Somerset West & Taunton and South Somerset Councils

JOINT LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT

July 2019

70049028
JULY 2019

PUBLIC

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CONSULTATION DRAFT - PUBLIC

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CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

To provide sustainable developments for communities, it is essential that the risk of flooding, both now and in the future, is considered at all stages of the planning process, from plan making through to site-specific assessments.

The National Planning Policy Framework (NPPF) recommends a Sequential Approach to the planning of development. In simple terms this aims to guide future development and regeneration away from areas at medium or high risk of flooding to areas at the lowest risk of flooding. When designing and locating future development, there are many tests and measures of sustainability that must be considered but, from a flooding perspective, developments should be made safe for their lifetime without increasing flood risk elsewhere.

The local authority areas of Somerset West and Taunton and South Somerset have joined together to prepare a joint Level 1 Strategic Flood Risk Assessment (SFRA) for their areas. The SFRA assesses the risk of flooding to the area from all sources, now and in the future, taking account of the impacts of climate change. This includes the risk of flooding from watercourses, the sea, surface water, groundwater, reservoirs, sewers and artificial sources. The assessment of flood risk presented provides sufficient detail to enable the Sequential Test to be applied and, where applicable, the Exception Test.

Summary information is provided on the relevant plans, policies and strategies that influence land use allocation and developments from a national, regional and local level. In addition, guidance is given on the requirements for site-specific Flood Risk Assessments (FRAs) relating to the application of the Sequential and Exception tests, climate change assessments, residual flood risk and surface water management.

ABBREVIATIONS

Table 1 - Abbreviations

Abbreviation	Meaning
ABD	Areas Benefitting from Defences
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Survey
CFMP	Catchment Flood Management Plan
DTM	Digital Terrain Model
EA	Environment Agency
FCERM	Flood and Coastal Erosion Risk Management
FRA	Flood Risk Assessment
IDB	Internal Drainage Board
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	Metres above ordnance datum
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
SCC	Somerset County Council
SFRA	Strategic Flood Risk Assessment
SRA	Somerset Rivers Authority
SSDC	South Somerset District Council
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
SWT	Somerset West and Taunton
uFMfSW	Updated Flood Map for Surface Water

1 INTRODUCTION

1.1 PROJECT OVERVIEW

This Joint Level 1 Strategic Flood Risk Assessment (SFRA) has been prepared for the Local Authority areas of Somerset West and Taunton (SWT) and South Somerset District Council (SSDC), hereafter referred to as the Study Area. The SFRA provides an evidence base for site allocations and to inform the preparation of plan policies to ensure flood risk from all sources is managed in the Study Area.

In accordance with the National Planning Policy Framework[1] (NPPF) and the accompanying Planning Practice Guidance (PPG)[2] this SFRA assesses the risk to the Study Area from flooding from all sources, both in the present and the future, including the impacts of climate change. The SFRA also assesses the impact that land uses changes and development in the Study Area could have on future flood risk.

This SFRA supersedes the following previously published Level 1 SFRAs for each council area:

- West Somerset Council and Exmoor National Park Authority Level 1 Strategic Flood Risk Assessment (2009)[3];
- Taunton Deane Borough Council (Level 1 and Level 2) Strategic Flood Risk Assessment (2011)[4]; and
- South Somerset District Council Strategic Flood Risk Assessment Level 1 SFRA – Final Report (2008)[5].

Whilst this report does not directly supersede the current Level 2 SFRAs, where they have been produced, the information contained within them will need to be validated by Applicants to ensure that it has not been superseded by this Level 1 update or by other updated modelling and mapping of the area. This applies to the following documents:

- West Somerset Council Level 2 Strategic Flood Risk Assessment (2010)[6]; and
- Taunton Deane Borough Council (Level 1 and Level 2) Strategic Flood Risk Assessment (2011)[7].

[1] Ministry of Housing, Communities and Local Government (2018) National Planning Policy Framework – Section 14: Meeting the challenge of climate change, flooding and coastal change.
[2] Ministry of Housing, Communities and Local Government (2014) Planning Practice Guidance – Flood Risk and Coastal Change.
[3] Scott Wilson (2009) West Somerset Council and Exmoor National Park Authority Level 1 Strategic Flood Risk Assessment.
[4] JBA Consulting (2011) Taunton Deane Borough Council Strategic Flood Risk Assessment.
[5] Halcrow Group Limited (2008) South Somerset District Council Strategic Flood Risk Assessment.
[6] Scott Wilson (2010) West Somerset Council Level 2 Strategic Flood Risk Assessment
[7] JBA Consulting (2011) Taunton Deane Borough Council Strategic Flood Risk Assessment.

1.2 SFRA OBJECTIVES

The aim of this Level 1 SFRA is to provide an assessment of flood risk across the Study Area with a suitable level of detail to facilitate and to enable the application of the Sequential Test and, where applicable, the Exception Test, where required.

