider. This is not illustrated within mapping.

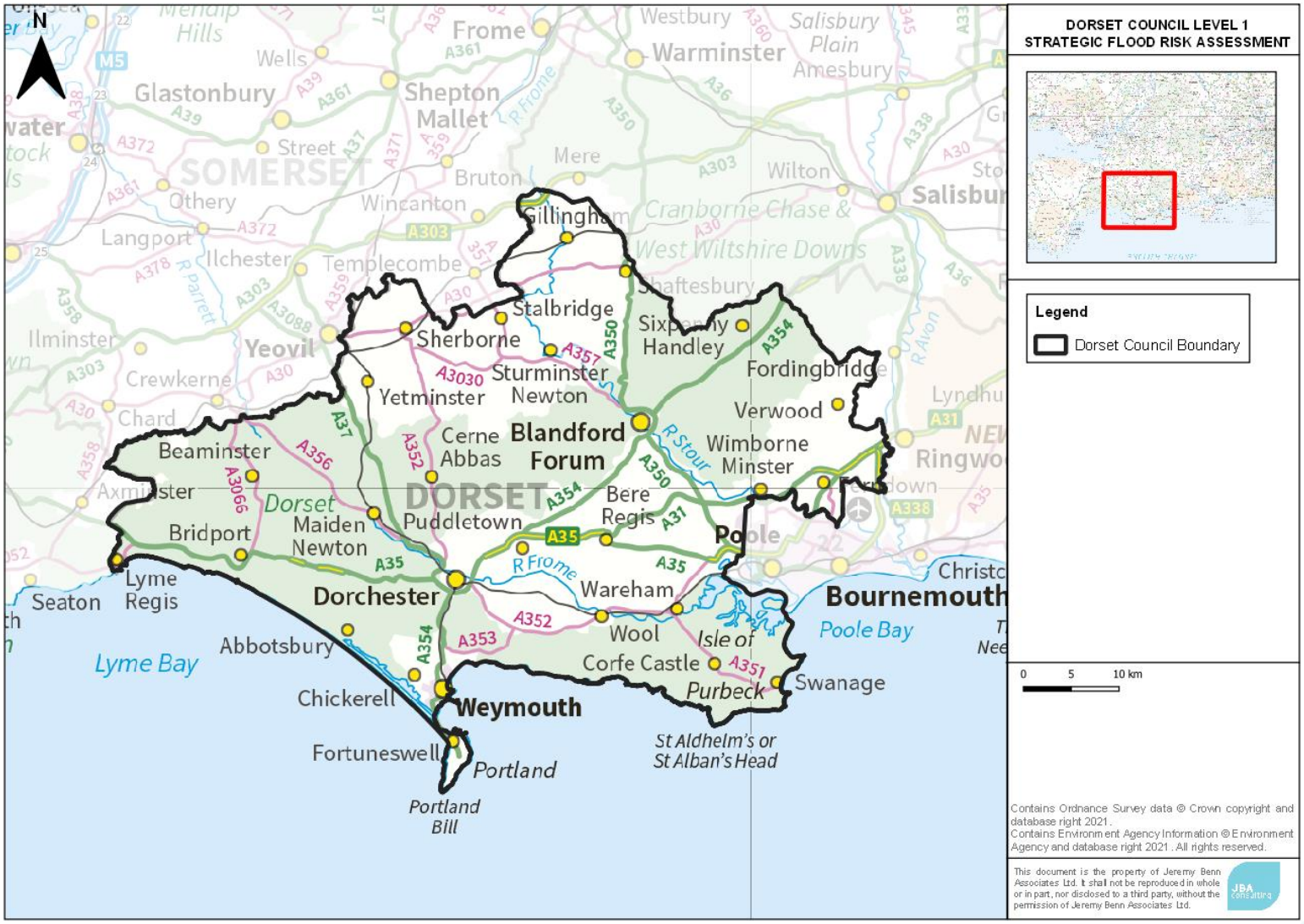

Figure 1-1: Dorset Council study

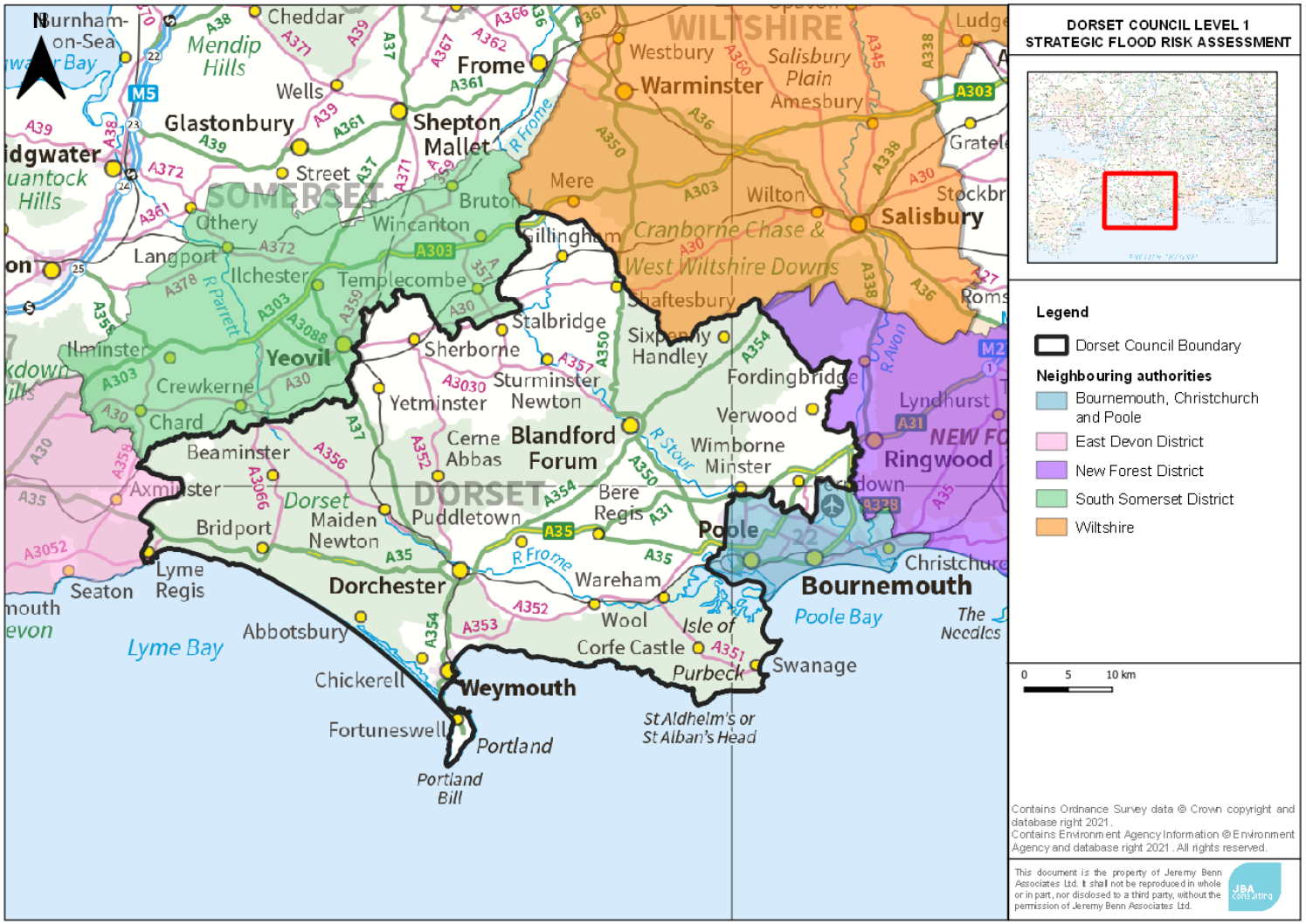

Figure 1-2: Neighbouring local authorities

The main river catchments that fall within Dorset are:

- Stour
- Frome
- Avon
- Piddle
- Bride
- Brit
- Yeo

The River Stour enters the region from the north and passes through Blandford Forum, moving south-east. The Rivers Frome and Piddle flow similarly from north of Dorchester, moving east and flowing out to Poole Bay at Wareham. The River Brit flows south from Beaminster to Bridport and the River Bride flows west, both entering Lyme Bay. The River Avon flows south along the very eastern extent of the area, entering Poole Bay at the coast. The River Yeo flows from the north of Dorset into Somerset.

There are several other notable rivers and minor rivers within Dorset including Moors River, River Allen, River Cerne, River Hooke, River Wey, River Winterborne, The Tarrant and Wriggle River.

The Moors River flows south, joining the River Stour to the south in Bournemouth, Christchurch and Poole Council area. The River Allen flows southwards from Gussage All Saints to just south of Wimborne Minster where it converges with the River Stour. The River Cerne runs south from Cerne Abbas before converging with the River Frome north of Dorchester. The River Hooke flows east from Toller Porcorum, joining the River Frome at Maiden Newton. The River Wey begins at Upwey, moving south and passing into Weymouth Bay at the southern coastline. The River Winterborne moves southeast from Winterborne Houghton and joins the River Stour at Sturminster Marshall. The Tarrant flows south from Tarrant Gunville, converging with the River Stour at Tarrant Crawford. The Wriggle River has its confluence with the River Yeo at Bradford Abbas, flowing north across the council boundary.

It should be noted that groundwater is extremely influential as a baseflow to many of the watercourses in Dorset such as the River Winterborne. This is particularly the case in chalk catchments which comprise a large proportion of Dorset and include key settlements such as Dorchester.

Figure 1-3 shows a map of the key watercourses within Dorset and a list of the Environment Agency's hydrological areas.

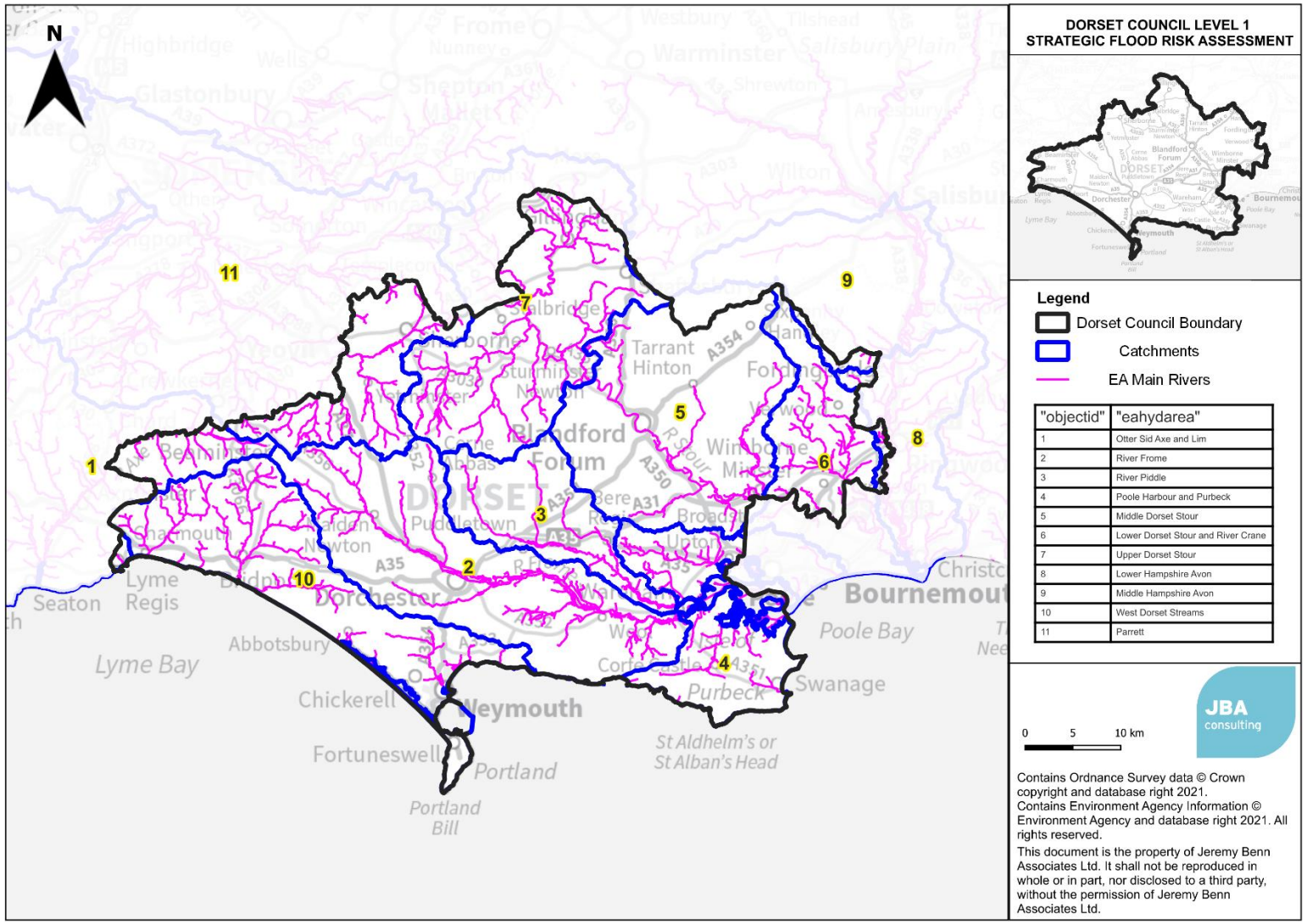

Figure 1-3: Map of the principal rivers and other watercourse within and around Dorset

1.6 Consultation

The following parties (external to Dorset Council) were consulted when preparing this SFRA:

- Dorset Council (as LLFA and Highway Authority)
- Environment Agency
- Wessex Water/South West Water
- Neighbouring authorities:
    - Bournemouth, Christchurch and Poole
    - East Devon
    - New Forest
    - South Somerset
    - Wiltshire

1.7 SFRA user guide

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

Developers will still be required to undertake site-specific Flood Risk Assessments to support Planning Applications. Developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail at site level.

Government has published specific guidance on SFRA (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment). This further explains how SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for Sequential and Exception Tests.

On the date of publication, the SFRA contains the latest flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), flood event information, new defence schemes and updates to policy and legislation. Developers should check the online **Flood Map for Planning** (https://flood-map-for-planning.service.gov.uk/) in the first instance to identify any major changes to the Flood Zones.

Table 1-1: SFRA user guide

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed.
2. Flood Risk Policy and Strategy	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. Planning Policy for Flood Risk Management	Describes the Sequential Approach and application of Sequential and Exception Tests. Outlines cross-boundary issues and considerations.
4. Impact of climate change	Outlines climate change guidance and the implications for the study area.
5. Understanding Flood Risk in Dorset	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting Dorset. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered.
6. Flood alleviation schemes and assets	Assessment of existing flood defences and flood risk management measures. Provides a detailed explanation on the difference between actual flood risk and residual flood risk.
7. Cumulative Impacts and Strategic Flood Risk Solutions	Identifies the cumulative impacts of development and provides an overview of possible strategies to reduce flood risk.
8. Flood risk management requirements for developers	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
10. Surface water management and SuDS	Advice on managing surface water run-off and flooding and the application of SuDS.
14. Summary and Recommendations	Review of the Level 1 SFRA and identification of recommendations for the council to consider as part of Flood Risk Management policy based on finding of the study to date.
Appendix A – Data sources used in the SFRA	Contains an overview of datasets and sources that were used tin the SFRA.
Appendix B – Flood Alert Areas and Flood Warning Areas	A list of Flood Alert Areas and Flood Warning Areas in Dorset.
Appendix C – Summary of flood risk in Dorset	A summary of flood risk to a number of key settlements in Dorset.
Appendix D – Cumulative Impact Assessment	Assessment of the cumulative impacts of development in Dorset.
Appendix E – SFRA site screening	Flood risk screening of sites and areas under consideration or of interest to Dorset Council.

1.8 Understanding flood risk

This section provides useful background information on how flooding arises and how flood risk is determined.

1.8.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways, as illustrated in Figure 1-4. Major sources of flooding include:

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

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

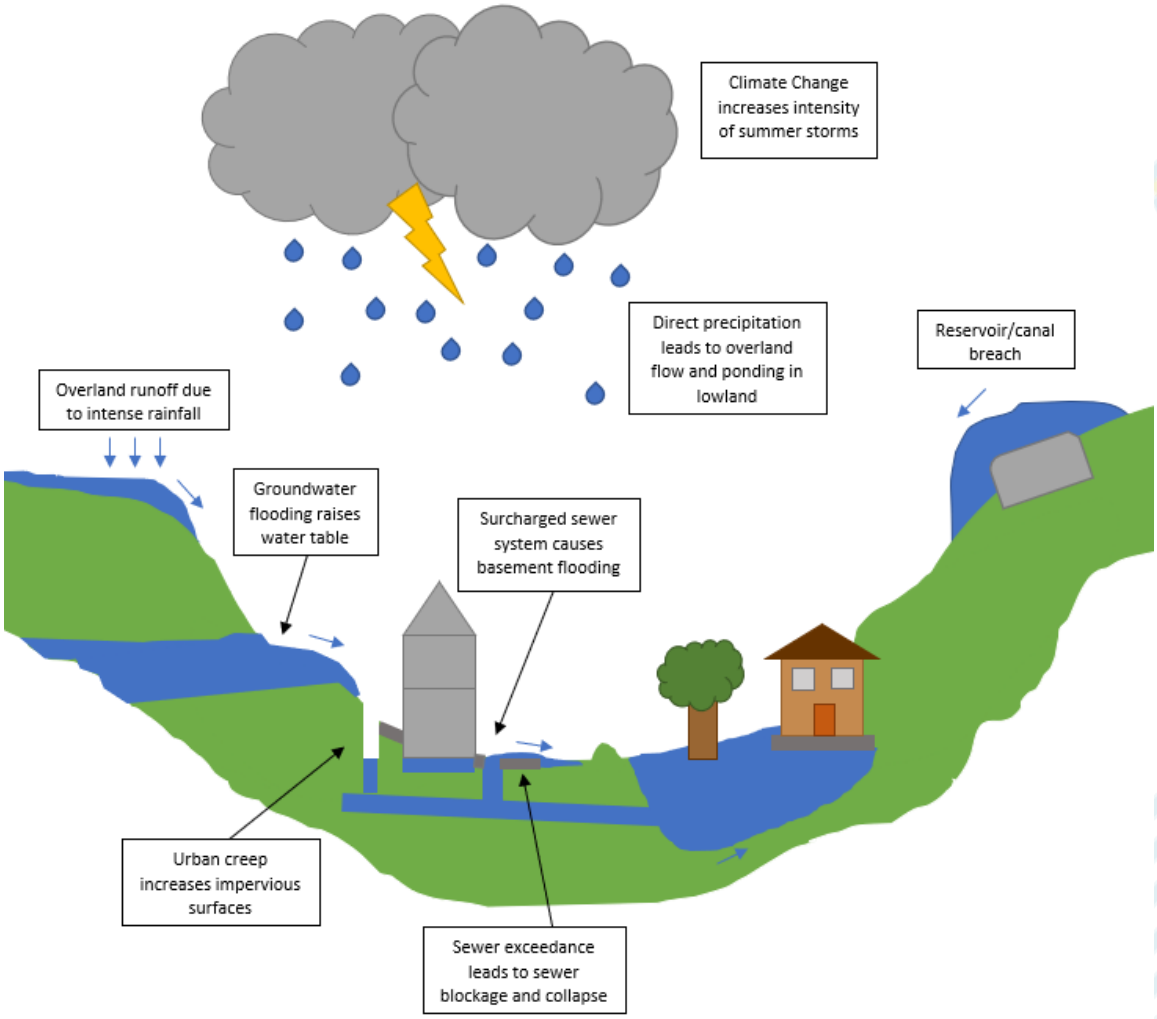

Figure 1-4: Flooding from all sources

1.9 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 1-5 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways (Figure 1-4 is presented as a simplified illustration only).