SWT and SSDC are required to prepare an SFRA in accordance with the NPPF to support the Local Plan and inform development control within the Study Area. Specifically, as outlined in the PPG, the SFRA should:

- Determine the variations in risk from all sources of flooding, and also the risks to and from surrounding areas in the same flood catchment;
- Inform the Sustainability Appraisal of the Local Plan;
- Enable the application of the Sequential Test and, where applicable, the Exception Test when determining land use allocations;
- Identify the requirements for site-specific Flood Risk Assessments (FRAs) in particular flood risk areas;
- Determine the acceptability of flood risk in relation to emergency planning capability; and
- Consider opportunities to manage flood risk to existing communities and developments through better management of surface water, provision for conveyance and of storage for floodwater.

This SFRA has been completed in accordance with the NPPF and has included the following:

- Review of changes in key national, regional and local planning policy and strategies relevant to the management of local flood risk within the Study Area;
- Consultation with the relevant authorities and stakeholders to obtain up-to-date datasets, discussing current and future flood risk and understanding development control and flood management requirements;
- Review of available datasets to understand historic, current and future flood risks within the Study Area from all sources of flooding;
- Interpretation of available data in order to understand the local flood risks to people and property for the purpose of informing development control policies; and
- Recommendation of measures to ensure the sustainable management of flood risk within the Study Area in relation to development.

1.3 STAKEHOLDER ENGAGEMENT

Key stakeholders have been engaged with throughout the development of this SFRA to source relevant data in relation to flood risk and development in the Study Area. The main stakeholders engaged with through this process are:

- The Local Authorities – SWT and SSDC;
- The Environment Agency (EA);
- Somerset County Council (SCC) in their role as Lead Local Flood Authority (LLFA);
- Wessex Water;
- South West Water; and
- Parrett Internal Drainage Board (the IDB).

1.4 FLOOD RISK SOURCES

The sources of flooding assessed in this SFRA are as follows:

- Fluvial;
- Tidal;
- Surface Water;
- Groundwater;
- Sewers; and
- Artificial flood sources (reservoirs, canals etc).

The above has also included an assessment of the possible change to these flood risks in the future as a result of climate change.

There have been updates to both the fluvial and surface water modelling and mapping within the Study Area since the previous SFRAs were published. The EA's Flood Map for Planning[8],which represents the risk of fluvial and tidal flooding, is updated on a quarterly basis. The Flood Map for Planning is based on a national generalised model, known as JFLOW and detailed modelling studies as detailed in Section 4.2.

The understanding and mapping of surface water risk has improved since the development of the previous SFRAs. The current updated Flood Map for Surface Water (uFMfSW) was produced in 2013 by the EA in collaboration with SCC as the LLFA for the study area.

1.5 STRUCTURE OF THE SFRA

A summary of the scope and purpose of each section of the SFRA is provided in Table 1-1 below to assist with navigation. The main report should be read in conjunction with the maps produced in the Appendices to the document.

Table 1-1 – Structure of the SFRA

Section	Contents
1: Introduction	This section provides a background to the SFRA and sets out the aims and objectives.
2: Study Area	This section provides a summary of the Study Area in relation to the existing land use, topography, geology, hydrogeology and watercourses. This section identifies how the study area is split into a number of subareas to assist with navigation of the report and to help finding information.
3: Policy and Strategy Context	This section provides a summary of the key national, regional and local policy and guidance relevant to the management of flood risk in the Study Area.
4: Data Collection and Review	This section provides a summary of the main datasets obtained and reviewed in order to map and inform the assessment of flood risk in the Study Area.

[8] Environment Agency (2019) Flood Map for Planning. Accessed online, 2019: https://flood-map-for-planning.service.gov.uk/

5: SFRA Flood Mapping	This section describes how the data outlined in the previous section has been used in the production of mapping and GIS deliverables for the SFRA.
6: Flood Risk Review	This section provides a summary of flood risk in the Study Area from all sources both now and in the future, taking into account the impacts of climate change. This includes information about past flood events and present and future flood defence and alleviation schemes.
7: Policy Recommendations and Guidance	This section sets out how Local Planning Authorities (LPAs) expect new development to consider and address flood risk. This includes information with respect to the application of the Sequential and Exception Tests and on the preparation of site-specific FRAs. This section contains specific information and guidance to be followed by Applicants.
8: Summary	This section provides an overview of the SFRA and sets out some recommendations for the Study Area.

Appendices:

The following appendices are provided to support this SFRA:

- A: Key map location plans
- B: Somerset West and Taunton flood risk maps
- C: South Somerset flood risk maps

2 STUDY AREA

2.1 THE STUDY AREA

The Study Area is defined by the administrative boundaries of SWT (excluding Exmoor National Park) and SSDC, all of which are located within Somerset County. A map of the Study Area is included in Figure 2-1 below.

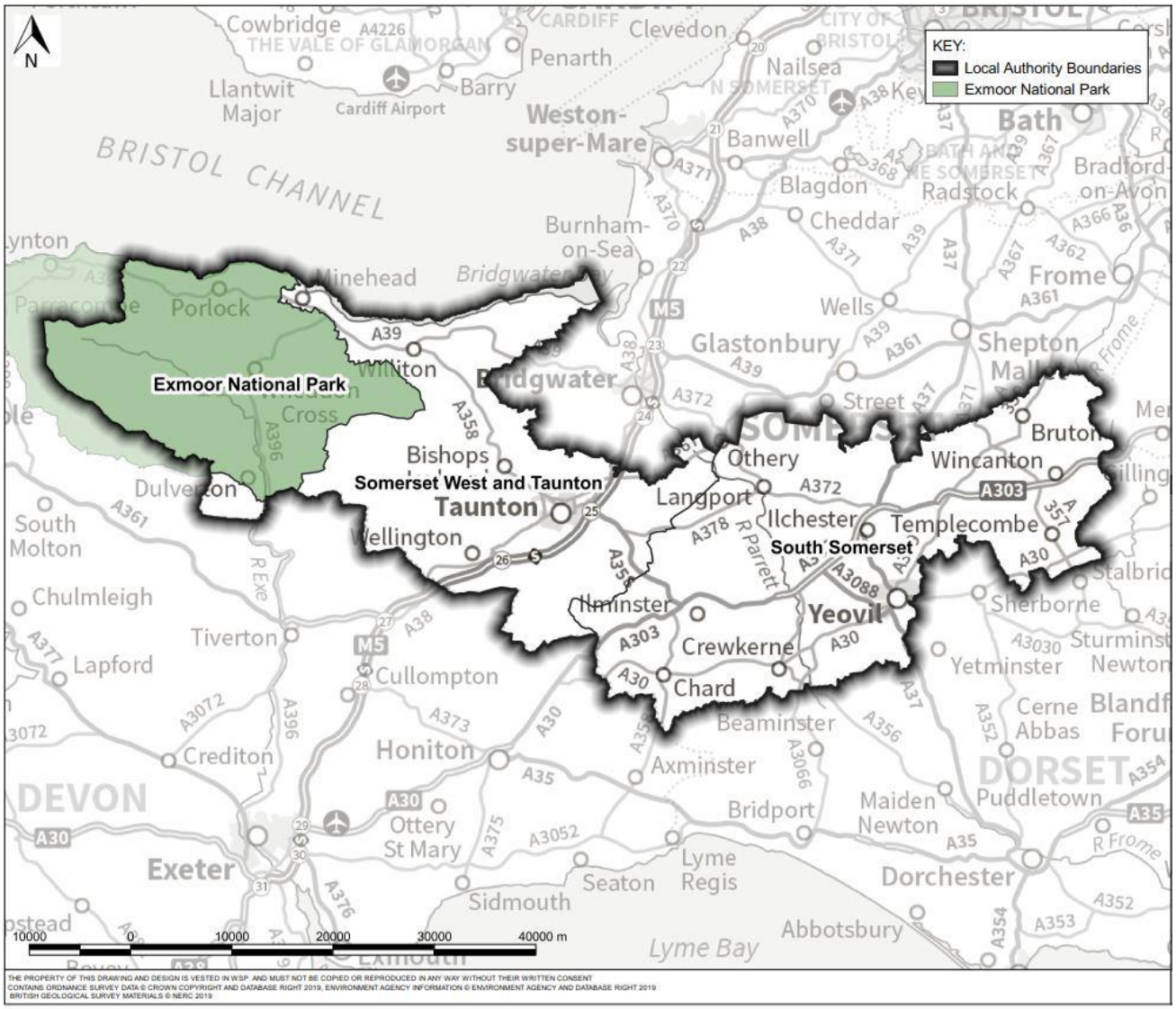

Figure 2-1 - The SFRA Study Area

SWT is formed from the former administrative areas of West Somerset and Taunton Deane, but on 1 April 2019 the two Council areas were dissolved and one District-level Council was created for the combined geographical area. However, to split the study area into simple units for reporting and to aid with finding information, the study area has been split into three subareas or reporting units as follows (**Figure 2-2**):

- Former West Somerset area;
- Former Taunton Deane area; and
- South Somerset area.

Where appropriate the report is split into subsections based on these reporting units or subareas.