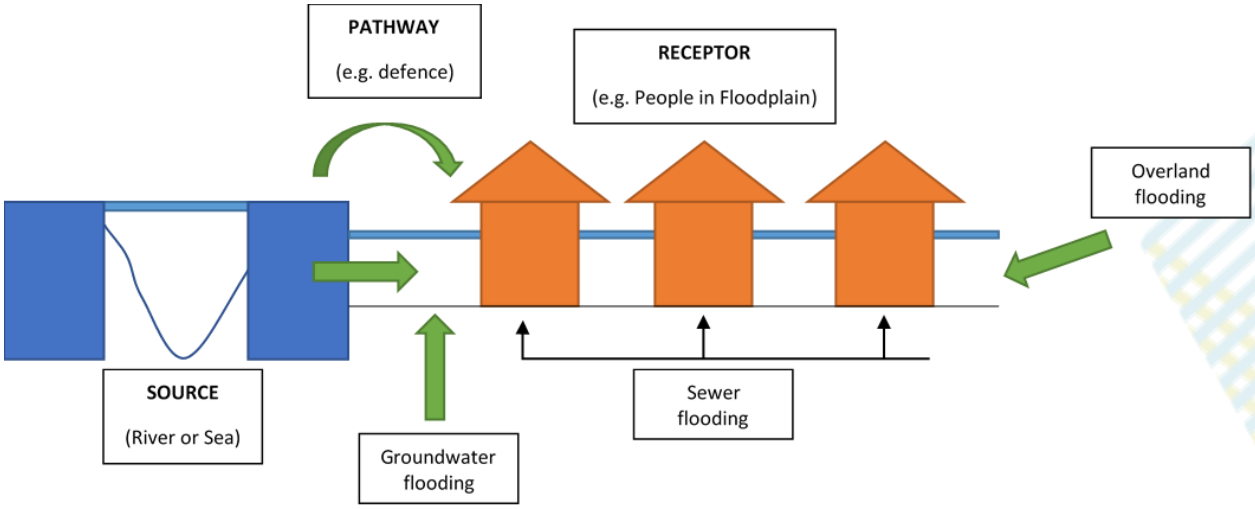

Figure 1-5: Source-Pathway-Receptor Model

The principal sources are the sea, rainfall, and rivers; the most common pathways are rivers themselves, drains, sewers, overland flows, floodplains and defence assets (for example through overtopping or breach). Receptors can include people, their property and the environment. All these elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding, but they can block or impede pathways or remove receptors.

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

1.10 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example: A 1% flood has a 1 in 4 chance of occurring at least once in a 30-year period - the period of a typical residential mortgage.

1.11 Consequence

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

Flood risk = Probability of flooding x Consequences of flooding

1.12 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on

the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

2 Flood risk policy and strategy

This section sets out the flood risk management roles and responsibilities for different organisations and relevant legislation, policy and strategy.

2.1 Roles and responsibilities for Flood Risk Management in Dorset

There is no single body for managing local flood risks in the UK. There are different organisations that cover Dorset that have responsibilities for flood risk management, known as Risk Management Authorities. These are shown in Table 2-1 with a summary of their responsibilities.

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

When it comes to undertaking works to reduce flood risk, the Environment Agency and Dorset Council as LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect. Permissive powers mean that Risk Management Authorities can undertake works on watercourses but are not obliged to do so.

Table 2-1: Roles and responsibilities for Risk Management Authorities

Risk Management Authority	Policy and strategy	Flood risk responsibilities	Planning role
Environment Agency	• Strategic overview for all sources of flooding • National Strategy • Reporting and general supervision	• Main rivers (e.g. River Stour) • Coastal flooding	• Statutory consultee for development in Flood Zones 2 and 3
Dorset Council as Lead Local Flood Authority (LLFA)	• Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy	• Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement) • Ordinary watercourses (works)	• Statutory consultee for major developments
Dorset Council as Local Planning Authority (LPA)	• Local Plans as LPA	• Determination of Planning Applications • Forward planning	• Determination of Planning Applications • Forward planning
Wessex and Southwest Water	• Asset Management Plans, supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans	• Public sewers • Reservoir management	• Non-statutory consultee
Highway Authorities *National Highways (motorways and trunk roads)* *Dorset Council (for non-trunk roads)*	• Highway drainage policy and planning	• Highway drainage	• Internal planning consultee regarding highways design standards and adoptions

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in Dorset:

- **Flood and Water Management Act (2010)**

  (https://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf) - this Act makes provision about water, including provision about the management of risks in connection with flooding and coastal erosion. Key aims are to minimise flood risk associated with extreme weather, compounded by climate change.

- **Flood Risk Regulations (2009)**

  (http://www.legislation.gov.uk/uksi/2009/3042/pdfs/uksi_20093042_en.pdf) - these transpose the European Floods Directive (2000) into law and require the Environment Agency and LLFAs to produce Preliminary Flood Risk Assessments and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk Management Plan is produced; this is done in a six-year cycle.

- **Town and Country Planning Act (1990)** (https://www.legislation.gov.uk/ukpga/1990/8/contents) – amongst other provisions, this act defines the process for preparing development plan documents (including local plans), taking decisions on planning applications, taking planning enforcement action and taking decisions on advertisement consent applications.

- **Water Industry Act (1991)** (https://www.legislation.gov.uk/ukpga/1991/56/contents) - consolidates previous enactments relating to the water supply and the provision of wastewater services in England and Wales and sets out the main powers and duties of the water and sewerage companies.

- The **Land Drainage Act (1991)** (https://www.legislation.gov.uk/ukpga/1991/59/contents) sets out the functions of boards and local authorities in relation to land drainage and **Environmental Permitting Regulations (2018)** (http://www.legislation.gov.uk/uksi/2018/110/contents/made) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an Ordinary Watercourse or Main River.

- The **Water Environment Regulations (2017)** (http://www.legislation.gov.uk/uksi/2017/407/contents/made) – these transpose the European Water Framework Directive (2000) into law and require the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.

- Other environmental legislation such as the Environment Act (2021), Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

Table 2-2 summarises summarises relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. Hyperlinks are provided to external documents. These documents may:

- Provide useful and specific local information to inform Flood Risk Assessments within the local area.
- Set the strategic policy and direction for Flood Risk Management (FRM) and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for FRM and drainage in the region.
- Provide guidance and/or standards that informs how a developer should assess flood risk and/or design flood mitigation and SuDS.

Table 2-2: National, regional and local flood risk guidance, policy and strategy documents

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
National	**Flood and Coastal Management Strategy** (see section 2.5.1) (Environment Agency) 2020	No	Yes	No	Due to be reviewed in 2026
National	**National Planning Policy Framework and Guidance** (Department for Levelling Up, Housing and Communities (DLUHC)) updated July 2021 (see section 3.1)	No	Yes	Yes	Due review 2026
Regional	**Dorset Stour Catchment Flood Management Plan** (Environment Agency) 2012 (see section 2.5.5)	Yes	Yes	No	-
Regional	**West Dorset Catchment Flood Management Plan** (Environment Agency) 2012 (see section 2.5.5)	Yes	Yes	No	-
Regional	**Frome and Piddle Catchment Flood Management Plan** (Environment Agency) 2012 (see section 2.5.5)	Yes	Yes	No	-
Regional	**South West River Basin Management Plan** (Environment Agency) 2015 (see section 2.5.3)	No	Yes	No	2021
Regional	**Drainage and Wastewater Management Plan** (Wessex Water) due 2022/23	Yes	Yes	Yes	2022/23
Regional	**Climate Change guidance for development and flood risk** (see section 4.1) (Environment Agency) 2020	No	No	Yes	-
Local	**Local Flood Risk Management Strategy for Dorset** Dorset County Council 2014 (see section 2.5.6)	Yes	Yes	No	2022

2.4 Key legislation for flood and water management

2.4.1 Flood Risk Regulations (2009)

The **Flood Risk Regulations 2009** translate the EU Floods Directive into UK law. The EU requires Member States to complete an assessment of flood risk (known as a Preliminary Flood Risk Assessment (PFRA)) and then use this information to identify areas where there is a significant risk of flooding. For these Flood Risk Areas, States must then undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans.

The Flood Risk Regulations direct the Environment Agency to do this work for river, sea and reservoir flooding. LLFAs must do this work for surface water, Ordinary Watercourse and Groundwater flooding. This is a six-year cycle of work and the second cycle started in 2017.

The Dorset Council PFRA (https://www.dorsetcouncil.gov.uk/documents/35024/280970/Preliminary+flood+risk+assessment+for+Dorset.pdf/52ebb752-1766-62c9-acbb-0cc8f2d8ac45) was published in 2009 and updated in 2017. This greater understanding of flood risk from the LLFA has drawn attention to new areas of risk not previously considered, particularly surface water. Areas identified as having higher risk include Dorchester, Weymouth and Bridport.

Key outputs of the 2009 PFRA include:

- No nationally significant Flood Risk Areas were identified in Dorset, however, there are a number of high-risk local sources of flooding, particularly from surface water across Dorset.
- 22,300 properties estimated to be at risk of flooding, mostly from surface water sources but also from groundwater and ordinary watercourses, to a depth of 0.3m during a 0.5% AEP Event.
- Reporting of significant flooding events that occurred in Dorset during 1955 in Martinstown, 2000 in Piddletrenthide, and 1993 and 2008 in Weymouth

An update of the PFRA was undertaken in 2017 and no new nationally significant flood risk areas were identified.

2.4.2 Flood and Water Management Act (FWMA) 2010

The Flood and Water Management Act (FWMA) was enacted in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

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

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

2.4.3 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP), which were last published in 2015 and are currently being updated.

Dorset lies within the South West River Basin District.

2.5 Key national, regional and local policy documents and strategies

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

The National Flood and Coastal Erosion Risk Management Strategy (FCERM) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/899498/National_FCERM_strategy_for_England.pdf)

for England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The new Strategy has been in preparation since 2018. The Environment Agency brought together a wide range of stakeholders to develop the strategy collaboratively. The Strategy is much more ambitious than the previous one from 2011 and looks ahead to 2100 and the action needed to address the challenge of climate change.

The Strategy has been split into 3 high level ambitions: climate resilient places; today's growth and infrastructure resilient in tomorrow's climate; and a nation ready to respond and adapt to flooding and coastal change. The strategy outlines strategic objectives relating to these ambitions, with specific measures to achieve these.

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a New **National Policy Statement for Flood and Coastal Erosion Risk Management** (https://www.gov.uk/government/publications/flood-and-coastal-erosion-risk-management-policy-statement). The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

1. Upgrading and expanding flood defences and infrastructure across the country,
2. Managing the flow of water to both reduce flood risk and manage drought,
3. Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. Better preparing communities for when flooding and erosion does occur, and
5. Ensuring every area of England has a comprehensive local flood and coast plan for dealing with flooding and coastal erosion.

2.5.2 River Basin Management Plans

The **South West River Basin District River Basin Management Plan** (RBMP)(https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718339/South_West_RBD_Part_1_river_basin_management_plan.pdf),

managed by the EA, has been updated since the first cycle in 2009. The latest version was published in December 2015. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The South West RBMP examples include management techniques such as the physical modifications, application of government advice and industry initiatives to reduce pollution from water to reduce flood risk whilst also increasing local water quality. Measures to advance water management techniques include further measures to address physical modification, changes to natural flow and level of water and status of water bodies, which are envisioned to be addressed up to 2027.

2.5.3 Flood Risk Management Plans

Flood Risk Management Plans (FRMPs) are part of the six-year cycle of assessment, mapping and planning required under the Flood Risk Regulations. The Environment Agency led the development of the **South West FRMPs** (https://www.gov.uk/government/publications/south-west-river-basin-district-flood-risk-management-plan), which were published in 2015. The FRMPs summarise the flooding affecting the area and describes the measures to be taken to address the risk in accordance with the Flood Risk Regulations. The draft FRMP for the South West river basin district for 2021 to 2027 is expected to be published in 2022 and the consultation for these has recently closed.

2.5.4 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.

Dorset lies within the Dorset Stour Catchment Flood Management Plan, the West Dorset Catchment Management Plan, and the Frome and Piddle Catchment Management Plan (https://www.gov.uk/government/collections/catchment-flood-management-plans) and is part of the following sub-areas:

- Upper Stour and Blackmore Vale
- Hambledon Hills
- Blandford Forum
- Middle Stour, Tarrant, Winterbournes and Allen
- Wimborne Minster, Corfe Mullen and Sturminster
- Gillingham
- St Leonards, Verwood and West Moors

2.5.5 Dorset Local Flood Risk Management Strategy

The **Dorset County Council's Local Flood Risk Management Strategy (LFRMS)** (https://www.dorsetcouncil.gov.uk/documents/35024/280970/Local+Flood+Risk+Management+Strategy+for+Dorset+%28Technical+Report%29.pdf/72585472-02bc-18f1-cd78-f40752127225) was published in 2014.

The Strategy sets out how Dorset Council will manage flood risk from surface water runoff, groundwater and ordinary watercourses for which it has a responsibility for as LLFA. This strategy predated the formation of BCP as a unitary authority and the strategy also covers areas now outside of the Dorset Council administrative area. The current National Strategy was published in July 2020, LLFAs will need to update their Local Strategies so that they reflect how national objectives for flood risk management will be delivered locally.

The existing Strategy notes that the council will seek to deliver sustainable drainage systems (SuDS) as part of new development in its roles as statutory consultee for major planning applications and non-statutory consultee for non-major planning applications.

The Strategy has five objectives, which are to:

- **Understand flood risk across Dorset** – Presents information relating to different types of flood risk and the communities exposed to these risks. Existing flood risk plans, strategies and assessments are reviewed in relation to challenges in understanding flood risk in Dorset.
- **Manage the likelihood and impact of flooding** – Details roles and responsibilities of management authorities and stakeholders. The importance of incident reporting

and how this information is used for long term future strategic planning of flood alleviation measures is emphasised.

- **Help Dorset's communities manage their own flood risk** – Encourage community and stakeholder engagement through flood warden and flood action groups.
- **Ensure flood risk is considered in local land development proposals** – Prepare for future population change within Dorset and how this relates with National Planning Policies. Measures are put in place to ensure flood risk is considered in local land development proposals.
- **Improve flood prediction, warning, response and post flood recovery** – Discusses flood warning, prediction, response and recovery within the requirements set out in the Civil Contingencies Act and the organisation of the Bournemouth, Dorset and Poole (BDP_ Local Resilience Forum (LRF) Severe Weather Group.

The strategy sets out actions for meeting these objectives.

2.5.6 LLFAs, surface water and SuDS

The 2021 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165). 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
- Through the use of planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime

Dorset Council's requirements for new developers on SuDS are set out on their website, alongside supporting documents. The supporting text to Policy ENV14 of the emerging Dorset Council Local Plan states that Dorset Council expects SuDs for:

- all major development sites;
- development of land that is at risk from flooding from any source; and
- developments where surface water runoff from the development is likely to increase the risk of flooding from any source, else-where.

At the time of writing this SFRA, documents and policies relevant to SuDS and surface water in Dorset are:

- **Local Flood Risk Management Strategy** (https://www.dorsetcouncil.gov.uk/documents/35024/280970/Local+Flood+Risk+Management+Strategy+for+Dorset+%28Technical+Report%29.pdf/72585472-02bc-18f1-cd78-f40752127225)
- The SuDS Manual (C753), published in 2007, updated in 2015
- **DEFRA Non-statutory technical standards for sustainable drainage systems, 2015** (https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards)
- **DEFRA National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011** (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82421/suds-consult-annexa-national-standards-111221.pdf)

- **Building Regulations Part H (MHCLG) 2010** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/738407/National_FCERM_strategy_Strategic_Environmental_Assessment_scoping_report.pdf)

  The 2021 NPPF states that flood risk should be managed "using opportunities provided by new development to reduce causes and impacts of flooding." As such, subject to site specific considerations and other relevant planning considerations Dorset Council encourages SuDS to be incorporated on minor development as well as major development.

2.5.7 Surface Water Management Plans

A Surface Water Management Plan (SWMP) is a study to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from risk from surface runoff, groundwater, and ordinary watercourses. SWMPs are led by a partnership of flood risk management authorities who have responsibilities for aspects of local flooding, including the LLFA, Local Authority, Water and Sewerage Undertaker and other relevant authorities.

The purpose of a SWMP is to identify what the local flood risk issues are, what options there may be to prevent them or the damage they cause and who should take these options forward. This is then presented in an Action Plan that the stakeholders and partners agree. It is understood that a Surface Water Management Plan for Bridport was prepared in 2016 and a Dorset wide strategic Surface Water Management Plan was previously prepared.

3 Planning policy for flood risk management

This section summaries national planning policy for development and flood risk.

3.1 National Planning Policy Framework and Guidance

The revised **National Planning Policy Framework (NPPF)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf) was published in July 2021, replacing the 2019 version. The NPPF sets out Government's planning policies for England. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF states that:

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

Planning Practice Guidance (https://www.gov.uk/government/collections/planning-practice-guidance) on flood risk was published in March 2014 and sets out how the policy should be implemented. **Diagram 1 in the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-risk-in-local-plans) sets out how flood risk should be considered in the preparation of Local Plans.

3.2 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas.

3.2.1 The Flood Zones

The definition of the Flood Zones is provided below. The Flood Zones do not take into account defences. This is important for planning long-term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones do not take into account surface water, sewer or groundwater flooding or the impacts of canal or reservoir failure. They do not consider climate change. Hence there could still be a risk of flooding from other sources and that the level of flood risk will change over time during the lifetime of a development.

The Flood Zones are:

- **Flood Zone 1 – Low probability:** less than a 0.1% chance of river and sea flooding in any given year.
- **Flood Zone 2 – Medium probability:** between a 1% and 0.1% chance of river flooding in any given year or 0.5% and 0.1% chance of sea flooding in any given year.
- **Flood Zone 3a – High probability:** greater or equal to a 1% chance of river flooding in any given year or greater than a 0.5% chance of sea flooding in any given year. Excludes Flood Zone 3b.

- **Flood Zone 3b – Functional Floodplain:** land where water has to flow or be stored in times of flood. SFRAs identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. It may be required to consider climate change on the functional floodplain; this would need hydraulic modelling to confirm extents and therefore it is recommended that this is considered in a Flood Risk Assessment and a suitable approach is agreed with the EA.

Important note on Flood Zone information in this SFRA

The Flood Zones 2 and 3a are the same as those shown on the Environment Agency's **'Flood Map for Planning'** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) (which incorporates latest modelled data), where available.

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

Functional floodplain (Flood Zone 3b) is identified as:

- Land which would flood with an annual probability of 1 in 20 years (or 5% AEP), where detailed hydraulic modelling exists; or
- Land which would flood with an annual probability of 1 in 20-year defended modelled flood extents (where data is available from the Environment Agency. Many of the older models are based on a 4% AEP).