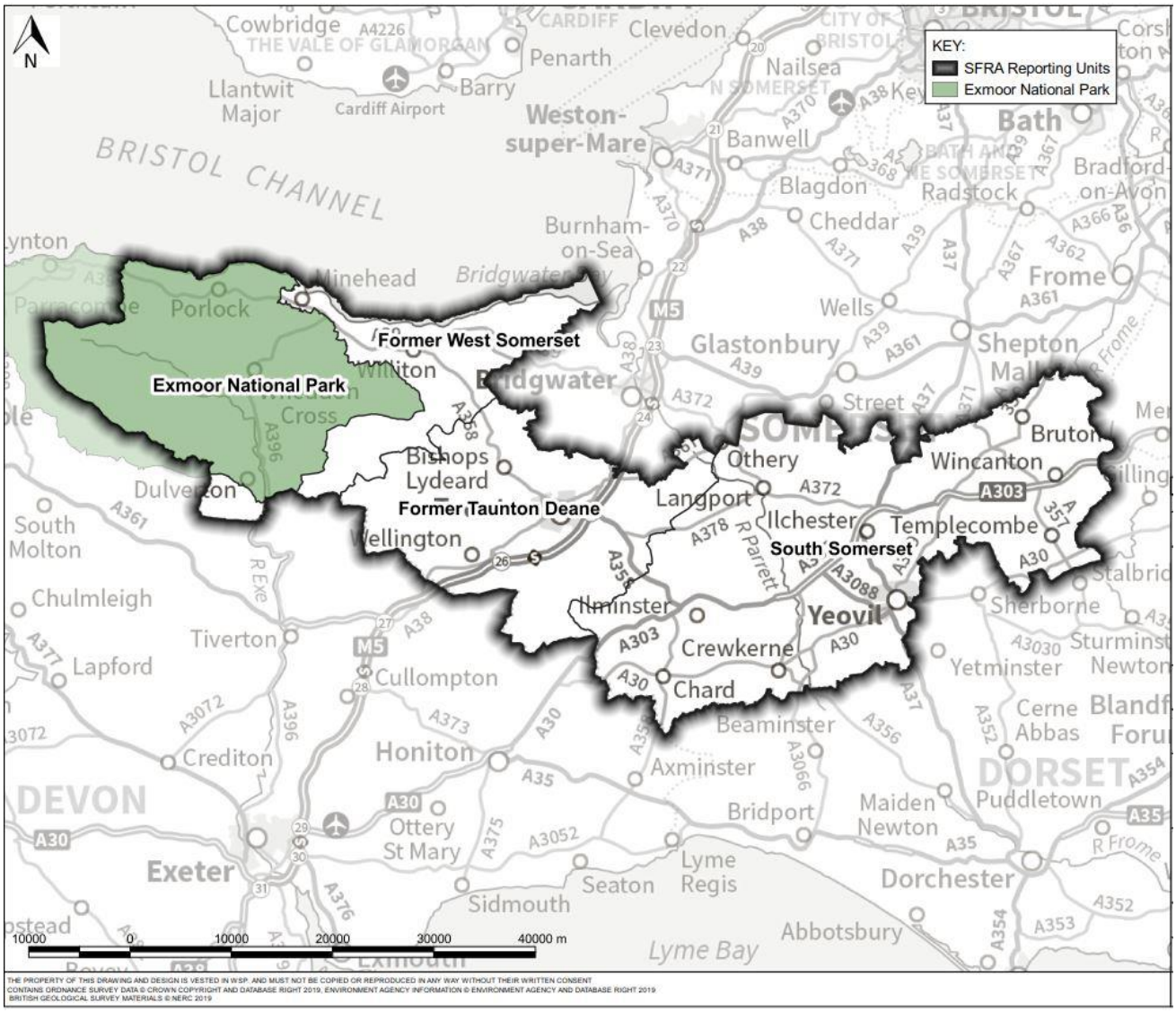

Figure 2-2 - SFRA reporting units

The former West Somerset area, excluding Exmoor National Park, forms the western boundary of the Study Area and borders the administrative areas of Mid Devon in the south, the former Taunton Deane in the southeast and Sedgemoor to the northeast. The National Park is not included in this study as they are a separate strategic and planning authority to SWT and so responsible for SFRA matters within their boundary. The former West Somerset has approximately 35km of coast line and has an area of approximately 254km^2.

The former Taunton Deane area makes up the centre of the Study Area and borders the administrative areas of the former West Somerset in the northwest, Sedgemoor in the northeast, South Somerset in the east and Mid Devon and East Devon in the south. This subarea totals 462 km^2.

South Somerset forms the eastern boundary of the Study Area and borders the administrative areas of SWT in the west, Sedgemoor in the northwest, Mendip in the north, Wiltshire and North Dorset in

the east and West Dorset and East Devon in the south. South Somerset's administrative area totals 959 km^2.

The total Study Area covers an area of approximately 1,675 km^2.

2.2 LAND USE AND PEOPLE

WEST SOMERSET

The former West Somerset area is predominantly rural and has three main settlements; Minehead with Alcombe, Watchet and Williton. Approximately 35,000 people live within this subarea, the majority near to the coast in the three main settlements.

The largest settlement is Minehead with a population of approximately 12,000. Minehead acts as the main service centre, with services such as a community hospital, community college and shopping centre, and is also home to the Butlins holiday resort. Watchet and Williton act as smaller service centres for the district[9].

TAUNTON DEANE

The former Taunton Deane area is predominantly rural and has a population of approximately 108,000 people, with over half of the population living in the town of Taunton. Taunton forms the main service centre and is well connected being on the southwest main train line and with direct access to the M5 motorway. Wellington is the second largest settlement with a population of approximately 13,000 people. It is a service centre serving the wider hinterland. Bishops Lydeard and Wiveliscombe are the next biggest settlements and major rural centres for the surrounding villages[10].

SOUTH SOMERSET

South Somerset is largely rural and has a population of approximately 161,000 people. Yeovil is the largest town in the district with a population of approximately 46,000, and is the primary centre of employment and services.

Approximately 40% of the population live in settlements with fewer than 2,500 people. The district is characterised by sparsely populated rural areas, networks of villages and market towns.

Manufacturing contributes to over 20% of employment in the district. Alongside this, the district is home to three military establishments which employ significant numbers of people both from within and outside South Somerset[11].

2.3 TOPOGRAPHY

The Study Area topography is illustrated in Figure 2-3 below and described in the following sections.

[9] West Somerset District Council (2016) West Somerset Local Plan to 2032 – Adopted November 2016
[10] Taunton Deane Borough Council (2012) Adopted Core Strategy 2011-2028 – Adopted 2012
[11] South Somerset District Council (2015) South Somerset Local Plan (2006-2028) – Adopted March 2015.

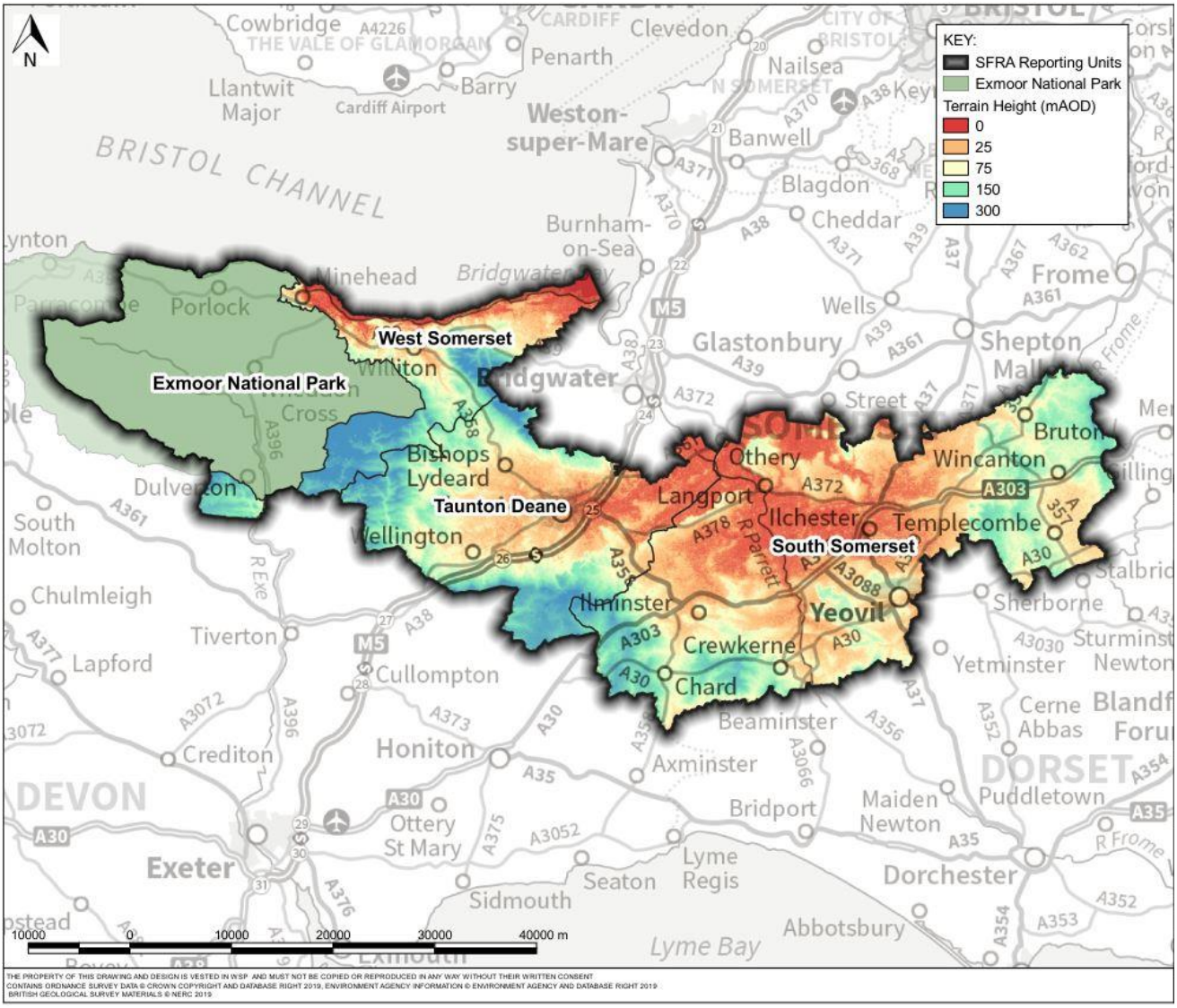

Figure 2-3 - Topography of the Study Area

WEST SOMERSET

In the West Somerset subarea, steep cliffs dominate the majority of the northern coastline with low-lying coastal plains in areas where the cliffs recede away. Minehead is a flat, low-lying coastal zone and forms a low-lying plateau relative to the higher ground to the south and west. Where the River Avill flows into the Dunster and Butlins holiday resort area, the topography is very low-lying at less than 10 metres above ordnance datum (mAOD). In this location, the main section of the River Avill flows in a north-westerly direction towards the Butlins holiday resort and the River Avill flood relief channel flows east towards Dunster Beach, with the elevation dropping to around 5 mAOD closer to the coast.