For areas outside of the detailed model coverage, or where no outputs were available, Flood Zone 3a can be used as a conservative indication. Further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b where no detailed modelling exists.

3.2.2 The Sequential Test in Dorset

The overarching aims of national planning policy and guidance are to direct new development to land at the lowest risk of flooding from all sources. A test is applied called the 'Sequential Test' to do this. Figure 3-1 summarises the Sequential Test. Councils apply the Sequential Test when making allocations for development through their local plans. For all other developments, developers must supply evidence to the LPA, with a Planning Application, in respect to the Sequential Test.

Councils' need to take account of national planning policy/guidance and work with relevant parties to define a suitable area of search for the consideration of alternative sides in the Sequential Test when preparing their local plans and assessing planning applications. (Dorset Council has suggested catchment search areas in the supporting text of its emerging local plan). The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal, through a free-standing document, or as part of Strategic Housing Land or Employment Land Availability Assessments.

Further work may be needed to decide if the land is suitable having regard to the development's vulnerability to flooding the Flood Zone it is proposed for. **Table 2 of the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification) defines the vulnerability of different development types to flooding. **Table 3 of the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability) shows whether, having applied the Sequential Test first, that vulnerability of development is suitable for that Flood Zone and where further work is needed.

This SFRA has considered the July 2021 changes to the sequential test requiring a sequential approach for of all sources of flood risk. In the absence of an update to PPG at the time this report was prepared or formal guidance, an approach to the sequential test for SDC has been developed in consultation and agreement with the LPA and LLFA. This proposed approach is outlined in Figure 3-2.

Surface water flood risk has been addressed through the inclusion of two surface water flood zones, these are defined as follows:

- Surface Water Flood Zone A – land at <0.1% annual probability of flooding from surface water;
- Surface Water Flood Zone B – land at 0.1% or greater annual probability of flooding from surface water.

The Risk of Flooding from Surface Water mapping (Appendix A3) has been used as a basis for this and it is considered that the 0.1% AEP event is a sufficiently conservative approach, this may be superseded by detailed modelling where it is available.

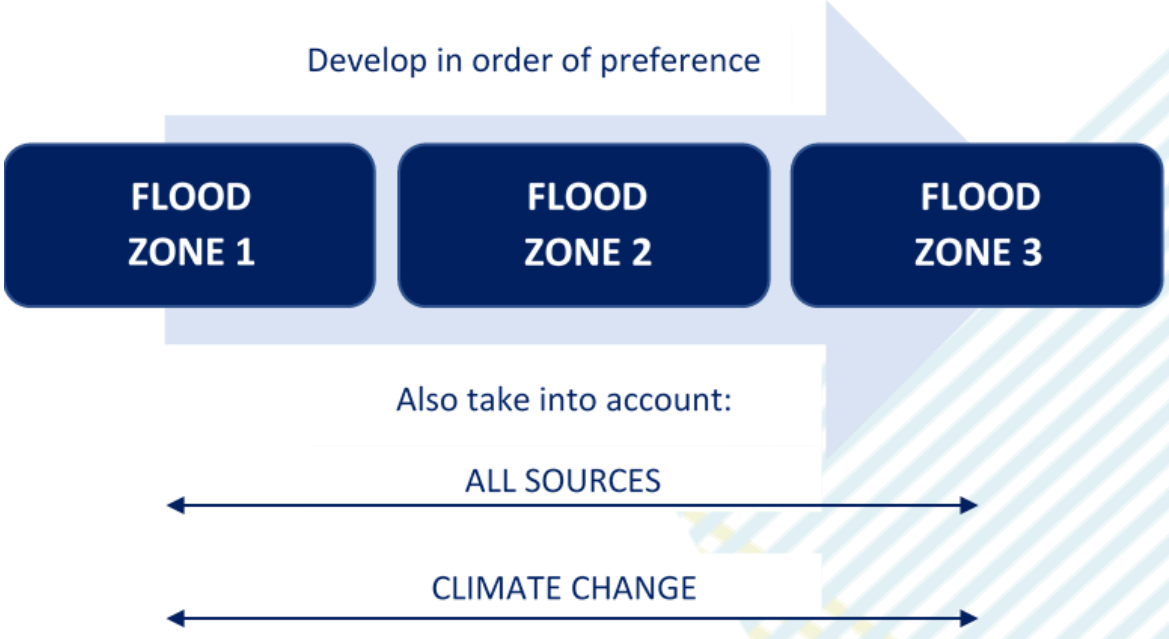

Figure 3-1: The Sequential Test

Figure 3-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against the EA's Flood Map for Planning flood zones and development vulnerability compatibilities.

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

sources and the impact of climate change must be considered when assessing which sites are suitable to allocate. The SFRA User Guide (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

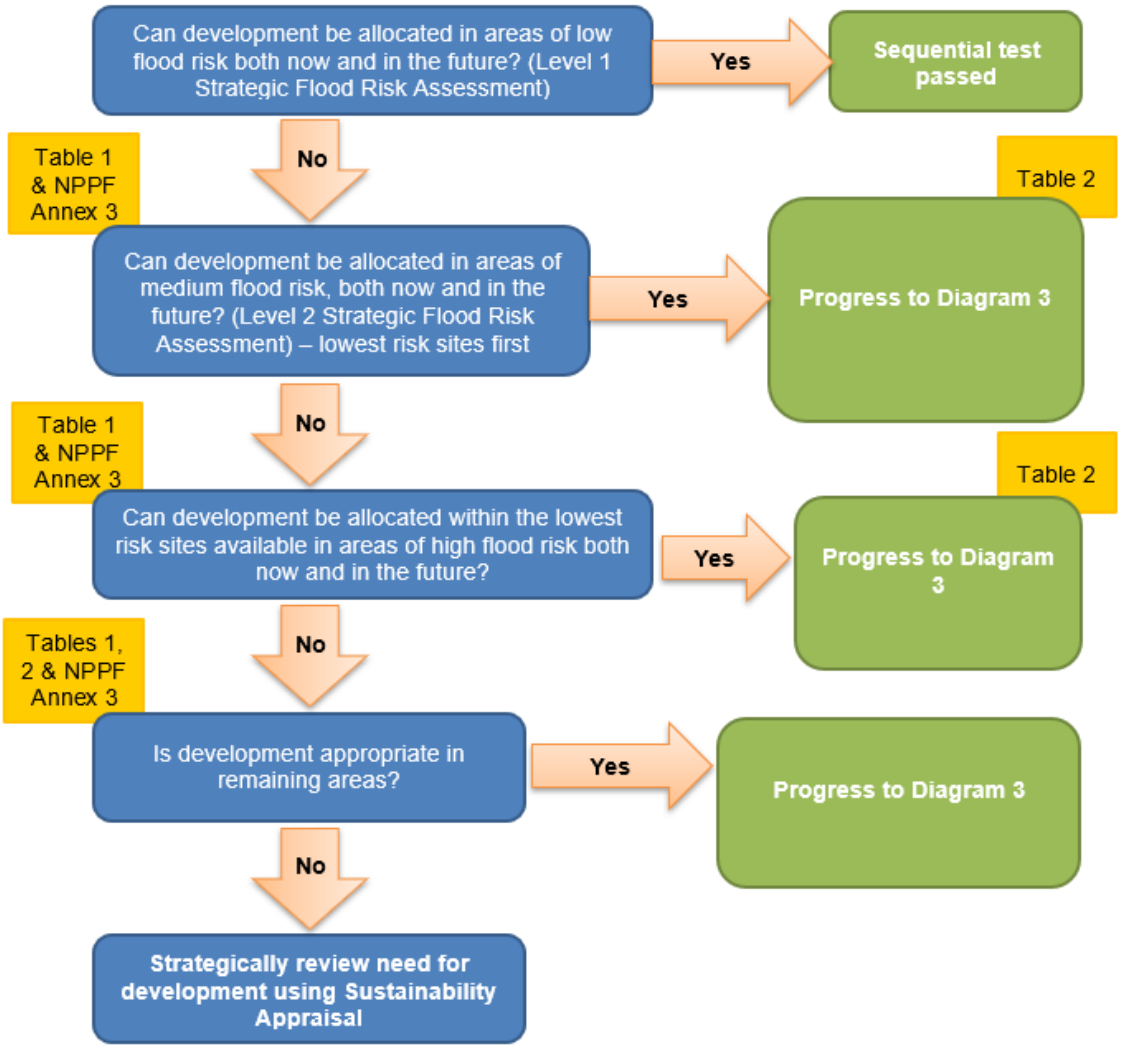

Figure 3-2: Application of the Sequential Test set out in Planning Practice Guidance[1]

Existing groundwater flood mapping is not considered sufficient to inform a sequential approach, as it shows risk of emergence and does not quantify volumes or flows. Any site potentially at risk of groundwater flooding should be screened as part of the L2 SFRA based on a hydrogeological understanding of 'actual' groundwater flood risk. This approach also applies to sites potentially at risk of reservoir flooding.

1 Planning Practice Guidance Paragraph 025, Diagram 2: https://www.gov.uk/guidance/flood-risk-and-coastal-change#the-sequential-approach-to-the-location-of-development (accessed 08 Feb 2023)

It is considered that the data quality of sewer flood risk is insufficient to adopt a sequential approach to development although these risks will be considered, where appropriate to inform the exception test.

3.2.3 The Exception Test

It will not always be possible for new development to be located on land that is not at risk from flooding. To further inform whether land should be allocated, or Planning Permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test may be required.

The Exception Test should only be applied following the application of the Sequential Test. It applies in the following instances:

- More vulnerable development in Flood Zone 3a (this is NOT permitted in Flood Zone 3b)
- Essential infrastructure in Flood Zone 3a or 3b
- Highly vulnerable development in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b)

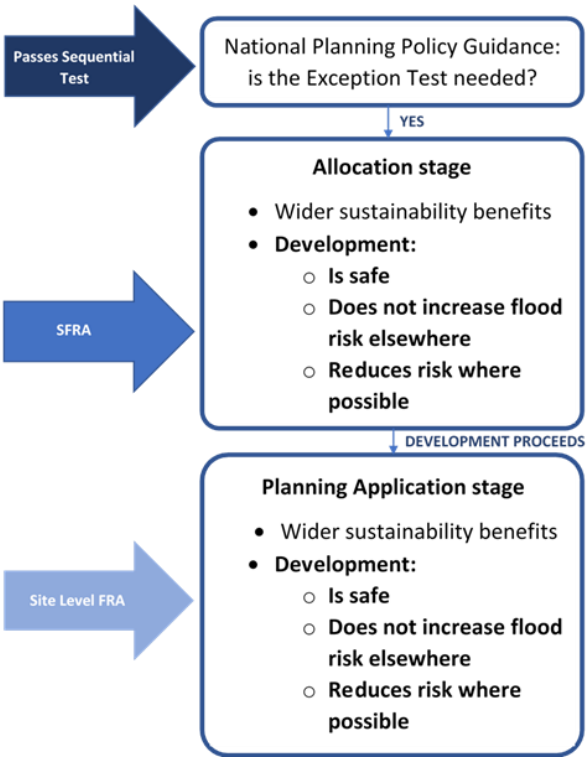

Figure 3-3 summarises the Exception Test.

For sites allocated within the Local Plan, the council should use the information in this SFRA to inform the Exception Test. At planning application stage, the applicant must design development that is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

For developments that have not been allocated in the Local Plan, following application of the Sequential Test and having regard to vulnerability of the development to flood risk, developers may also need to undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 1 SFRA can be

used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

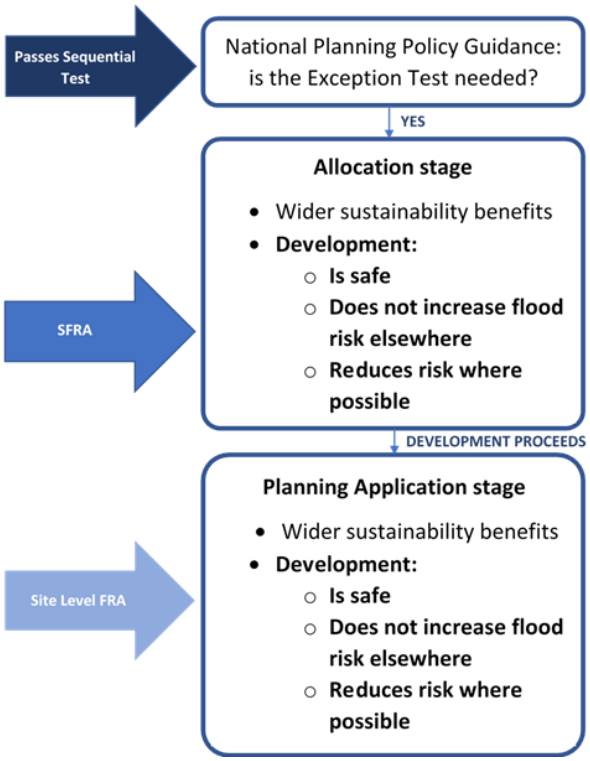

Figure 3-3: The Exception Test

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

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

The council will need to consider what criteria it uses to assess whether this part of the Exception Test has been satisfied and decide what evidence is needed to demonstrate that it has been passed. When considering an allocation through a local plan or taking a decision on a planning application the council should consider whether the use of planning conditions, planning obligations or specific policy requirements could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and the council would need to decide whether to make the allocation or refuse planning permission.

At the stage of allocating development sites, the council should consider wider sustainability objectives, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

The council should consider the sustainability issues the development will address and how doing so will outweigh the flood risk concerns for the site, e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

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

A Level 2 SFRA is likely tocould be needed to inform the Exception Test in these circumstances for strategic allocations. At Planning Application stage, a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.2.4 Making a development safe from flood risk over its lifetime

Local Planning Authorities will need to consider the actual and residual risk of flooding and how this will be managed over the lifetime of the development:

- The actual risk is the risk to the site considering existing flood mitigation measures. The 1% annual probability of fluvial flooding event should be used as a design standard when assessing the suitability of development and any mitigation measures.
- Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.
- Residual risk is the risk that remains after the effects of flood defences have been taken into account and / or from a more severe flood event than the design event. The residual risk can be:
    - The effects of an extreme 0.1% chance flood in any year event. Where there are defences this could cause them to overtop, which may lead to failure if this causes them to erode; and/or
    - Structural failure of any flood defences, such as breaches in embankments or walls.

Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage it does, should water enter a property. Emergency plans should also account for residual risk, e.g. through the provision of flood warnings and a flood evacuation plan where appropriate.

In line with the NPPF, the impacts of climate change over the lifetime of the development should be taken into account when considering actual and residual flood risk.

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

3.3.1 Sequential Test

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

Developers are required to undertake and submit a Sequential Test with applications for all development, unless the site is either:

- A strategic allocation and the test has already been carried out by the council as part of the plan making process;
- A change of use (except changes to a caravan, camping or chalet site, or to a mobile home or park home site);
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m2); or

- A development in Flood Zone 1, unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

The SFRA contains information on all sources of flooding and taking into account the impact of climate change. This should be considered when a developer undertakes the Sequential Test, including the consideration of reasonably available sites at lower flood risk.

Local circumstances, including the supporting text of the emerging local plan, should be used to define Sequential Test area of search (where the council will expect the applicant to determine whether there are any reasonably available alternative sites at a lower flood risk). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear e.g. school catchments, in other cases it may be identified by other Local Plan policies. For some sites e.g. regional distribution sites, it may be suitable to widen the search area beyond administrative boundaries. (The supporting text of the emerging Dorset Council Local Plan provides guidance on defining the areas of search when undertaking the Sequential Test).

The sources of information on reasonably available sites may include:

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

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

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

The SFRA User Guide (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

3.3.2 The 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 may then need to be be applied if required (as set out in Table 3 of the NPPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations) where this has not been undertaken through the Local Plan process. (The advice in paragraphs 3.2.3 and 3.2.4 of this SFRA is also relevant when considering the application of The Exceptions Test to planning applications).

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

- Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk
- Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.
- Applicants should detail the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

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

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

  - The design 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, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
  - Any funding arrangements required for implementing measures.

4 Impact of climate change

Climate change projections show an increased chance of warmer wetter winters and hotter drier summers with a higher likelihood of more frequent and intense rainfall. These changes are likely to increase the incidences of severe flooding.

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

4.1 Revised Climate Change Guidance

The Climate Change Act 2008 creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050. Planning policy and decisions on planning applications have roles in mitigating climate change and adapting to its impacts. Section 19 (1A) of the Planning and Compulsory Purchase Act 2004 also states 'Development plan documents must include policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change.'

The Environment Agency published **updated climate change guidance** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances) in 2021 on how allowances for climate change should be included in both strategic and site specific FRAs for use in planning applications. The guidance adopts a risk-based approach considering the vulnerability of the development. This updated guidance reflects the latest projections within the 2018 new UK Climate projections (UKCP18) with regards to updated fluvial and rainfall allowances. Developers should check on the government website for the most recent guidance before undertaking a detailed Flood Risk Assessment.

4.2 Applying the climate change guidance

To apply the climate change guidance, the following information needs to be known:

- The vulnerability of the development – see the **NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#making-development-safe-from-flood-risk).
- The likely lifetime of the development – in general 100 years is used for residential development. Lifetime of a non-residential development depends on its specific characteristics. Usually for a commercial development this is 60 years, but this needs to be confirmed at site-specific FRA stage.
- The River Basin that the site is in – Dorset is situated in the South West River Basin District.
- 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).
- The 'built in' resistant / resilience measures used, for example, raised floor levels
- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

4.3 Peak river flows

Climate change is expected to increase the frequency, extent and impact of flooding, reflected in peak river flows. Wetter winters and increased rainfall may increase fluvial flooding and surface water runoff. There may also be increased rainfall intensity during summer periods. 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 a 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 95th 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. Maps showing the extent of Management Catchments **are published by the Environment Agency** (https://www.gov.uk/government/publications/map-of-water-management-catchments).

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

- The '2020s' (2015 to 2039)
- The '2050s' (2040 to 2069)
- The '2080s' (2070 to 2125)

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**.

Updated peak river flow allowances (taking account of UKCP18 projections) were published by the Environment Agency in July 2021. Developers should consult the **climate change allowances guidance website** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances) for details of the most up-to-date allowances. Where additional climate change modelling has been undertaken, the new allowances have been used. Developers should review the climate change allowance online to understand which allowances may apply to their sites.

4.4 Relevant allowances for Dorset

Table 4-1 shows the peak river flow allowances that apply in Dorset for fluvial flood risk.

Table 4-4 shows the peak rainfall intensity allowances that apply in Dorset for small catchments (less than 5km^2) and urban drainage catchments for surface water flood risk (based on a 1961 to 1990 baseline). Catchment which are larger than 5km^2 or are rural should use Table 4-1 for peak rainfall intensity. Both the central and upper end allowances should be considered to understand the range of impact.

Table 4-1: Peak river flow allowances for the Dorset Management Catchment

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	37%	58%	103%
Higher central	25%	35%	63%
Central	19%	25%	47%

Table 4-2: Peak river flow allowances for the Hampshire Avon Management Catchment

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	33%	52%	102%
Higher central	19%	27%	56%
Central	12%	16%	38%

Table 4-3: Peak river flow allowances for the South and West Somerset Management Catchment

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	29%	45%	82%
Higher central	18%	26%	50%
Central	12%	17%	37%

Table 4-4: Peak rainfall intensity allowances for small and urban drainage catchments

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

4.5 Representing climate change in the Level 1 SFRA

Climate change modelling for the watercourses in the study area was undertaken based on the EA's climate change guidance.