To the southwest of Minehead, levels rise rapidly into Exmoor National Park and the tributaries of the Bratton Stream have a steep gradient, with its southern branch falling from approximately 100 mAOD at the border of Exmoor National Park to 20 mAOD within the centre of Minehead approximately 1.4 km downstream.

Between Minehead and Blue Anchor, the coastline is characterised by an area of salt marsh protected from tidal flooding by sea walls, sand dunes and earth embankments and ground levels are in general less than 10 mAOD. A continuous sea wall exists between The Quay and Warren Point in Minehead, and another sea wall runs parallel to the B3191 road where it reaches Blue Anchor, eastwards as far as the Blue Anchor Hotel. The sea defences in between compromise rock-amour form Warren Point alongside part of West Somerset Golf Club and then shingle-bank and wooden groynes around Dunster Beach and Kerr Moor.

Between Blue Anchor and Hinkley Point, the majority of the coastline comprises low cliffs with the exception of a few low-lying areas around coastal settlements and river mouths, such as at Watchet, Doniford, Kilve and Lilstock. The coastline in this area has been subject to significant erosion and slumping in places in the recent past, especially between Blue Anchor and Watchet. Cliffs are present to the west of Watchet but fall away around Watchet Harbour and the Washford River.

There is low-lying land to the south and east of Hinkley Point which forms part of the Steart Peninsula. This area has been subject to significant change following the EA scheme for managed realignment of the sea defences forming Steart marshes, which is an area of compensatory intertidal habitat that extends into the neighbouring Sedgemoor District Council area.

The district generally rises from north to south towards the upland areas where river channel gradients are typically steeper with rapid responses to rainfall. The majority of the district's watercourses rise in Exmoor National Park. The Holford Stream and the Doniford Stream (also known as the Doniford Brook) rise in the Quantock Hills, an Area of Outstanding Natural Beauty (AONB) located in the east of the district. Excluding Exmoor National Park, the Quantock Hills are the highest area of the district with highest elevations above 300 mAOD. The Monksilver Stream flows into Doniford Brook to the north of Williton.

TAUNTON DEANE

The topography of the Taunton Deane subarea can be described in terms of the 'uplands' and 'lowlands'. The uplands comprise the headwaters of the watercourses draining into the Taunton area, including the Brendon Hills to the northwest within Exmoor National Park in the West Somerset subarea, the Quantock Hills in the northeast and the Blackdown Hills in the south. Elevations in the upland areas are above 360 mAOD in the Quantock Hills in the north of Taunton Deane and over 300 mAOD in the Blackdown Hills in the south. The uplands are characterised by rolling countryside, with some steep escarpments around the Blackdown Hills. The watercourses within the uplands are largely steep, within confined floodplains, and exhibit rapid responses to rainfall.

Levels fall towards the centre of the borough and the floodplain of the River Tone. North of Wellington where the Back Stream joins the River Tone, ground levels are in the region of 50 mAOD. As the Tone flows downstream into Taunton, the gradient of the watercourse becomes shallower, with ground levels falling from approximately 20 mAOD in the west of Taunton to approximately 10 mAOD in the east of the town, approximately 6.5 km downstream.

The lowlands in the east of the borough include part of the Somerset Levels and Moors and the eastern part of the lower floodplain of the River Tone. The topography in this area is extremely low-lying and flat, at around 3 to 5 mAOD.

SOUTH SOMERSET

The topography of South Somerset can also be described in terms of upland and lowland areas. The tributaries of the River Parrett originate in the Blackdown Hills to the southwest and south. Elevations in the upland areas are above 200 mAOD in the Blackdown Hills.

Yeovil in the southeast of the district is raised above the floodplain of the River Yeo with ground levels generally around 50 to 100 mAOD. Ground levels drop to the south and east of the town towards an ordinary watercourse in the south and the River Yeo in the east.

The River Isle rises in the south of the district and levels fall from approximately 80 mAOD in the vicinity of Chard to around 6 mAOD where the River Isle meets the River Parrett. The lowlands are situated in the north of the district and include the Somerset Levels and Moors, which includes the floodplain of the River Parrett. Ground levels within this low-lying area are generally between 3 and 8 mAOD.

2.4 GEOLOGY AND HYDROGEOLOGY

The EA has produced the Aquifer Designation Map[12] which shows aquifer designations for superficial and bedrock aquifers in England. The designations identify the potential of the geological strata to provide water that can be abstracted and have been defined through the assessment of the underlying geology. The aquifer designations are:

- *Principal aquifers* – geology that exhibit high permeability and/or provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale;
- *Secondary A aquifers* – permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers;
- *Secondary B aquifers* – lower permeability strata which may in part have the ability to store and yield limited amounts of groundwater by virtue of localised features such as fissures and thin permeable horizons;
- *Secondary (Undifferentiated) aquifers* – defined in cases where it has not been possible to attribute a category *Secondary A or Secondary B aquifer* to a rock type; and
- *Unproductive strata* – these are geological strata with low permeability that have negligible significance for water supply or river base flow.

The geological and hydrogeological setting provides an indication of the potential for groundwater flooding and an understanding of the role of infiltration drainage within the overall natural water cycle. The topography and geology significantly influence the catchment hydrology and the response to rainfall, i.e. areas draining from higher ground will typically have steep channel gradients and have a rapid response to rainfall.

The main characteristics in the geology of the Study Areas are described below under the subsequent headings.

[12] Environment Agency (2019) DEFRA MAGIC Map Application. Accessed online, 2019: https://magic.defra.gov.uk

WEST SOMERSET

Review of the British Geological Survey (BGS) mapping (Section 4.2) indicates that superficial deposits in the West Somerset subarea comprise the following:

- Marine Beach Deposits and Tidal Flat Deposits composed mostly of clay, silt, sand and gravel. These deposits are prominent along the coastline between Minehead and Stolford;
- Alluvium and Head Deposits composed mostly of sand, gravel, clay and silt. These deposits are confined to major and minor watercourses across the district between Minehead and Stolford; and
- Undifferentiated River Terrace Deposits occur in isolated areas at Williton and Minehead. These deposits are composed of sand and gravel.

The EA designates the Alluvium and River Terrace Deposits as *Secondary A aquifers*. Tidal Flat Deposits, Marine Beach Deposits and Head Deposits are designated *Secondary (Undifferentiated) aquifers.*

The bedrock geology for the West Somerset subarea is influenced by localised faulting that has also influenced groundwater flow locally within the subsurface. Springs are recorded at distinct geological boundaries i.e. where sandier more permeable layers (Sherwood Sandstone Group) abut less permeable mudstone layers (Mercia Mudstone Group)[13]. The Mercia Mudstone Group comprises mudstones and dominate subordinate siltstones and is present at outcrops over much of the area from Minehead and south towards Crowcombe Heathfield and east towards Holford. Between Watchet and Stolford the Lias Group, which is largely composed of mudstone, dominates. The Sherwood Sandstone Group, comprising fine to medium grained sandstones and conglomerates, is isolated to areas at Minehead, Williton and Lawford. The Aylesbeare Mudstone Group forms a distinct scarp feature fringing Exmoor National Park and is exposed at the surface west of Lawford.

The EA designates the Mercia Mudstone Group as a *Secondary B aquifer* and the Lias Group as a *Secondary A aquifer.* The Sherwood Sandstone Group is designated as a *Principal aquifer.*

As a result of the descriptions above, the bedrock geology for the West Somerset subarea identifies variable infiltration potential across the district.

TAUNTON DEANE

Review of BGS mapping (see Section 4.2) indicates that superficial deposits in the Taunton Deane subarea comprise the following:

- Alluvium and Head Deposits composed mostly of clay, silt, sand and gravel. These deposits are confined to major and minor watercourses across the Study Area, and are prominent to the southeast of Wellington and to the south of North Curry;
- Undifferentiated River Terrace Deposits occur in isolated areas across the Study Area and are composed of sand and gravel. River Terrace Deposits are prominent in and around Taunton; and

[13] British Geological Survey, NERC (1982) Hydrogeological Map for the Perme-Trias and other Minor Aquifers of South West England. Accessed online, January 2019: http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1003983

- Clay with Flint Formation comprising clay, silt, sand and gravel. These deposits are present in the southwest at Churchinford and Otterford.

The EA designates the Alluvium, River Terrace Deposits and Clay with Flint Formation as *Secondary A aquifers* and the Head Deposits as *Secondary (Undifferentiated) aquifers*.

The Mercia Mudstone Group comprises mudstones and dominate subordinate siltstones and is present over most of the Study Area. The Sherwood Sandstone Group which comprises fine to medium grained sandstones, is present to the west of Taunton at Wellington with isolated occurrences also present to the north of Taunton. The Selbourne Group comprises sandstone and siltstone and is present to the south of Taunton at Churchinford.

The EA designates the Mercia Mudstone Group as a *Secondary B aquifer.* The Sherwood Sandstone Group and Selbourne Group are designated *Principal aquifers.* The bedrock geology as described above indicates variable infiltration potential across the borough.

SOUTH SOMERSET

Review of BGS mapping (see Section 4.2) indicates that superficial deposits in South Somerset comprise the following:

- Alluvium and Head Deposits composed mostly of clay, silt, sand and gravel. These deposits are confined to major and minor watercourses across the district, and are prominent in and around Yeovil, north and south of Wincanton, Langport, Ilminster and Chard;
- Undifferentiated River Terrace Deposits occur in isolated areas across the district and are composed of sand and gravel. River Terrace Deposits are prominent south of Wincanton with isolated occurrences of these deposits occurring to the north of Yeovil and Langport; and
- Clay with Flint Formation comprising clay, silt, sand and gravel. These deposits are present south of Chard where underlying Chalk deposits are prominent.

The EA designates the Alluvium, River Terrace Deposits and Clay with Flint Formation as *Secondary A aquifers* and the Head Deposits as *Secondary (Undifferentiated) aquifers*.