Existing EA hydraulic models were obtained, and where these had not already been run with the latest climate change allowances, these were run (where possible) for the 2080s period for all three updated 2080s allowance categories (relevant to the Dorset Management Catchment, so 100-year +47%, +63% and +103%). As part of the Level 1 SFRA, the following models have been updated with the new allowances:

- Bridport;
- Crane and Moors;
- River Frome;
- Gillingham.

Whilst an attempt was made to update the Lower Stour model, this resulted in instabilities and as a result no outputs for this were produced. Additionally, the Risk of Flooding for Surface Water mapping has been updated with allowances for climate change. It is understood that Dorset Council is currently undertaking tidal modelling in Weymouth as part of its Level 2 SFRA.

The risks from some sources of flooding have not yet been modelled and in other instances it has not been possible to update existing modelling with the latest climate change allowances. In these instances, this SFRA estimates the effects of climate change on existing flood extents and cross references modelling to estimate these risks. Flood Zone 2 was used as an indicative climate change extent. This is appropriate given the 100-year flows with an allowance for climate change are often similar to the Flood Zone 2 extents; therefore, the impacts of climate change would be minimal.

The 1,000-year surface water extent can also be used as an indication of surface water risk, and risk to smaller watercourses, which are too small to be covered by the EA's Flood Zones.

Developers will need to undertake a more detailed assessment of climate change as part of the planning application process when preparing Flood Risk Assessments, using the percentage increases which relate to the proposed lifetime and the vulnerability classification of the development. In areas where no modelling is present, this may require development of a 'detailed' hydraulic model, using channel topographic survey. The EA or LLFA should be consulted to provide further advice for developers on how best to apply the new climate change guidance.

It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity and hazard may increase compared to the 100-year current-day event.

When undertaking a site-specific Flood Risk Assessment, developers should:

- Confirm which national guidance on climate change and new development applies by visiting **GOV.uk** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances).
- Apply this guidance when deciding the allowances to be made for climate change, having considered the potential sources of flood risk to the site (using this SFRA), the vulnerability of the development to flooding and the proposed lifetime of the development. If the site is just outside the indicative climate change extents in this SFRA, the impact of climate change should still be considered because it may get affected should the more extreme climate change scenarios materialise.

- Refer to the SFRA User Guide (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment).

4.6 Impact of climate change on flood risk

This section explores which areas of the Dorset Council Area are most sensitive to increases in flood risk due to climate change. It should be noted that areas that are already at high risk will also become at increasing risk in future and the frequency of flooding will increase in such areas.

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

4.6.1 Impact of climate change on fluvial flood risk

Climate change modelled flood extents (or Flood Zone 2 where no modelling exists) can be compared to the 100-year flood extent (Flood Zone 3a) for an indication of areas most sensitive to climate change.

Areas most sensitive to fluvial impacts of climate change are:

- Areas surrounding Poole Harbour, such as Wareham and Upton.
- Areas around the River Stour (Stalbridge to Wimborne Minster) and River Frome (West Chelborough to Wareham) and tributaries of both.
- Along the River Crane from Verwood to Ferndown towards the east of the county.
- The River Brit from Beaminster to Bridport.

Sensitivity has been assessed with regard to change between the present day and climate change flood extents and with regard to future development in Dorset.

4.6.2 Impact of climate change on surface water flood risk

In the absence of modelling surface water risk with climate change uplifts, the 1,000-year surface water flood extent can be used as an indication of climate change (as well as for smaller watercourses; some of which are not included in the Flood Zones).

Areas in Dorset most sensitive to changes between the 100-year and 1,000-year surface water extents are:

- Highly urbanised areas with a large proportion of impermeable surfaces.
- Highways and pathways.
- Low relief areas.

4.6.3 Impact of climate change on groundwater flood risk

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

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended.

4.7 Adapting to climate change

The **NPPG Climate Change guidance** (https://www.gov.uk/guidance/climate-change) contains information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses; and
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. The Council and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option, such as at defended locations.

It is recommended that the differences in flood extents from climate change are compared by the Council when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access / egress and how much land could still be developable overall. Recommendations for development are made for the levels of risk in the SFRA User Guide (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment).

5 Understanding flood risk in Dorset

This chapter explores the key sources of flooding in the district and the factors that affect flooding including topography, soils and geology. The main sources of flooding are from watercourses, surface water and sewers.

This is a strategic summary of the risk in Dorset. Developers should use this chapter to scope out the flood risk issues they need to consider in greater detail in a site-specific Flood Risk Assessment to support a Planning Application. A full breakdown of flood risk to individual settlements in Dorset can be found in Appendix C.

5.1 Historical flooding

The Environment Agency and Dorset Council hold records of recorded historical flood events. There is a history of documented flood events, with the main sources being fluvial, groundwater and surface water. Table 5-1 highlights a number of historic flood events that are based off the EA Historic Flood Map.

Table 5-1: The Environment Agency's Historic Flood Map

Location	Date	Additional information recorded
East Hill, Charminster	04/01/2014	Channel capacity exceeded (no raised defences)
Bridport Lyme Regis, Beaminster, Charmouth	2012	Fluvial/ surface water
The Street, Charmouth	27/01/2014	Local drainage/surface water
Brandy Lane, Chiswell	05/01/2014	Overtopping of defences
Hibberdsfield, Cranborne	06/01/2014	Channel capacity exceeded (no raised defences)
Drake's Lane, Cheselbourne	30/12/2006	Channel capacity exceeded (no raised defences)
Mill Lane, Durweston	24/12/2013	Channel capacity exceeded (no raised defences)
Wriggle Chetnole	07/07/2012	Channel capacity exceeded (no raised defences)
Gladelands Park, Ferndown	24/12/2013	Channel capacity exceeded (no raised defences)
North Street, Fontmell Magna	01/01/2014	Local drainage/surface water
Hammoon Manor	24/12/2013	Channel capacity exceeded (no raised defences)
Longham	25/12/2013	Channel capacity exceeded (no raised defences)
Dorchester Road, Maiden Newton	24/12/2014	Channel capacity exceeded (no raised defences)
Blandford Hill, Milborne St Andrew	20/02/2014	Channel capacity exceeded (no raised defences)

Location	Date	Additional information recorded
Bridge Street, Netherbury	04/01/2014	Channel capacity exceeded (no raised defences)
North Wessex Brue Parrett Yeo	26/03/2009	Overtopping of defences
The Moor, Puddletown	06/01/2013	Channel capacity exceeded (no raised defences)
Beech Close, Spetisbury	01/01/2014	Channel capacity exceeded (no raised defences)
River Stour at Sturminster Marshall	11/02/2009	Channel capacity exceeded (no raised defences)
Hod Drive, Stourpaine	24/12/2013	Channel capacity exceeded (no raised defences)
Mill Lane, Sturminster Marshall	24/12/2013	Channel capacity exceeded (no raised defences)
Common Lane, Sturminster Newton	24/12/2013	Channel capacity exceeded (no raised defences)
Shore Road, Swanage	05/02/2014	Overtopping of defences
Meadow Way, Verwood	23/12/2013	Channel capacity exceeded (no raised defences)
Shatter's Hill, Wareham	07/02/2014	Channel capacity exceeded (no raised defences)
Riverside Road, West Moors, Ferdown	25/12/2013	Channel capacity exceeded (no raised defences)
The Acorns, Wimborne Minster	23/12/2013	Channel capacity exceeded (no raised defences)
Whatcombe Lane, Winterborne Clenston	18/02/2014	Groundwater/High Water table
Manor, Farm Lane, Winterbourne Abbas	07/01/2014	Groundwater/High Water table
Higher Wraxhall	23/01/2014	Unknown

5.2 Topography, geology, soils and hydrology

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

5.2.1 Topography

The topography of Dorset is characterised by a ridge of high ground roughly 10km from the southern coastline, running parallel to the coast. Highest elevations reach 260m in the centre of Dorset. Elevations are much lower towards the coast at the southern extent of the area where elevations are around 20m.

The topography of Dorset is shown by Figure 5-1.

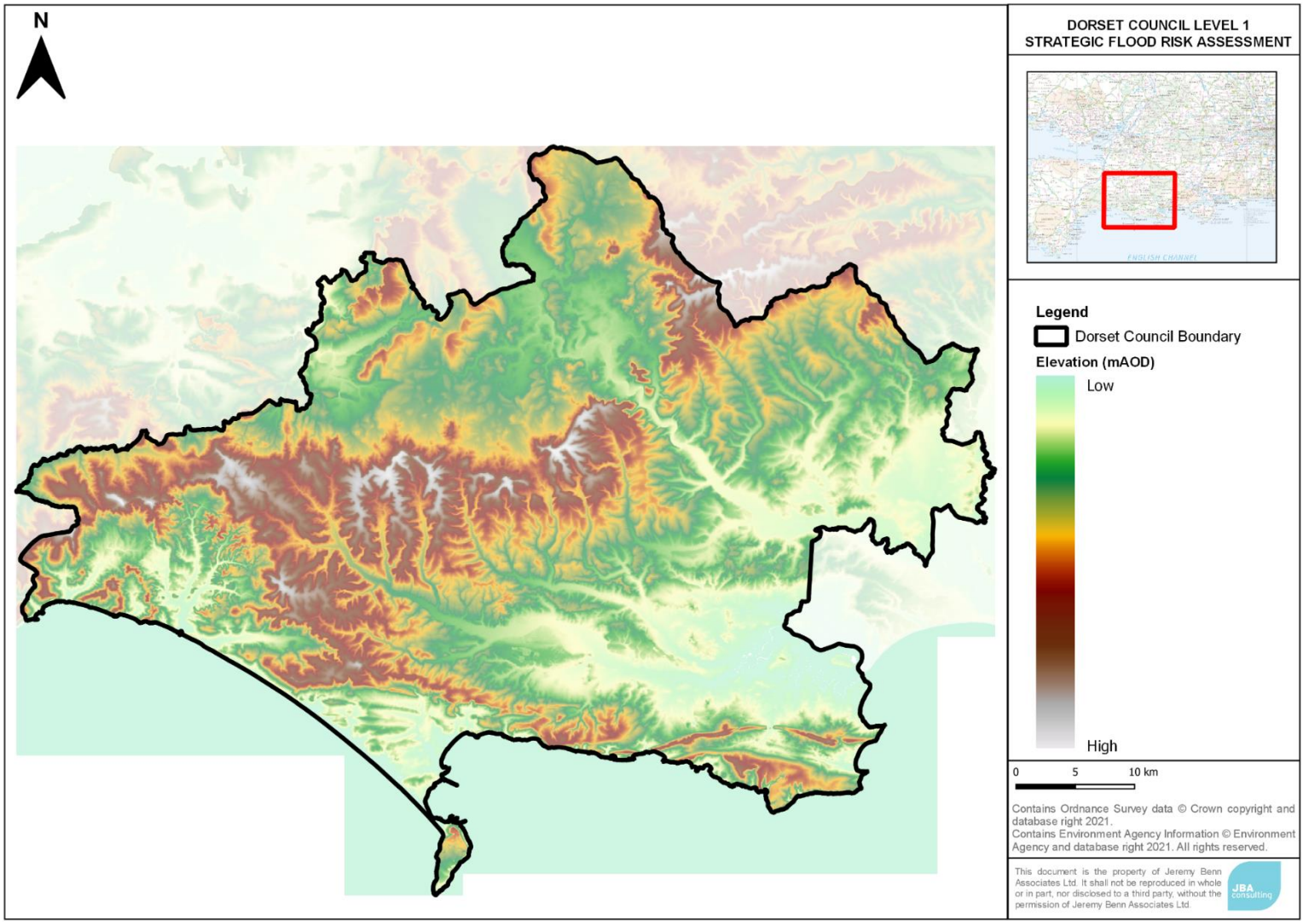

Figure 5-1: Topography of Dorset

5.2.2 Geology

The underlying geology of Dorset is from the Triassic through to the end of the Cretaceous period with the most notable group being the Cretaceous chalk which runs from along the central and north-eastern extent of the study area. This chalk is highly permeable and is a key aquifer unit. As such, it is typically associated with areas at risk of groundwater flood risk in the county such as South Winterbourne.

The area is predominantly composed of sedimentary units. The bedrock in the south of Dorset is made up of east-west orientated bands of Kimmeridge Clay, the Kellaways Formation (mudstone, siltstone and sandstone), Oxford Clay the Corallian group (limestone, sandstone, siltstone and mudstone) and the Great Oolite Group (sandstone, limestone and argillaceous rocks). Towards the West of Dorset the bedrock is predominantly composed of the Lias Group (mudstone, siltstone and sandstone). The bedrock geology is shown in

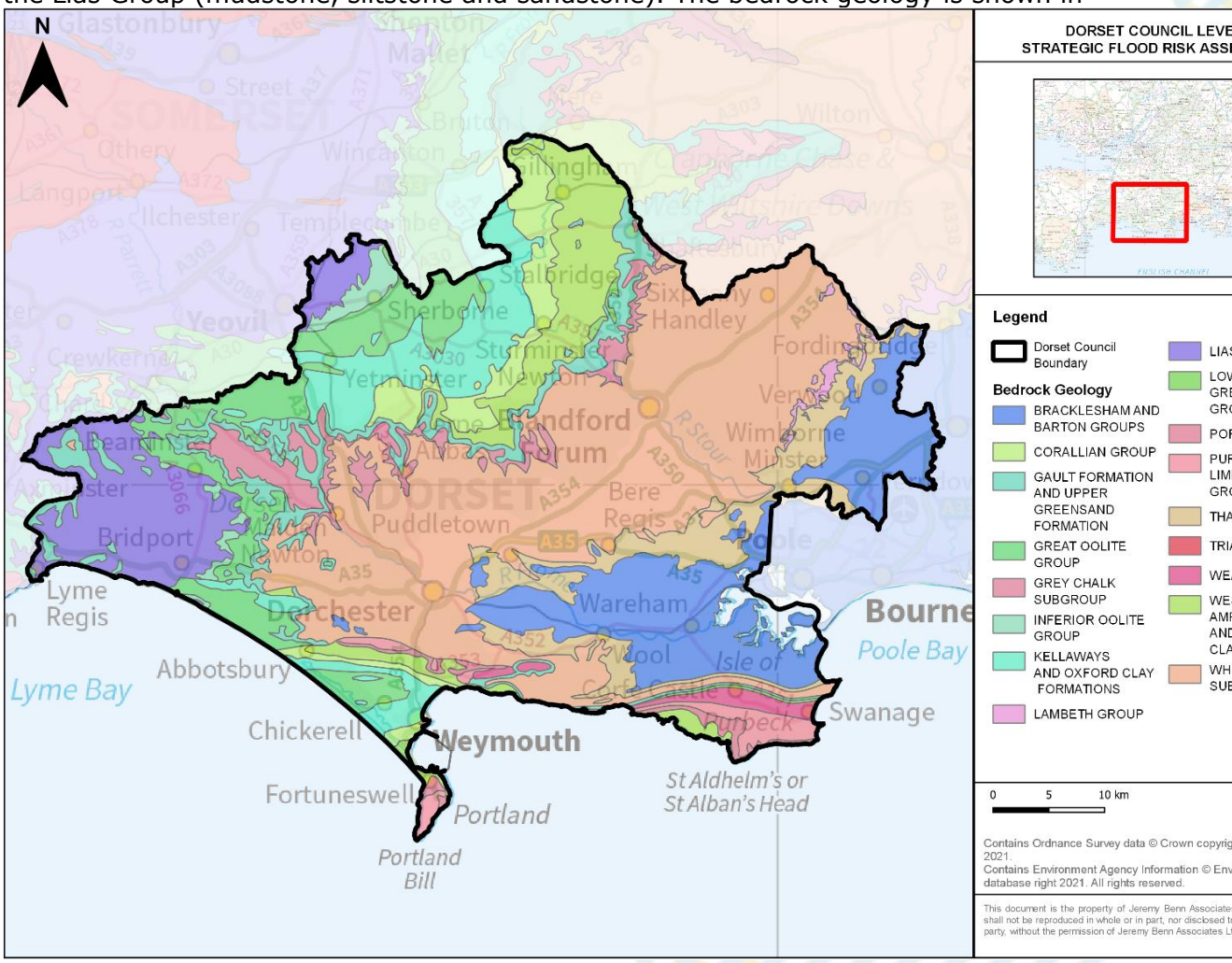

Figure 5-2.

Superficial geology in the area is mostly Clay with Flints formation (diamicton). Other superficial deposits include sand and gravel river terrace deposits, clay, sand and silt alluvium and unclassified landslide deposits. The superficial geology is shown in

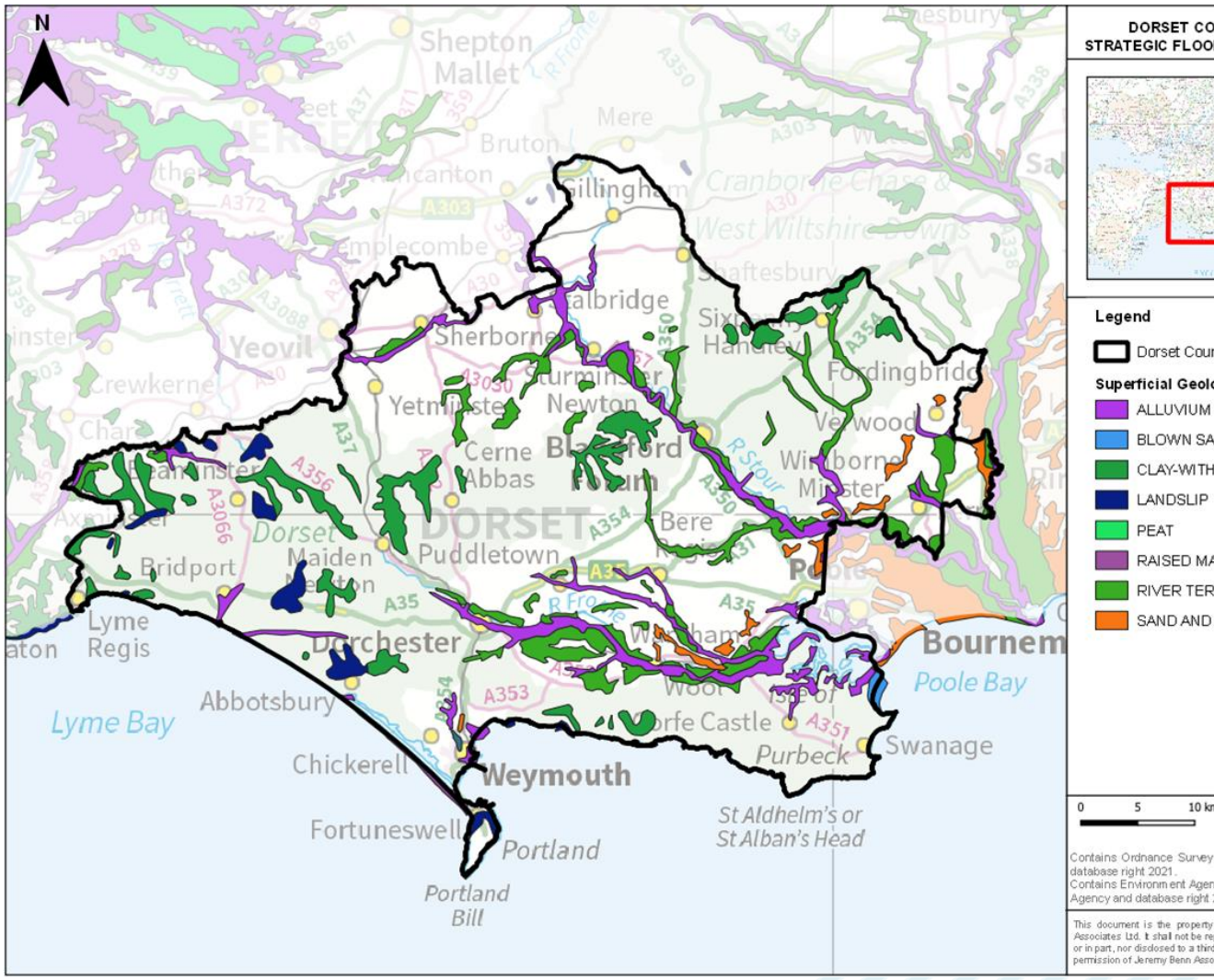

Figure 5-3.

5.2.3 Soils

The floodplains around the Rivers Frome and Stour consist of loamy and clayey soils with naturally high groundwater. The soils around the River Frome are shallow lime-rich soils over chalk and limestone and around the River Stour they are very acid sandy and loamy soils. Towards the northern and southern extents of the study area, soils are slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. Around Poole Harbour, in the east of Dorset there are naturally very wet acid sandy and loamy soils. Towards Bridport, at the western edge soil is more freely draining in comparison. Soils are shown in Figure 5-4.

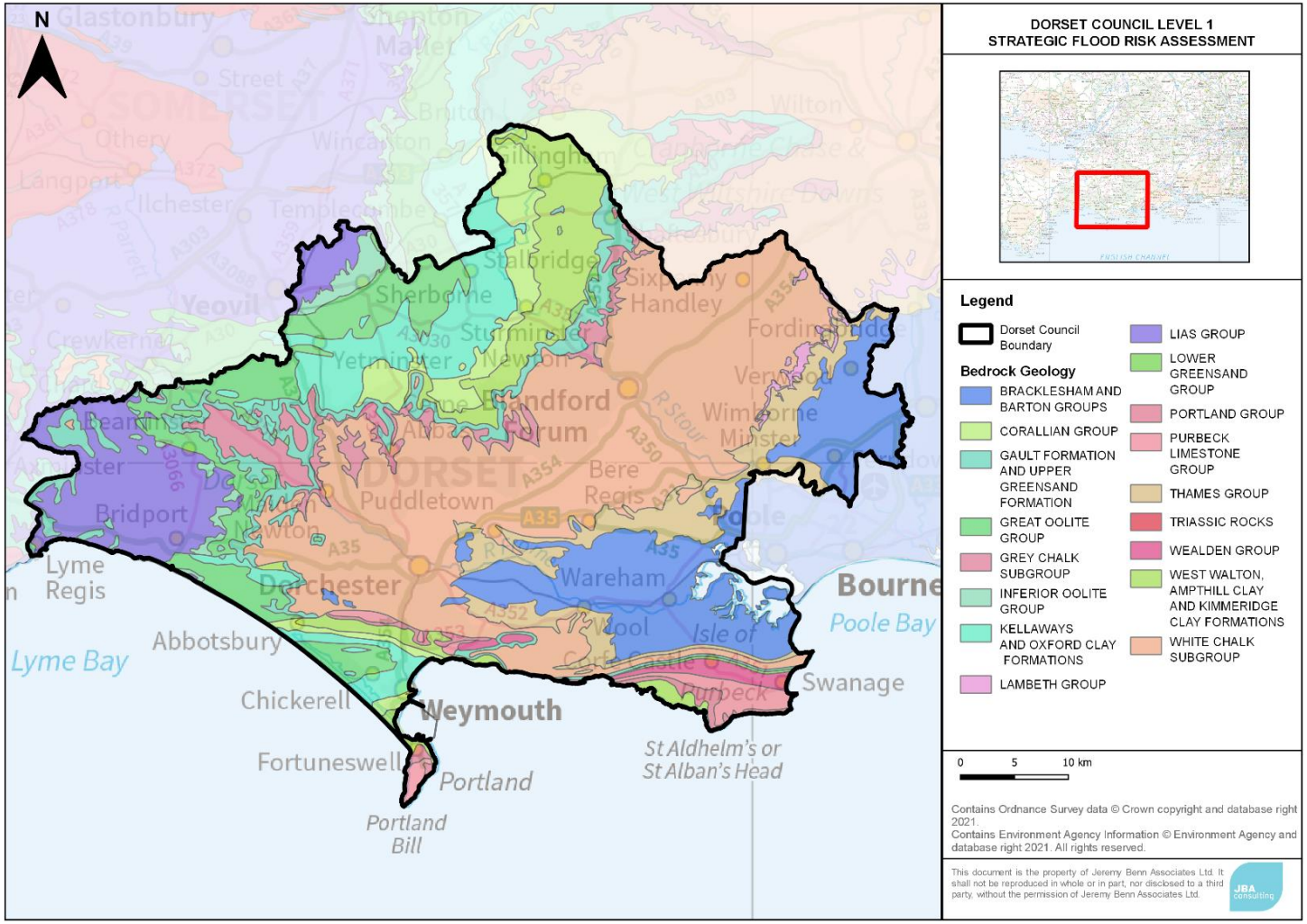

Figure 5-2: Bedrock geology of Dorset

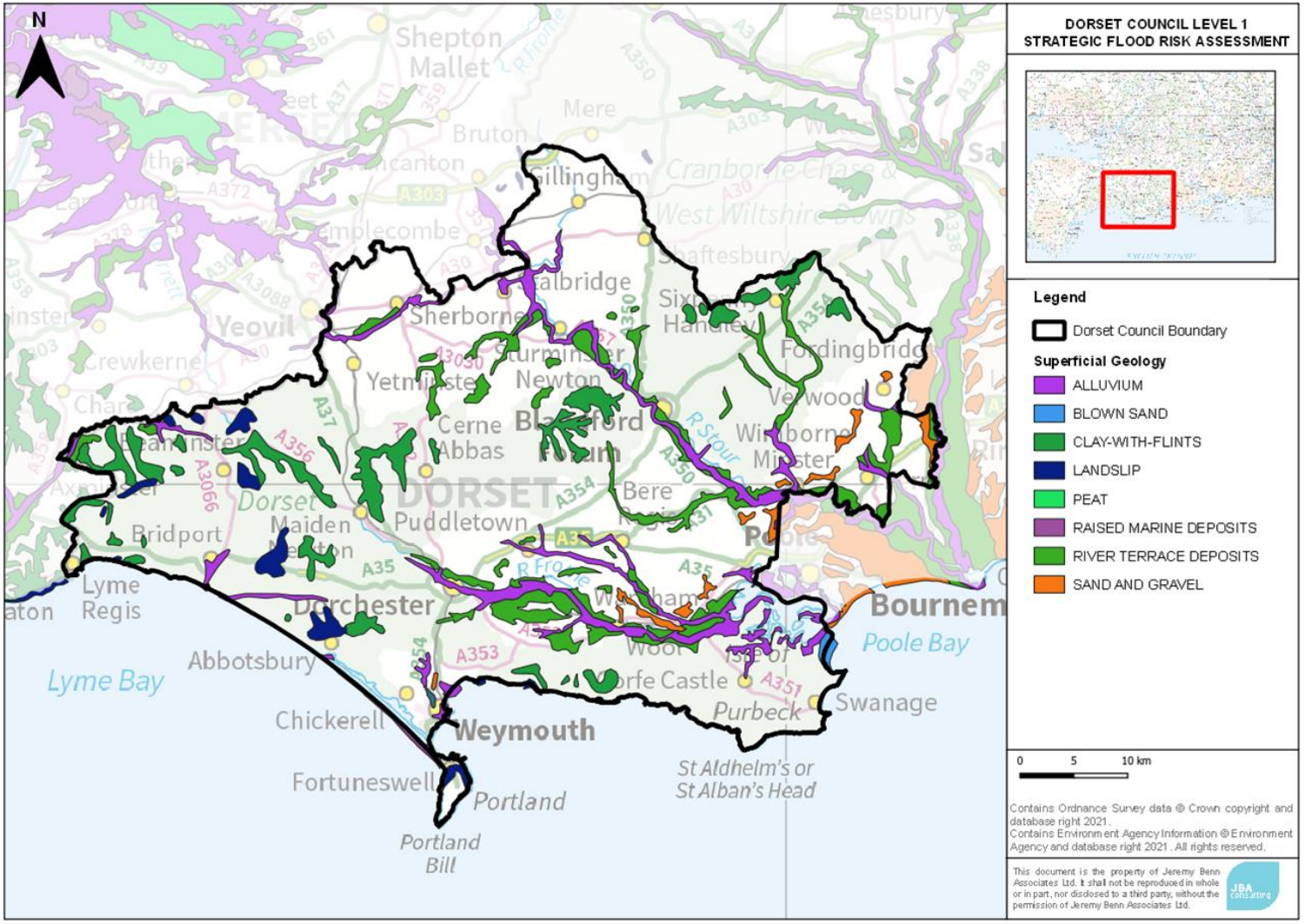

Figure 5-3: Superficial geology of Dorset

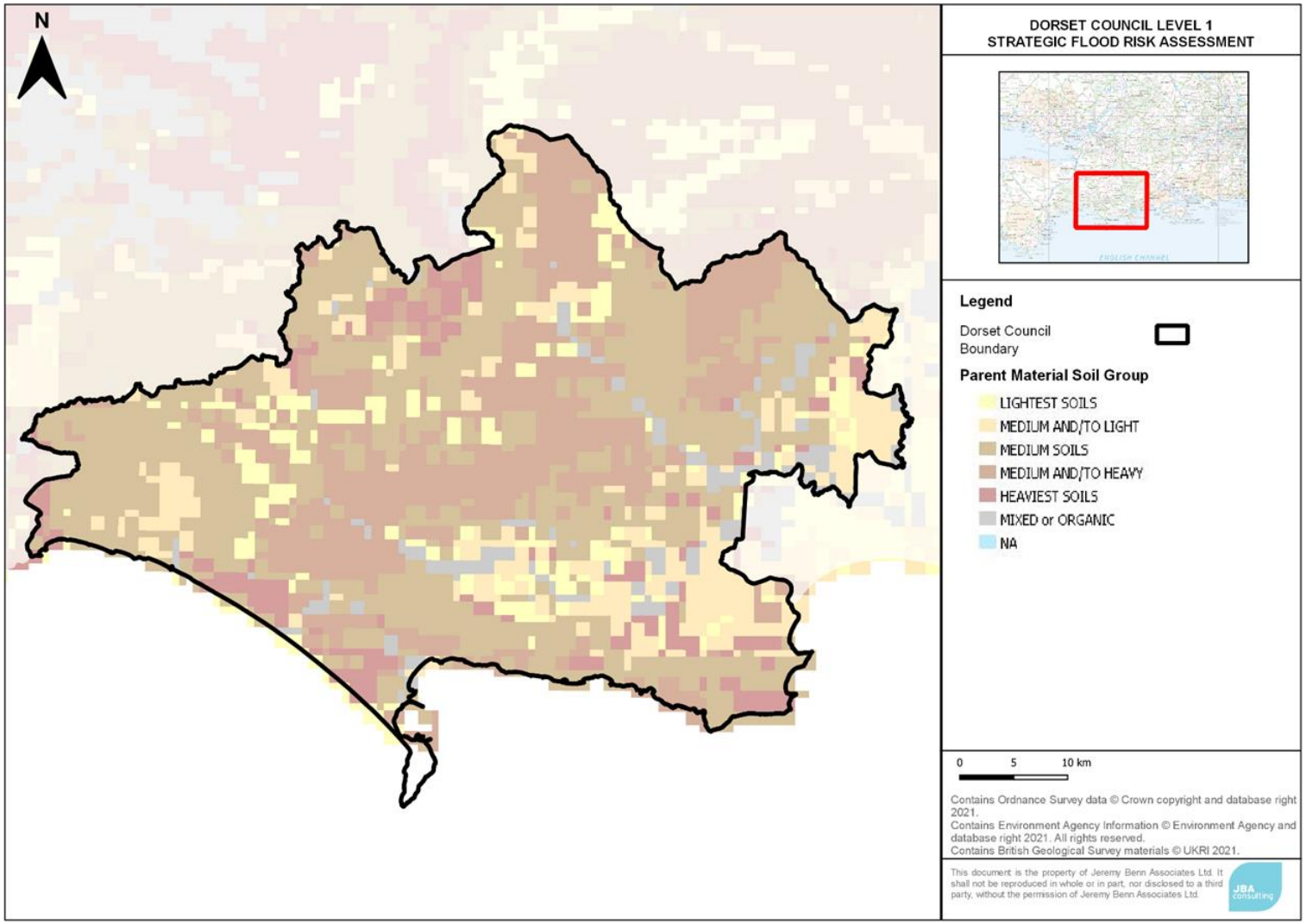

Figure 5-4: Soil surface of Dorset

5.3 Hydrology

The principal watercourses flowing through the SFRA area are:

- River Stour
- River Frome
- River Avon
- River Piddle
- River Winterborne
- River Brit
- River Bride

There are a number of tributaries of these main watercourses, including the River Wey, the River Cale, the River Axe, the River Parrett, the River Cerne, the River Yeo, the River Allen, the River Lydden, the River Hooke, the Wriggle River, the Moors River, the Tarrant, Bere Stream, Sydling Water, and Fontmell Brook that flow through the area. There are some estuaries, ponds and lakes within the study area including Poole Harbour which is located in the southeast of the site. A map of the key watercourses is included in Figure 1-3 (see page 5).

5.4 Fluvial flood risk

The most prominent fluvial flood risk in Dorset is along the River Stour and River Frome, and the tributaries of both rivers such as the River Allen. A higher fluvial flood risk occurs at the confluence between watercourses. The area towards the south of Dorset is at high risk due to drainage of many of the larger rivers southwards towards the coast.

A high flood risk also occurs along the:

- River Piddle
- River Brit
- River Allen
- River Cale
- River Wey
- Wriggle River

These rivers pass through or near to larger urban areas which poses a higher risk to people and property within the region. There are also many smaller tributaries and brooks throughout the region that pose a lower flood risk, the many of which are unnamed watercourses. The areas that these smaller watercourses affect are predominantly rural owing to the high agricultural land use of the area.

In addition to flood risk shown by the flood risk mapping, there are a number of small watercourses and field drains which may pose a risk to development. Flood Zone mapping (where more detailed modelling investigations are not available) has only been prepared for watercourses with a catchment greater than 3km^2. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. As part of a site-specific Flood Risk Assessment, the potential flood risk and extent of Flood Zones should be refined for these smaller watercourses and this information used as appropriate to perform the Sequential and Exception Tests. The Risk of Flooding from Surface Water (RoFSW) mapping can be used to indicate where this is likely to be an issue.

5.5 Tidal flood risk

Tidal flooding is caused by extreme tide levels exceeding ground and/or defence level. The south of Dorset is directly bordered by the English Channel, which poses a huge tidal flood risk to the south of the county. Lyme Bay is located along the south-west boundary of the study area and is the source of tidal flood risk to settlements such as West Bay, and up to the A35 south of Bridport which is the tidal limit. To the south of Dorset is Weymouth Bay, which poses tidal risk to Weymouth and the Isle of Portland. To the south-east lies Poole Bay, which is the source of tidal flooding to towns such as Swanage and Wareham.

It should be noted that in some areas where surface water drainage discharges into the sea, or into tidally influenced rivers there may be flood risks associated with tide locking where surface water drainage may be unable to discharge runoff due to tidal levels. This could include settlements such as Bridport, which although not at risk of tidal flooding itself, is situated close to the tidal boundary of the River Brit. This is also the case in Weymouth and Wareham, where tidal flood risk can occur in combination with fluvial and surface water sources and can exacerbate flood risk.

The following communities are considered to be at greatest risk of tidal flooding in Dorset:

- Weymouth;
- West Bay;
- Lyme Regis;
- Wareham;
- Upton; and
- Swanage.

5.6 Surface water flooding

Surface water runoff (or 'pluvial' flooding) is most likely to be caused by intense downpours e.g. thunderstorms. At times the amount of water falling can completely overwhelm the drainage network of low-lying areas, which are not designed to cope with extreme storms. The flooding can also be complicated by blockages to drainage networks, sewers being at capacity and/ or high-water levels in watercourses that cause local drainage networks to back up.

The Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) shows that a number of communities across Dorset are at risk of surface water flooding. Surface water predominantly follows topographical flow paths of existing watercourses or dry valleys, starting in topographic highs and ponding in low-lying areas. In the vast majority of cases the risk is confined to roads. There are several run-off flow routes around properties, such as properties situated at the foot of topographic highs. Caution should be given to these dwellings.

The updated Dorset Council Local Plan acknowledges the need to reduce the impact of surface water flooding within the region e.g. to land stability and drainage systems. This can be achieved by increasing the use and efficiency of Sustainable Drainage Systems (SuDS).

5.7 Groundwater flooding

In general, less is known about groundwater flooding than other sources. Groundwater flooding can be caused by:

- High water tables, influenced by the type of bedrock and superficial geology

- Seasonal flows in dry valleys, which are particularly common in areas of chalk geology
- Rebounding groundwater levels, where these have been historically lowered for industrial or mining purposes
- Where there are long culverts that prevent water easily getting into watercourses

Groundwater flooding is different to other types of flooding. It can last for days, weeks or even months and is much harder to predict and warn for. Groundwater monitoring does occur in certain areas, and the Environment Agency does provide flood warnings and flood alerts for groundwater flooding in Dorset. This includes Dorchester, Wareham, Sherborne and Blandford Forum, South Winterborne,and Cerne Abbas

The **British Geological Survey** (https://www.bgs.ac.uk/research/groundwater/flooding/home.html) provides further information on groundwater flooding on their website.

5.8 Sewer flooding

Sewer flooding occurs when intense rainfall/river flooding overloads hydraulic capacity (surface water, foul or combined), and/or when the urban drainage system cannot discharge to watercourses due to high water levels. Therefore, sewer flooding can occur in any location where there is a sewer system in place.

Sewer flooding can also be caused by blockages, collapses, equipment failure/damage or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that sewers will be overwhelmed in larger rainfall and flood events often considered when looking at river or surface water flooding (e.g. a 1 in 100 chance of occurring in any given year (1% AEP)). Existing sewers can also become overloaded as new development adds to the surface water discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area, particularly in increasingly urbanised areas.

Flood risk can be reduced in some areas by flood alleviation schemes and increased drainage capacity. Drainage area plans can be used to examine where improvements to sewer systems can take place.

5.9 Flooding from reservoirs

Reservoirs with an impounded volume greater than 10,000 cubic metres are governed by the **Reservoir Act 1975** (https://www.legislation.gov.uk/ukpga/1975/23) and are on a register held by the Environment Agency. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low and is considered a 'residual risk'. Legislation under the **Flood and Water Management Act** (https://www.legislation.gov.uk/ukpga/2010/29/contents) requires the Environment Agency to designate the risk of flooding from these reservoirs.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. 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 is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The Environment Agency hold mapping showing what might happen if reservoirs fail. Developers and planners should check the **Long-Term Risk of Flooding website** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=504825&northing=249317&address=100081210838&map=RiversOrSea) before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. Existing or new hydraulic models in locations where there are reservoirs should represent the effect of reservoirs, for example the attenuation effect on flood response, which will either be represented in the hydrology or as part of the model itself.

The current **flood warning information service** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) mapping shows that there are several reservoirs within Dorset and a few outside of the region which cause flooding within Dorset for example due to changes in topography. Major reservoirs which pose a risk in Dorset are detailed in Table 5-2.

Table 5-2: Reservoirs with potential risk to Dorset Council area

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?
Cerne Abbas Lakes	365981, 102726	Environment Agency	Dorset Council	Yes
Crichel Lake Reservoir	399604, 107777	Private ownership	Dorset Council	Yes
Sutton Bingham Reservoir	357790, 105863	Wessex Water	South Somerset District Council	No
Longham Lakes	406129, 97767	South West Water in partnership with Bournemouth Water	Dorset Council	Yes
Blashford Lakes Nature Reserve and Ibsley Water	415045, 108790	Wildlife Trust in partnership with Bournemouth Water, New Forest District Council and Wessex Water	Hampshire County Council	No
Sherborne Lake	365300, 116500	Sherborne Castle Estates	Dorset Council	Yes
Swinehame Farm Reservoir	393763, 88025	Private	Dorset Council	Yes
The Plantation Reservoir	387514, 89502	Private	Dorset Council	Yes

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?
Pallington Lakes	378343, 91202	Private	Dorset Council	Yes
Turner's Paddock Lake, New Lake and Garden Lake	377085, 133683	Private	Wiltshire Council	No
Swanage No.1 Flood Detention Reservoir	401627, 79373	Environment Agency	Dorset Council	Yes
Swanage No.2 Flood Detention Reservoir	401534, 79390	Environment Agency	Dorset Council	Yes

5.10 Flood Alert and Flood Warnings

The Environment Agency is the lead organisation for providing warnings of main river and tidal flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zone 2. Flood Warnings can also be received by people outside the FWA as part of an opt in service.

There are currently 24 Flood Alert Areas (FAA) and 96 Flood Warning Areas (FWAs) covering Dorset. Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that 'flooding is possible', and therefore Flood Alert Areas usually cover the majority of Main River reaches. Flood Warnings are issued to designated Flood Warning Areas (i.e. properties within a defined flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge (such as a river gauge or borehole sensor), with a lead time to warn that 'flooding is likely'.

For Dorset, there are specific groundwater flood warning and flood alert areas. These are typically associated with the superficial deposits forming in the valleys.

6 Flood alleviation schemes and assets

This section provides a summary of existing flood alleviation schemes and assets in the Dorset. Planners should note the areas that are protected by defences where further work to understand the actual and residual flood risk through a Level 2 SFRA may be beneficial. Developers should consider the benefit they provide over the lifetime of a development in a site-specific Flood Risk Assessment.

6.1 Asset management

Risk Management Authorities hold databases of flood risk management and drainage assets:

- The Environment Agency holds a national database that is updated by local teams
- The LLFA holds a database of significant local flood risk assets, required under Section 21 of the Flood and Water Management Act (2010)
- Highway Authorities hold databases of highways drainage assets, such as gullies and connecting pipes
- Water and Sewerage Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.

The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific Flood Risk Assessment.

6.2 Standards of Protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 100-year SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.

Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.

It should be noted that the Environment Agency's on-going hydraulic modelling programme may revise flood risk datasets and, as a consequence, the standard of protection offered by flood defences in the area may differ from those discussed in this report.

Developers should consider the standard of protection provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

The Environment Agency and Lead Local Flood Authorities have permissive powers to maintain and improve Main Rivers and Ordinary Watercourses, respectively. There is no legal duty to maintain watercourses, defences or assets and maintenance and improvements are prioritised based on flood risk. The ultimate responsibility for maintaining watercourses rests with the landowner.

Highway Authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g. where there is frequent highway or sewer flooding. Dorset Council as LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect.

There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defences has degraded over time. Drainage networks can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.

Developers should not assume that any defence, asset or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact the relevant RMA about current and likely future maintenance arrangements and ensure future users of the development are aware of their obligations to maintain watercourses.

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-1.

Table 6-1: Grading system used by the Environment Agency to assess flood defence condition

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 are planned to be maintained and/or improved in the future must be considered with respect to the safety and sustainability of development over its intended life and also with respect to the financial and economic commitment to the long-term provision of appropriate standards of protection. In some cases, the relevant strategy may suggest that it is not appropriate to maintain the condition of the assets, which may prove influential for the development over its intended life. In addition, detailed FRAs undertaken by developers (if a defence is influential to the proposed development) 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 in accordance with the policy and strategy for Flood Risk Management.

6.4 Fluvial, tidal and coastal flood defences in Dorset

6.4.1 Fluvial defences

A number of main rivers in Dorset have flood defences along some of their lengths. River defences generally consist of embankments, river control structures, high ground and walls.

According to data from the Environment Agency, the majority of fluvial defences within Dorset are classified 2-3, indicating good to fair conditions. However, there are 16 instances of a section of defences being classed 4 or 5, signalling poor to very poor conditions, and where a significant reduction in performance may occur. These sections are spread throughout the study area.

Notable examples include a section along the Wriggle River, just before its confluence with the River Yeo at Bradford Abbas, along three sections of the River Brit at Bridport upstream of its confluence with the River Asker and again further downstream just before reaching Lyme Bay; a section of the River Wey before entering Weymouth Harbour; and a section of the unnamed watercourse running through Swanage before entering Swanage Bay.

Fluvial flood defences in Dorset offer a standard of protection varying from 50% AEP (2-year flood) to 0.5% AEP (200-year flood).

6.4.2 Tidal and coastal defences

There are several Environment Agency and Dorset Council maintained tidal defence schemes along the Dorset coast. These defences consist of a mix of barrier-beach, cliffs, demountable defences, embankments, flood gates, high ground, promenades, quays and walls.

There are 82 specific pieces of tidal and coastal defence insfrastructure in Dorset. These defences consist of embankments, flood gates, high ground and walls.

When considering defences along the coastline, it is important to differentiate between those which are constructed to protect the coastal frontage from erosion and those which are designed to protect the coast from flood risk from the tide levels in the sea e.g. still water levels exceeding the defence crest, or waves overtopping the defence. However, the vast majority of defence in the Dorset region are designed to protect the coast from flood risk. The defences present are not designed to necessarily fulfil the dual purpose of managing flood risk and coastal protection. However, with climate change, it is likely that many of locations with coastal defences will need to include provision for tidal defence in the future if standards of protection are to be maintained.

According to the Environment Agency, all of the defences' condition are classified 2-3, signalling good to fair conditions. Tidal defences in Dorset offer a standard protection varying from 4% AEP (25-year flood) to 0.5% AEP (200-year flood).

6.5 Major flood risk management assets in Dorset

The Flood Map for Planning contains information on 'Areas Benefiting from Defences' (ABD). This shows areas that benefit from the defences that provide a SoP of at least a 100-year river flood event. It does not show areas that benefit from protection for more frequent events.

However, the Environment Agency 'AIMS' flood defence dataset gives information on all flood defence assets within the area. The following locations benefit from flood defences at a lower (or unknown) standard of protection in Dorset. Flood defences are shown in Figure 6-1.

Table 6-2: Locations shown in the 'EA AIMS' data set

Watercourse	Location	Type	Design SOP	Condition Rating
Bere Stream	Milborne St Andrew to Bere Regis	High ground	2yr	2-3
Bow Brook	Higher Nyland to Lower Nyland	High ground	2yr	2-3
Corfe River	Isle of Purbeck	High ground	2yr	2-3
Fontmell Brook	Fontmell Magna to Hammoon	High ground	2yr	2-3
Moors River	Verwood to St Leonard's Farm Park	High ground	2yr and 20yr	2-3
River Allen	Brockington Farm to Wimborne Minster	Embankment, high ground, wall,	2yr, 50yr and 100yr	2-4
River Asker	Bridport	demountable defence, embankment, flood gate, high ground, wall	2yr, 10yr, 30yr, 50yr and 100yr	1-4
River Bride	Burton Bradstock	Barrier beach, demountable defence, embankment, high ground, wall	2yr and 100yr	2-3
River Brit	Beaminster	Embankment, high ground, wall	2yr and 100yr	2-3
River Cerne	Cerne Abbas to Charminster	Embankment, high ground, wall	2yr, 5yr, 25yr and 100yr	1-3
River Char	Catherston Leweston	High ground	2yr	2-3
River Frome	Sandhills to Maiden Newton	High ground, wall	2yr and 100yr	2-3
River Frome	Dorchester	High ground	2yr, 5yr, 10yr, 20yr, 25yr, 50yr and 200yr	2-3
River Frome	Woodsford to Wareham	Embankment, high ground, wall	2yr, 5yr, 10yr and 200yr	2-3
River Hooke	Toller Porcorum to Maiden Newton	High ground	2yr and 25yr	2-3
River Jordan	Overcombe	High ground, wall	2yr, 75yr and 100yr	2-3
River Lim	Lyme Regis	Cliff, high ground, wall	5yr and 100yr	2-3
River Lodden	Motcombe to Gillingham	High ground	2yr, 5yr, 50yr and 100yr	2-3
River Lydden	Bagber to King's Mill Farm	High ground	2yr	2-3
River Parrett	South Perrott	Embankment, high ground	2yr	3
River Piddle	Piddletrenthide to Wareham	Embankment, high ground, wall	2yr, 50yr and 200yr	1-3
River Stour	Bourton to Wimborne Minster	Demountable defence, embankment, flood gate, high ground, wall	1yr, 2yr, 20yr, 25yr, 60yr, 90yr 100yr, 200yr	2-3
River Wey	Weymouth and Overcombe	Beach, demountable defence, embankment, high ground, promenade, quay, wall	1yr, 2yr, 5yr, 10yr, 25yr 100yr, 200yr and 500yr	2-4
River Win	West Chaldon to East Burton	High ground	2yr	2-3
River Winterborne	Winterborne Houghton to Sturminster Marshall	Embankment, high ground, wall	2yr	2-3
River Yeo	Thornford	Embankment, high ground	2yr and 5yr	2-3
River Yeo	Sherborne	High ground	2yr, 40yr and 100yr	2-3
Sherford River	Lytchett Minster	High ground	2yr	2-3
Shreen Water	Huntingford to Gillingham	High ground, wall	2yr, 5yr, 50yr and 100yr	2-5
Studland Bay	Studland	Beach, wall	25yr and 200yr	3
Sydling Water	Sydling St Nicholas to Grimstone	High ground	2yr	2-3
The Tarrant	Tarrant Gunville to Tarrant Crawford	High ground	2yr	2-3
Uddens Water	West Moors	Embankment, high ground, wall	2yr	2-3
Unnamed watercourse	Swanage	Embankment, high ground	2yr, 25yr and 100yr	2-4
Unnamed watercourse	New Swanage	High ground	2yr	2-3
Unnamed watercourse	Gussage St Michael	High ground	2yr	2-3
Unnamed watercourse	Pimperne to Blandford Forum	High ground	2yr, 10yr and 100yr	2-3
West Bay	Fortuneswell	Beach, embankment, flood gate, high ground, wall	10yr and 200yr	2-3
Wriggle River	Chetnole to Bradford Abbas	Embankment, high ground, wall	2yr and 25yr	2-4

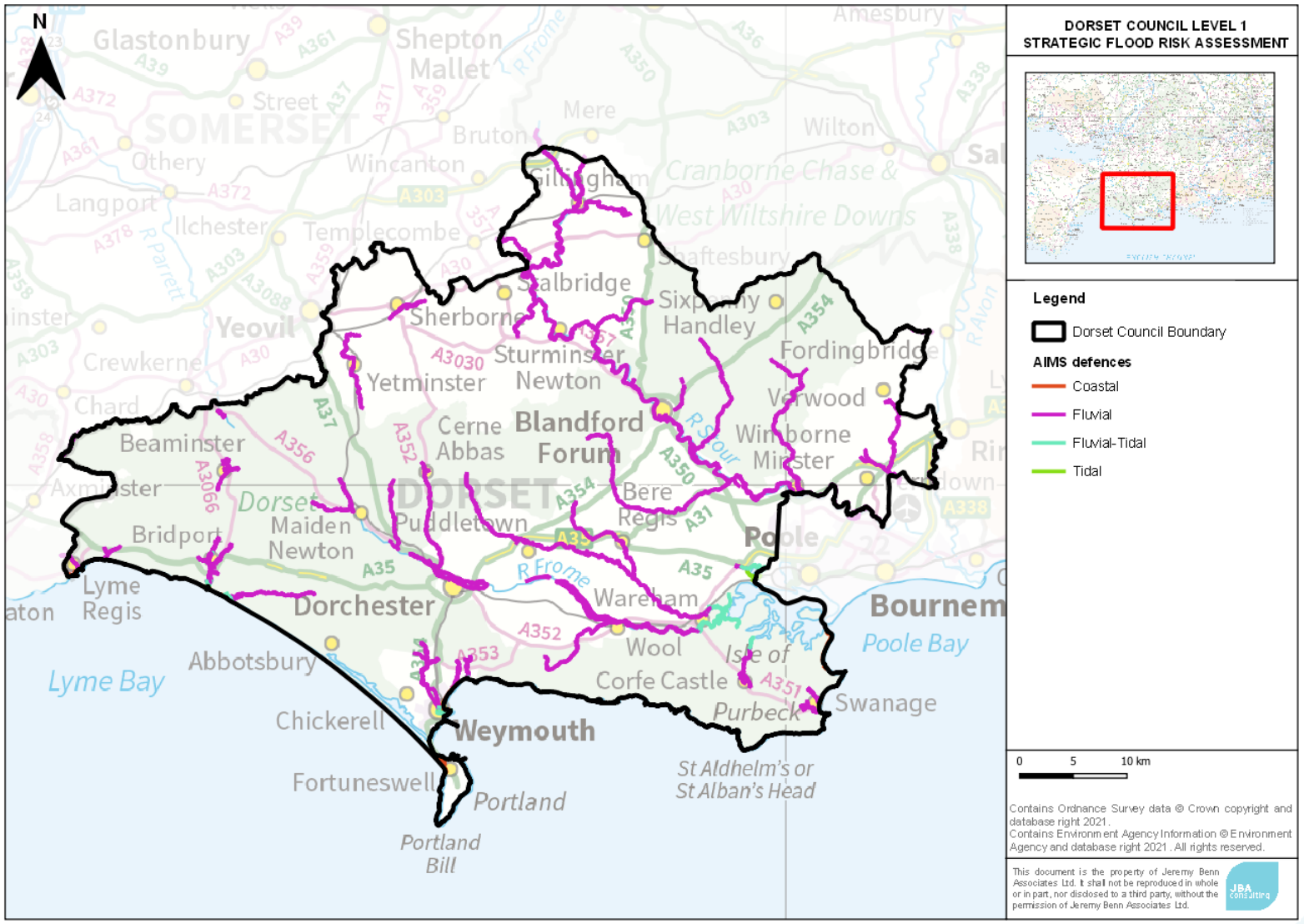

Figure 6-1: Flood defences within Dorset

6.6 Existing and future flood alleviation schemes

There are a number of alleviation schemes within Dorset. These include flood alleviation schemes with actions to improve river structure resilience and increased coastal defence management. Known schemes within Dorset include:

- West Bay Coastal Defence Improvements;
- Lyme Regis Coastal Erosion Scheme;
- Swanage Flood Alleviation Scheme
- Blandford Forum;
- Wimborne;
- Weymouth;
- Lower Stour Strategy;
- Arne Moors Managed Realignment;
- Dorchester and Piddle Valley.

6.6.1 Charminster Bridge Flood Alleviation Scheme (existing scheme)

The village of Charminster has previously experienced flood events due to a bridge structure with three small brick arches. When river levels were high, floodwater build up behind these arches and the structure acted as a dam before flooding the centre of the village. This was particularly destructive due to a number of listed buildings such as St Mary's Saxon Church in the village centre.

The Environment Agency liaised with Dorset Highways to form a scheme working on a structure resembling the original bridge but with additional resilience to high peak river flows. This was achieved by re-building the bridge with larger openings to prevent floodwater backing up. English Heritage carried out an archaeological survey prior to demolition of the original bridge. The flood investigation also required the upstream river bank to the churchyard to be raised and improvements to the highway drainage.

6.6.2 Swanage Flood Alleviation Scheme (future scheme)

Swanage presently has sea walls along the coast which protect the coastline. During high tide, storm events and periods of strong easterly winds, these sea walls are overtopped and floodwater reaches the town centre. The Environment Agency have implemented seasonal temporary concrete block defences to prevent Swanage flooding during the winter. However, the increasing storm frequency and rising sea level as a result of climate change means more permanent defence structures are needed.

The scheme proposes for the new design and placement of improved flood defences. The scheme has been designed by flood and coastal erosion risk management authorities and will involve a number of stakeholders. The permanent structures will be made of concrete clad with stone and include seating areas.

6.7 Actual and residual flood risk

The actual and residual flood risk due to the presence of flood and drainage assets should be considered in detail within a Level 2 SFRA (for strategic allocations) or by a developer through a site-specific Flood Risk Assessment.

6.7.1 Actual flood risk

This is the risk to the site considering the impacts of existing flood mitigation measures (if present) and any planned to be provided through new development. Note that it is not likely to be acceptable to allocate developments in existing undefended areas on the basis that they will be protected by developer works, unless there is a wider community benefit that can be demonstrated.

The assessment of the actual risk should take into account that:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day standard of protection afforded by defences 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 and safe-guarded that is required for affordable future flood risk management measures.
- 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.

6.7.2 Residual risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been taken into account. 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 larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of river control structures to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of river control structures or other assets, and failure of pumping stations.

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

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

The assessment of residual risk should take into account:

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

6.7.3 Overtopping

In exposed locations along the coast, landward flooding is more likely to occur as a consequence of wave overtopping than inundation.

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and Environment Agency **Flood Risks to People** (http://sciencesearch.defra.gov.uk/Document.aspx?Document=FD2321_3437_TRP.pdf) guidance document provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds / reservoirs, may need overtopping modelling or assessments at the site-specific FRA stage.

6.7.4 Defence breach

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

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

Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the potential for multiple breaches. There are currently no national standards for breach assessments and there are various ways of assessing breaches using hydraulic modelling. Work is currently being undertaken by the Environment Agency to collate and standardise these methodologies. It is recommended that the Environment Agency are consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

7 Cumulative Impacts and Strategic Flood Risk Solutions

This section provides a summary of the catchments with the highest flood risk and development pressures and then makes recommendations for local planning policy based on these.

7.1 Introduction

Under the NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.160), rather than just to or from individual development sites.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may potentially only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. It should be noted that flood risk may exist as a result of a combination of factors, for example through interactions between surface water and fluvial sources and that these mechanisms may be sensitive to the cumulative impacts of development.

All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments comply with the latest guidance and legislation relating to flood risk and sustainable drainage, in theory they should not increase flood risk downstream.

Catchments within the study area that have the potential to influence existing flood risk issues in neighbouring Local Authorities were identified, as well as catchments in the study area that may be influenced by development in catchments in neighbouring Local Authorities. Historic flood incidents, the current and predicted increase in surface water flood risk to properties and cross boundary issues in each catchment were assessed to identify the catchments at greatest risk.

Local planning policies can also be used to identify areas where the potential for development to increase flood risk is highest and identify opportunities for such new development to positively contribute to decreases in flood risk downstream.

As part of this SFRA, an assessment into the cumulative impacts of development has been undertaken, the results of the assessment can be seen in Figure 7-1 and a summary of the methodology can be found in Appendix D.

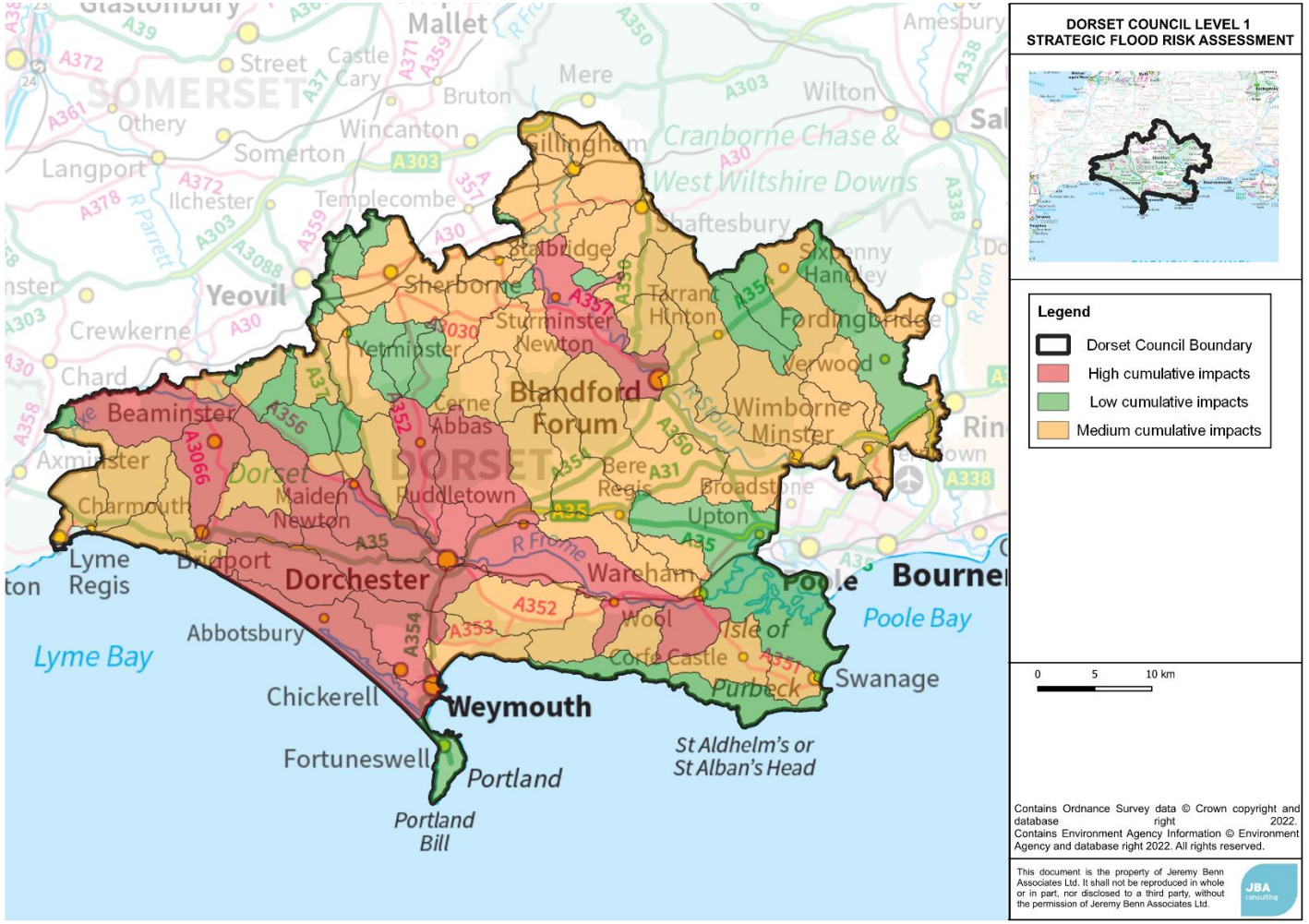

Figure 7-1: Cumulative flood risk impacts in Dorset

7.2 Strategic flood risk solutions

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

Not all measures will be appropriate for all development sites, however this is intended as a guide to identify some of the more common solutions. Discussions should be held with Dorset Council as the LLFA and the Environment Agency where strategic solutions are being considered to confirm their appropriateness. Design guides for many of these solutions are published by **CIRIA**[2].

7.3 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. According to the **Environment Agency's Fluvial Design Guide**[3], methods to provide these schemes include:

- enlarging the river channel;
- raising the riverbanks; and/ or
- constructing flood banks set back from the river.

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

There are a number of flood storage areas in Dorset, including three in Swanage and two to the north of Weymouth. There are also flood storage areas in Beaminster, Cerne Abbas and South Perrot.

7.4 Nature Based Solutions

Nature Based Solutions refers to the sustainable management and use of natural features to tackle socio-environmental challenges. This can include the use of Natural Flood Management techniques which use natural processes to reduce the risk of flooding and coastal erosion.

Developments provide opportunities to work with natural processes of catchments, floodplains, rivers and the coast to reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. Natural flood management requires integrated catchment management and involves those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies. The Environment Agency has developed **Natural Flood Management (NFM) mapping**[4] which displays opportunities for NFM.

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2 CIRIA website. https://www.ciria.org/

3 Environment Agency: Fluvial Design Guide – Chapter 10. (2010). https://assets.publishing.service.gov.uk/media/60549b7a8fa8f545cf209a29/FDG_chapter_10_-_Flood_storage_works.pdf

4 Working with Natural Processes. JBA Consulting, Defra, Environment Agency. (2021) wwnp.jbahosting.com

Conventional flood prevention schemes may be preferred, but consideration of 're-wilding' rivers upstream could provide cost efficiencies as well as helping to manage the risks from multiple sources of flooding. For example, smaller scale natural flood management measures comprising of reducing peak flows upstream through felling trees into streams or building earth banks to capture runoff, could be cheaper than building more conventional flood walls. With flood prevention schemes, consideration needs to be given to the impact that flood prevention has on the Water Framework Directive (WFD) status of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

A number of the different NFM approaches and techniques are summarised in the following sections. Whilst there is potential for the use of Nature Based Solutions across Dorset, there is significant potential in the following catchments:

- Frome catchment;
- River Stour catchment
- Upper Piddle Valley
- River Bride catchment

7.4.1 Catchment and floodplain restoration

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

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

- Apply the Sequential Approach to avoid new development within the floodplain.
- 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

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

7.4.2 Re-naturalisation

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

7.5 Structure removal and / or modification

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

regime and interruption of biological connectivity, including the passage of fish and invertebrates.

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

In the case of weirs, whilst 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.

7.6 Bank stabilisation

Any activities that lead to bank erosion should be avoided, and landowners encouraged to avoid using machinery and vehicles close to or within the watercourse except where required for maintenance. There are several techniques that can be employed to restrict the erosion of the banks of a watercourse. In an area where bankside erosion is particularly bad and / or vegetation is unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spiling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils.

7.7 Flood defences

There are a number of formal flood defences present within the Local Plan area (see Section 6 for further information). The flood risk at several potential site under consideration that are identified within Dorset could be influenced by the presence of these defences. At these locations it will be important to understand the benefit that defences can have on reducing flooding, and consequences if their design standard is exceeded or they fail. Residual risk of these defences should be understood and managed. Maintenance arrangements, including funding mechanisms, for the defences will need to be evidenced for the lifetime of development.

7.8 Green Infrastructure

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

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

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

waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

7.9 Engaging with key stakeholders

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

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

- maintaining river bed and banks;
- allowing the flow of water to pass without obstruction; and
- controlling invasive alien species e.g. Japanese knotweed.

More information about riparian owner responsibilities can be found in the Environment Agency's guidance on **Owning a Watercourse**[5] (2018).

5 Guidance: Owning a watercourse. Environment Agency. (2018). https://www.gov.uk/guidance/owning-a-watercourse

8 Flood risk management requirements for developers

This section provides guidance on site-specific Flood Risk Assessments (FRAs). These 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, considering climate change and vulnerability of users.

The report provides a strategic assessment of flood risk within Dorset Council area. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and any defences at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed Flood Risk Assessment (FRA) may show that a site, windfall[6] or other, is not appropriate for development as set out in **Table 3 Flood Risk Guidance of NPPG**. The Sequential and Exception Tests in the NPPF apply to all developments and An FRA should not been seen as an alternative to proving these tests have been metdemonstrating that The Sequential and Exceptions Tests have been passed.

As detailed in the National Planning Policy Framework, a Flood Risk Assessment (FRA) is required for all developments within Flood Zones 2 and 3, including change of use applications.

- Developments in Flood Zone 1 which are over 1 hectare also require a Flood Risk Assessment due to surface water drainage requirements.
- Developments in Flood Zone 1 also require a Flood Risk Assessment if they are located within a Critical Drainage Area (CDA)*.

  *The Environment Agency has confirmed that there are no CDAs in Dorset and that there at the time of writing this SFRA there are no plans to create any.
- Flood risk from all sources should be considered.

[6] 'Windfall sites' is used to refer to those sites which become available for development unexpectedly and are therefore not included as allocated land in a planning authority's development plan.

8.1 General principles for new developments

8.1.1 Apply the Sequential and Exception Tests

Developers should refer to Section 3 for more information on how to consider the Sequential and Exception Tests. For allocated sites, Dorset Council should use the information in this SFRA to apply the Sequential Test. For windfall sites a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk.

The Sequential Test should be applied to all 'Major' and 'Non-major development' proposed in areas at risk of flooding, but it will not be required where:

- The site has been allocated for development;
- The site is in an area at low risk from all sources of flooding now and in the future; or
- The application is for a development type that is exempt from the test, as specified in footnote 56 of the NPPF.

Only if development passes the Sequential Test should the Exception Test then be applied if required.

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

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

8.1.2 Consult with statutory consultees at an early stage to understand their requirements

Developers should consult with the Environment Agency, Dorset Council as the LLFA and LPA 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.

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

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific Flood Risk Assessment. At a site level, developers will need to check before commencing on a more detailed Flood Risk Assessment that they are using the latest available datasets. Developers should apply the 2021 Environment Agency climate change guidance and ensure the development has taken into account climate change adaptation measures. There will also be a need to apply site specific topographic information in the design of any flood mitigation measures at a site.

8.1.4 Developers should incorporate site specific considerations into the assessment of flood risk and the design of any mitigation measure included as part of the Flood Risk Assessment. This includes consideration of topography, watercourses and geology. Ensure that the development does not increase flood risk elsewhere

Developers should also ensure mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary.

Chapter 9 sets out these requirements for taking a sustainable approach to surface water management.

8.1.5 Ensure the development is safe for future users

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. Developers should consider both the actual and residual risk of flooding to the site, as discussed in section 3.

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

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

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines, including flood risk and biodiversity / ecology, and may provide opportunities to use the land for an amenity and recreational purposes. Where possible, developers should identify and work with partners to explore all avenues for improving the river and the wider river corridor environment. Developers should open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

8.1.7 Consider and contribute to wider flood mitigation strategy and measures in the district and apply the relevant local planning policy

Wherever possible, developments should seek to help reduce flood risk in the wider area e.g. by contributing to a wider community scheme or large scale flood mitigation measures, such as defences or natural flood management or by contributing in kind by mitigating wider flood risk on a development site. More information on the contribution developers are expected to make towards achieving the wider vision for FRM and sustainable drainage in the district can be found in Section 8.3.5. Developers mustshould seek to demonstrate in an FRA how they are contributing towards this vision.

8.2 Requirements for site-specific Flood Risk Assessments

8.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals of 1 hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency). There are no CDAs or proposals to create CDAs in Dorset.
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)
- Where evidence of historical or recent flood events have been passed to the LPA
- In an area of high / moderate surface water flood risk, or other source of flooding.

8.2.2 Objectives of a site-specific FRA

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

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

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

- **Standing Advice on Flood Risk** (Environment Agency) (https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities)
- **Flood Risk Assessment for Planning Applications** (Environment Agency) (https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applicationshttps:/www.gov.uk/guidance/flood-risk-assessment-for-planning-applications); and
- **Site-specific Flood Risk Assessment: CHECKLIST** (NPPF PPG, Defra) (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section)

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** (https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities).

8.3 Local requirements for mitigation measures

8.3.1 Site layout and design

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

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

Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow

routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

Planning Practice Guidance (PPG) states: "Access considerations should include the voluntary and free movement of people during a 'design flood', as well as the potential for evacuation before a more extreme flood".

8.3.2 Modification of ground levels

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

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

If it is proposed to raise ground levels in the floodplain, compensatory flood storage must 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 be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624.

Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment.

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.

The Environment Agency has noted that the use of voids under buildings is not supported as floodplain compensation for new development, as they are likely to create confined spaces that can build up debris and be used for storage of household items. Therefore floodplain compensation is the appropriate method for loss of conveyance and storage

8.3.3 Raised floor levels

If raised floor levels are proposed to mitigate flood risk, these levels should be agreed with Dorset Council and the Environment Agency. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The Environment Agency advises that minimum finished floor levels should be set 600mm above the 100-year (fluvial) or 200-year (tidal) climate change peak flood levels, where the new climate change allowances have been used (see Chapter 4 for the climate change allowances). An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA.

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

Similarly, the use of basements should not be permitted in Flood Zones 3b, 3a and 2 and it is acknowledged that large areas of land currently considered within Flood Zone 2 are likely to be at increased risk in the future. Flooding of basement dwellings presents a severe risk to occupants and for this reason basement dwellings in areas at risk of flooding should be avoided..

8.3.4 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. The impact of raised defences on the conveyance of flood water, including surface water flow paths should also be managed.

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

8.3.5 Developer contributions

In some cases, and following the application of the Sequential Test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS). The council should only use planning obligations to secure contributions where it is satisfied that the contributions will fund works / measures which are:

- Necessary to make the development acceptable in planning terms;
- Directly related to the development; and
- Fairly and reasonably related in scale and kind to the development (Paragraph 57, NPPF).

8.3.6 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and permits access to the watercourse, structures and defences for future maintenance purposes. It also discourages disturbance along riverbanks, which can have adverse impacts on ecology, and avoids the need to construct engineered riverbank protection.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult.

8.3.7 Making space for water

NPPG (https://www.gov.uk/government/collections/planning-practice-guidance) sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river

restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

8.4 Resistance and resilience measures

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

Having applied planning policy, there will be instances where developments, such as those that are for a change of use, water compatible development and essential infrastructure are permitted in high flood risk areas. The above measures should be considered before resistance and resilience measures are replied on. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. The proposals must include details of how the temporary measures will be stored, maintained and deployed and the cost of replacement when they deteriorate. Available resistance and resilience measures are shown in Table 8-1.

Table 8-1: Resistance and resilience measures

Measures	Description
Permanent barriers	Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers
Temporary barriers	Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water. It should be noted that flood depths above 600mm have the potential to cause structural damage if the building fabric is not designed to prevent loading of water. https://www.befloodready.uk/
Community resistance measures	These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.
Flood resilience measures	These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls and fixtures. https://www.befloodready.uk/

8.5 Reducing flood risk from other sources

8.5.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised 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. Mitigation measures such as sump pumps and tanking may also be required to mitigate groundwater flood risk to developments, including situations involving the re-development or modification of existing buildings.

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

8.5.2 Surface water and sewer flooding

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

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

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

Consideration must also be given to attenuation and flow ensuring that flows during the 100-year plus climate change storm event can be managed safely within the site, in the event of tide locking or surcharging outfalls that can prevent the discharge of surface water runoff. This should be demonstrated with suitable modelling techniques.

8.5.3 Reservoirs

As discussed in Section 5.9, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

- Developers should contact the reservoir owner for information on:
    - the Reservoir Risk Designation
    - reservoir characteristics: type, dam height at outlet, area/volume, overflow location
    - operation: discharge rates / maximum discharge
    - discharge during emergency drawdown; and
    - inspection / maintenance regime.

- The EA online Reservoir Flood Maps contain information on the extents, depths and velocities following a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extent, depths and velocities shown in these online maps.
- The GOV.UK website on **Reservoirs: owner and operator requirements** (https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements) provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.

Developers should use the above information to:

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

8.6 Emergency planning

Emergency planning covers three phases: before, during and after a flood. 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. National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

Guidance from the Association of Directors of Environment, Economy, Planning & Transport (ADEPT) (Flood risk emergency plans for new development) is available on preparing flood emergency plans: https://www.adeptnet.org.uk/system/files/documents/ADEPT%20%26%20EA%20Flood%20risk%20emergency%20plans%20for%20new%20development%20September%202019....pdf

The 2021 NPPF requires site level Flood Risk Assessments to demonstrate that:

> *"d) any residual risk can be safely managed; and*
>
> *e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan."*

Certain sites will need emergency plans:

- Sites with vulnerable users, such as hospitals and care homes
- Camping and caravan sites
- Sites with transient occupants e.g. hostels and hotels

- Developments at a high residual risk of flooding from any source e.g. immediately downstream of a reservoir or behind raised flood defences
- Situations 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).

Emergency Plans will need to consider:

- The characteristics of the flooding e.g. onset, depth, velocity, hazard, flood borne debris
- The vulnerability of site occupants
- Structural safety
- The impact of the flooding on essential services e.g. electricity, drinking water
- Flood warning systems and how users will be encouraged to sign up for them
- Safe access and egress for users and emergency services
- 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.
- A safe place of refuge where safe access and egress and advance warning may not be possible, having discussed and agreed this first with emergency planners. Proposed new development that places an additional burden on the existing response capacity of the Councils will not normally be appropriate.

Dorset Council has prepared relevant guidance for emergency planning that includes specific advice relating to flooding. This includes practical advice before, during and after flooding has occurred including, preparation, understanding warnings, actions to limit exposure to risk and recovery.

https://www.dorsetcouncil.gov.uk/emergencies-severe-weather/flooding/sandbags-and-local-flooding-advice

Further information is available from:

- **The National Planning Policy Guidance** (https://www.gov.uk/government/publications/national-planning-policy-framework--2)
- **2004 Civil Contingencies Act** (http://www.legislation.gov.uk/ukpga/2004/36/contents)
- **DEFRA (2014) National Flood Emergency Framework for England** (https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england)
- **FloodRe** (http://www.floodre.co.uk/)
- The Environment Agency and DEFRA's **Standing Advice for FRAs** (https://www.gov.uk/guidance/flood-risk-assessment-standing-advice)
- Environment Agency's **"How to plan ahead for flooding"** (https://flood-warning-information.service.gov.uk/plan-ahead-for-flooding)
- Sign up for **Flood Warnings** with the Environment Agency (https://www.gov.uk/sign-up-for-flood-warnings)
- The **National Flood Forum** (https://nationalfloodforum.org.uk/)
- **GOV.UK** - Make a Flood Plan guidance and templates (https://www.gov.uk/prepare-for-flooding/future-flooding)

A full breakdown of Flood Alert Areas and Flood Warning Areas in Dorset can be found in Appendix B.

9 Surface water management and SuDS

This chapter provides guidance and advice on managing surface water runoff and flooding.

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

In April 2015, Dorset Council as LLFA was made a statutory planning consultee on the management of surface water. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to ensure that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, Dorset Council will provide advice to the Planning Department on the management of surface water. As LPA, Dorset Council satisfy themselves that the development's 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 lifetime of the development.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by Dorset Council. This will assist with the delivery of well designed, appropriate and effective SuDS.

9.2 Sustainable Drainage Systems (SuDS)

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

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

There are a number of ways in which SuDS can be designed to meet surface water quantity, climate change resilience, water quality, biodiversity and amenity goals. Given this flexibility, SuDS are generally capable of overcoming or working alongside various

constraints affecting a site, such as restrictions on infiltration, without detriment to achieving these goals.

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

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

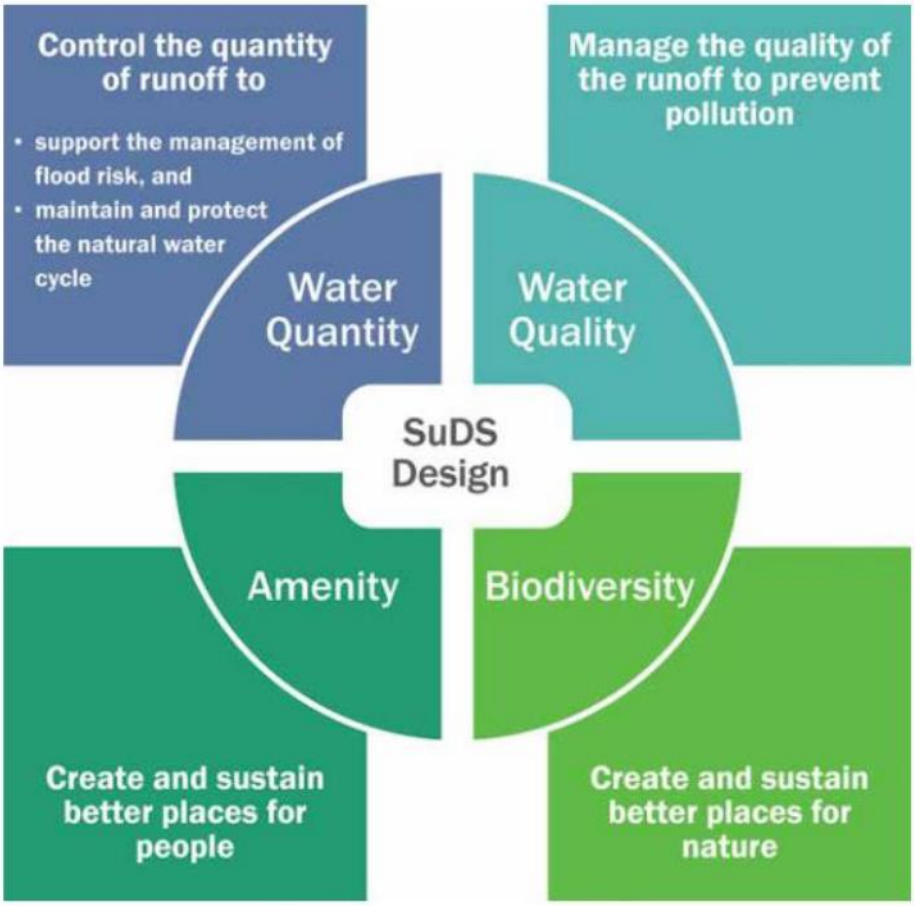

Figure 9-1: The four pillars of SuDS design, from the The SuDS Manual C753 (2015)

9.3 Sources of SuDS guidance

9.3.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015)

(https://ciria.sharefile.com/share/getinfo/s7227335a22e40b6a) provides guidance on planning, design, construction and maintenance of SuDS. 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.

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

Non-Statutory Technical guidance

(https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards) provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations.

In February 2021, Defra published its **research project** (https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards) to review and recommend updates to the Non-Statutory Technical guidance. The proposals have not yet been adopted but would bring the standards in line with current best practice according to the construction industry research and information association (CIRIA) SuDS Manual.

9.3.3 Non-statutory Technical Guidance for Sustainable Drainage Practice Guidance, LASOO (2016)

The Association of SuDS Authorities (ASA) formerly known as the Local Authority SuDS Officer Organisation produced their **practice guidance** (https://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf) in 2016 to give further detail to the Non-statutory technical guidance.

9.3.4 Dorset Council Surface water management proposal requirements

Dorset Council has outlined requirements for surface water drainage proposals in the county:

(https://www.dorsetcouncil.gov.uk/documents/35024/280970/Surface+Water+Management+Proposal+Information+Requirements.pdf/33f6035a-fd3e-6c8b-8702-c148ea944541)

This outlines the minimum information required on surface water management in a submission for planning, which must include a drainage catchment plan, site characteristics assessment, surface water management design details and a management plan. It outlines further information that should be followed which is listed above. Dorset council can provide, pre-application planning advice on surface water management for major developments (the council makes a charge for providing this guidance).

9.4 Other surface water considerations

9.4.1 Groundwater Vulnerability Zones

The Environment Agency published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The

map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological and soil propertied within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found **on Defra's interactive mapping** (https://magic.defra.gov.uk/MagicMap.aspx).

9.4.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on **DEFRA's Magic Map** (https://magic.defra.gov.uk/MagicMap.aspx).

Large proportions of Dorset are located within GSPZs including areas within Zone 1 (inner protection zone).

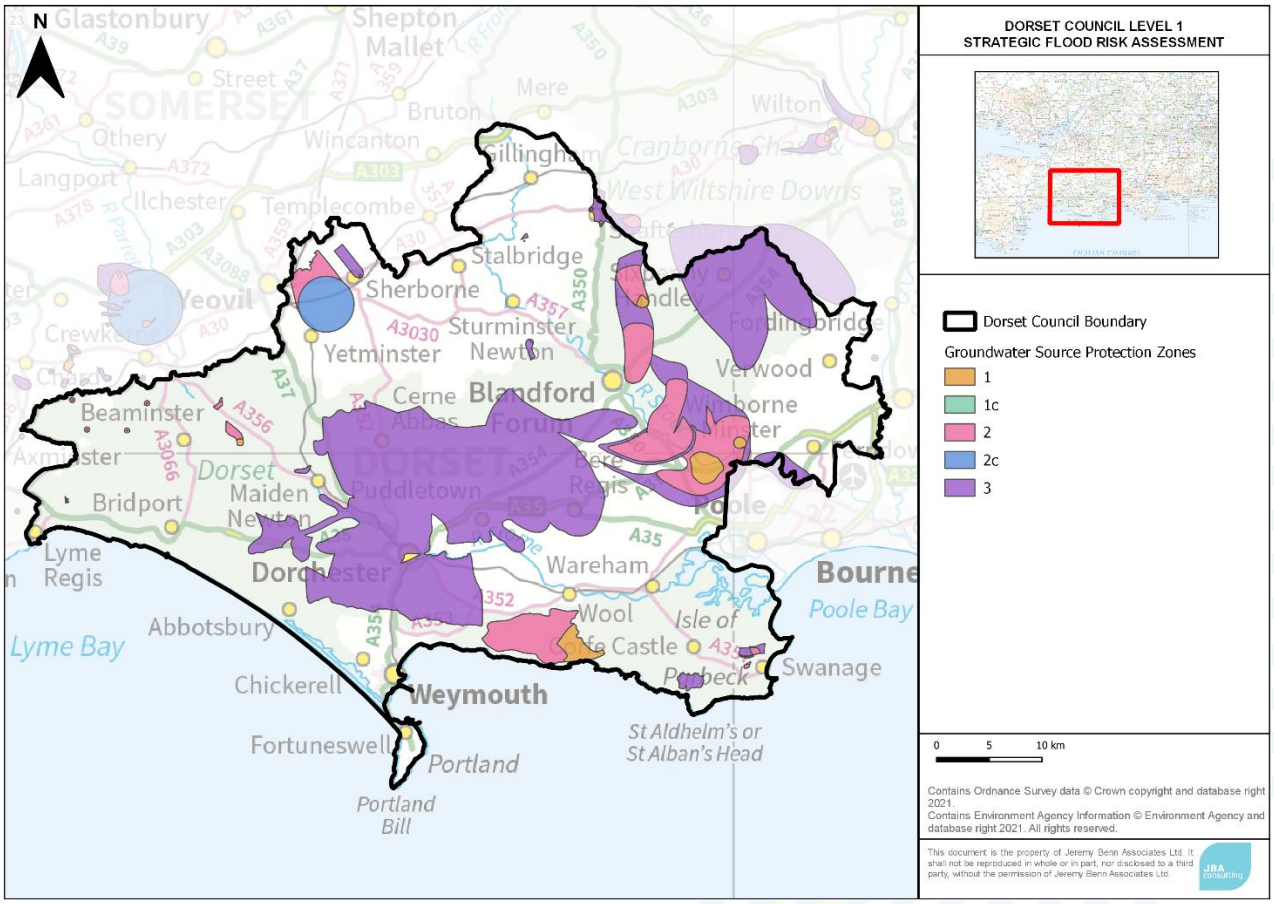

Figure 9-2: Groundwater Source Protection Zones

9.4.3 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.

Nitrates also have the potential to contaminate groundwater bodies such as aquifers. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

A large proportion of Dorset is covered by a NVZ, these can be viewed on the **Environment Agency's website** (https://environment.data.gov.uk/farmers/).

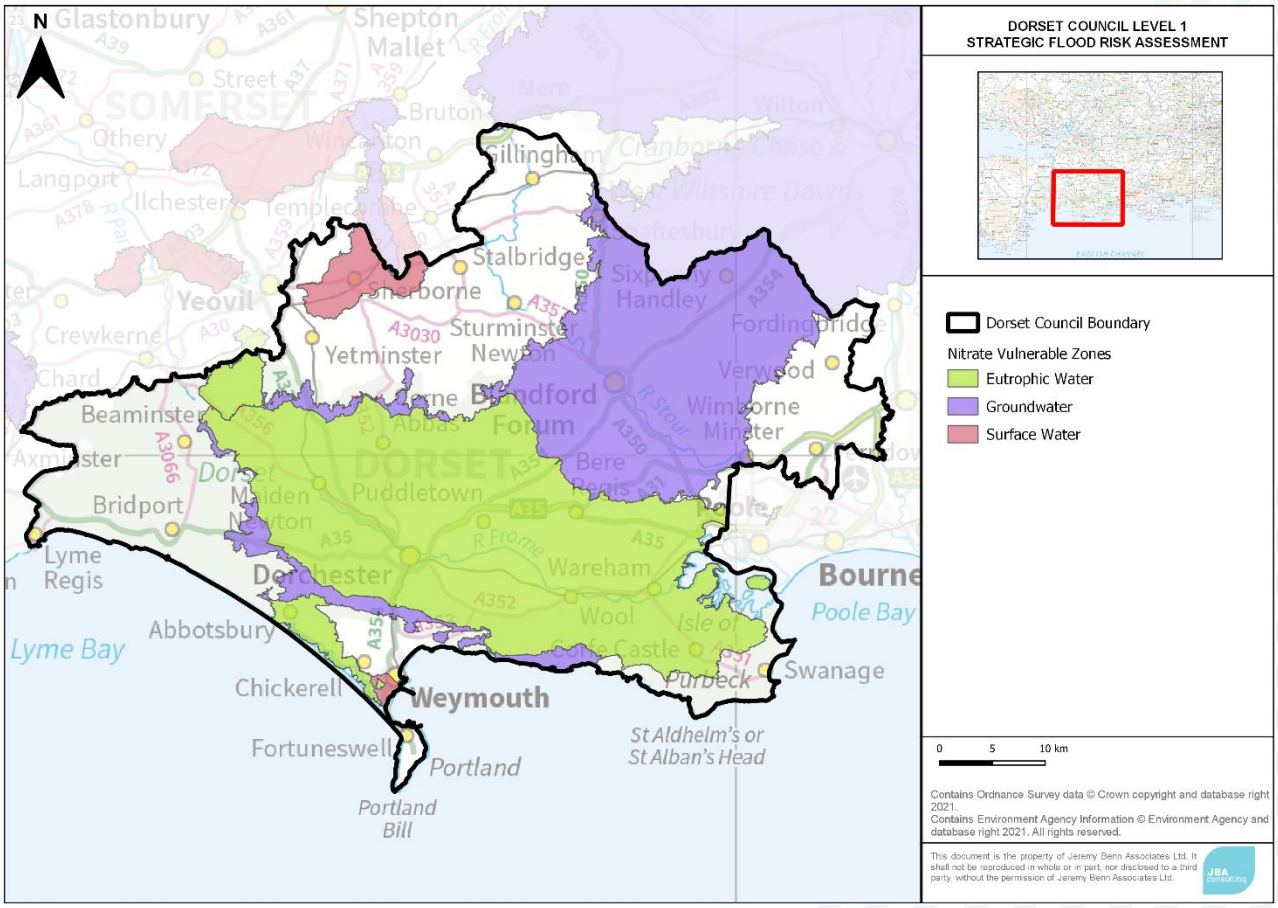

Figure 9-3: Nitrate Vulnerable Zones

10 Summary and Recommendations

- Dorset Council's (LLFA) Historic Flooding Incidents (FORT database) includes recorded historical flood events. There is a history of documented flood events, with the main sources being fluvial, groundwater and surface water. EA Historic Flooding data has also been used, which is displayed in Table 5 1 and highlights the most significant historic flood events.
- The major catchments in the SFRA area are the rivers Stour, Frome, Avon, Piddle and Brit, Bride and Winterbornes. There are a number of smaller catchments, including the River Wey, the River Cale, the River Axe, the River Parrett, the River Cerne, the River Yeo, the River Allen, the River Lydden, the River Hooke, the Wriggle River, the Moors River, the Tarrant, Bere Stream, Sydling Water, and Fontmell Brook that flow through the area.
- The Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) shows that a large number of communities across Dorset are at risk of surface water flooding. Surface water predominantly follows topographical flow paths of existing watercourses or dry valleys, starting in topographic highs and ponding in low-lying areas.
- Flood risk is expected to increase in the future as a result of the impacts of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. The emerging Dorset Council Local Plan acknowledges the need to reduce the impact of surface water flooding within the region e.g. to land stability and drainage systems. This can be achieved by increasing the use and efficiency of Sustainable Drainage Systems (SuDS).
- The JBA 5m Groundwater Flood Map shows that large areas of Dorset area at risk of groundwater flooding. This is often the result of the permeable chalk geology that is underlying much of Dorset and is a particular issue in chalk valleys. Settlements known to be at risk of groundwater flooding include Dorchester, Wareham, Sherborne and Blandford Forum. However, it should be noted that many other smaller settlements are considered at risk of groundwater flooding and there have been a number of reported flooding incidents attributed to groundwater.
- There is a potential risk of flooding from reservoirs, both within Dorset and outside the county. There are no records of flooding from reservoirs in the study area. The level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

  The risk of flooding from reservoirs mapping shows that there are several reservoirs within Dorset and a few outside of the region which could pose a potential flood risk in the unlikely event of failure.

10.1 Recommendations for the Local Planning Authority

- To locate new development in areas of lowest risk, in line with the Sequential Test, by steering development to sites with the lowest risks from flooding (taking account of Flood Zones and relevant evidence on the risks from other sources of flooding). If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, a more detailed assessment of risk will need to be carried out (in certain circumstances, and in accordance with NPPG, an Exceptions Test may also need to be completed).

- After a more detailed assessment of risk, a sequential approach to site design will be used to reduce risk. Any re-development remaining within areas of flood risk will be made resistant / resilient to flooding and developers should explore the opportunities to address the causes and impacts of flooding in the locality.
- Identification of long-term opportunities to remove development from the floodplain and to make space for water. This may include moving highly vulnerable development and essential infrastructure outside of flood risk when opportunities arise.
- A Level 2 SFRA or detailed local area Strategic Drainage Study may be required to consider how the cumulative effects of potential peak rates and volumes of water from development sites would impact on peak flows, duration of flooding and timing of flood peaks on receiving watercourses. Such studies could be used to justify greater restrictions / enforce through Local Planning Policy development site runoff rates and volumes specific to each catchment that are over and above those required by National and Local SuDS Standards. They could also identify where there are opportunities with allocated sites to reduce the causes and impacts of flooding e.g. online/ offline flood storage and where land should be safeguarded within proposed site allocations to fulfil this purpose.
- Safeguard functional floodplain from future development.
- Identify opportunities for brownfield sites in functional floodplain to reduce risk and provide flood risk bettermentcauses of flooding.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.
- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.

10.2 Recommendations for the Lead Local Flood Authority

- In light of the updates to the National Flood and Coastal Erosion Risk Management Strategy, Local Flood Risk policy is currently being developed within the draft Local Plan and supporting documentation.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.
- There should be no built development within 8m from the top of a watercourse or Main River for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.
- The council will require developers to explore opportunities to contribute toward community flood defences outside of their red line boundary to provide wider benefit and help offset any cumulative impacts from development.

The following planning policy recommendations have been made for the catchments where cumulative development is likely to have the greatest impact on flood risk:

- That the LLFA and other RMAs should use this information to inform a long-term pipeline of flood alleviation studies and schemes to better manage flood risk.

- That the Environment Agency, in consultation with Dorset Council, should consider whether to formally designate these catchments as Critical Drainage Areas. This would mean that a detailed Flood Risk Assessment would be required for all developments that are proposed, regardless of their size.
- A Surface Water Drainage Strategy will be required for all developments within these catchments, regardless of development size.

10.3 Recommendations for developers

- Ordinary watercourses not currently afforded flood maps should be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.
- Ensure development is 'safe', dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then as assessment should be made to detail the flood duration, depth, velocity and flood hazard rating in the 1 in 100-year plus climate change flood event, in line with FD2320.
- Raise residential and commercial finished floor levels **by 600mm** above the 1 in 100-year plus climate change flood level. The Environment Agency has stated that this could be relaxed to 300mm where there is suitable detailed modelling that has been reviewed and approved by the EA or appropriate Risk Management Authority. Developers should protect and promote areas for future flood alleviation schemes.
- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.
- Use of the SuDS management train (outlined in Section 9.2) to manage, and prevent, pollutants being discharged into the receiving waterbody.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
- Space should be provided for the inclusion of SuDS on all allocated sites and considered in the site design at an early stage.
- Promote biodiversity, habitat improvements and **Countryside Stewardship schemes** (https://www.gov.uk/government/publications/countryside-stewardship-runoff-and-soil-erosion-risk-assessment) to help prevent soil loss and to reduce runoff from agricultural land.
- Assess condition of existing flood risk and drainage assets and upgrade, if required, to ensure that the infrastructure can accommodate pressures / flows for the lifetime of the development.
- Natural drainage features should be maintained and enhanced.
- Identify opportunities for river restoration/enhancement to make space for water.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.

- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.
- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 100-year rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 1 in 100-year (plus climate change) event.
- Ensure robust emergency (evacuation) plans are produced and implemented for major developments.
- Increase awareness and promote sign-up to the Environment Agency Flood Warnings Direct (FWD) within Dorset.
- Developers should explore, through site-specific FRAs, opportunities to provide wider community flood risk benefit through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either be by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes. Consultation on the site-specific requirements should be undertaken with Dorset Council as LLFA and the Environment Agency at the earliest opportunity.
- The council will expect developers to explore opportunities to contribute toward community flood defences outside of their red line boundary to provide wider benefit and help offset any cumulative impacts from development.

Appendices

Offices at

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

Registered Office
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