The bedrock geology of South Somerset is variable and complex with a wide range of lithological units and significant faulting including the Mere Fault through Wincanton and numerous fault systems between Yeovil and Crewkerne. A review of BGS mapping (Section 4.2) indicates that bedrock geologies in South Somerset comprise the following groups:

- Lias Group – comprising the Bridport Sandstone Formation, Dyrham Formation, Marlstone Rock Formation, Blue Lias Formation and Charmouth Formation;
- Great Oolite Group – comprising the Fuller Earths Formation, Forest Marble Formation, Frome Clay Formation and Cornbrash Limestone Formation;
- Inferior Oolite Group – comprising limestone;
- Selbourne Group – comprising the Upper Greensand Formation; and
- White Chalk Subgroup – comprising the Zig Zag Chalk Formation.

The bedrock geology of the area comprises a significant succession of mudstone, clays, limestone, sandstones and chalk lithologies. The complexity of the bedrock geology listed above identifies significant variability of the infiltration potential across South Somerset with both *Principal* and *Secondary A aquifers* prominent in and around Yeovil. The Lias Group (Bridport Sandstone Formation) and Inferior Oolite Group (limestone) are exposed at surface between Yeovil and Bruton.

2.5 WATERCOURSES AND CATCHMENTS

The main watercourses and catchments within the Study Area are described below. Details of canals and reservoirs within the Study Area are included in Section 6.9.

WEST SOMERSET

The majority of watercourses within this area rise within Exmoor National Park and either flow north and discharge to the sea along the northern coast, or south where they join larger river catchments that drain Devon, such as the Exe.

The rivers which discharge to the former West Somerset's northern coastline are detailed in Table 2-1 below.

Table 2-1 - West Somerset main watercourses draining to the northern coast

Watercourse	Classification	Description
The Bratton Stream	Main River	Originates in Exmoor National Park and flows into Minehead
The River Avill	Main River	Originates in Exmoor National Park and flows into Dunster.
The Pill River	Main River	Originates in the Brendon Hills in Exmoor National Park and discharges to the sea at Blue Anchor.
The Washford River	Main River	Originates in Exmoor National Park before flowing through Washford and discharging to the sea at Watchet.
The Doniford Stream	Main River	Southeast tributaries rise in the Quantocks joined by tributaries rising to the southwest in Exmoor National Park and discharges to the sea at Doniford.
The Holford Stream	Ordinary watercourse	Originates in the Quantock Hills before flowing through Holford and Kilve and discharging to the sea.

East Brook and West Brook	Ordinary watercourse	These tributaries discharge to the sea between Stolford and Hinkley Point.
The Monksilver Stream	Ordinary watercourse	Originates in Exmoor National Park and flows from Monksilver and joins the Doniford Stream to the north of Williton.
River Barle	Ordinary watercourse	Originates in Exmoor National Park and flows south from Dulverton to Brushford before joining the River Exe

A number of main settlements fall within low-lying coastal zones which the above rivers drain through, including Minehead, Dunster, and Watchet. Main Rivers also flow through the settlements of Washford and Williton.

The remaining watercourses within the West Somerset subarea drain south into the River Exe Catchment into Devon or the River Tone Catchment into the Taunton Deane subarea. They are all classed as ordinary watercourses.

TAUNTON DEANE

The River Tone and its tributaries are the most significant watercourses in the former Taunton Deane area. The headwaters of the River Tone's tributaries rise in the Brendon Hills within the southeast of Exmoor National Park and flow southeast through the West Somerset subarea into the Taunton Deane subarea. The most significant watercourses within this area are detailed in Table 2-2 below.

Table 2-2 - Main watercourses within Taunton Deane

Category	Watercourse	Classification	Description
Main watercourse within the borough.	The River Tone	Main River	Originates in the Brendon Hills and flows south into the former Taunton Deane area, passing through Greenham, Wellington and Bradford-on-Tone. As the River Tone approaches Taunton, it is joined by tributaries from the south and the north (see below).

Upstream southern tributaries of the River Tone	Westford Stream/Back Stream	Main River at and downstream of Westford	Originates in the Blackdown Hills and flows north through Westford before joining the River Tone north of Tonedale.
	Haywards Water	Ordinary watercourse	Originates in the Blackdown Hills and flows north before joining the River Tone at Bradford-on-Tone.
	Unnamed ordinary watercourse	Ordinary watercourse	Originates in the Blackdown Hills and flows north before joining the River Tone near to the confluence with the Hillfarrance Brook from the north (west of Taunton).
Upstream northern tributaries of the River Tone	Hillfarrance Brook	Ordinary watercourse upstream of Hillfarrance Main River downstream of Hillfarrance.	Drains the northwest of the borough before joining the River Tone to the west of Taunton.
	Halse Water	Ordinary watercourse upstream of Norton Fitzwarren. Main River from Norton Fitzwarren	Drains the northwest of the borough and passes through Norton Fitzwarren as the Norton Brook before joining the River Tone in the west of Taunton.
	Back Stream	Ordinary watercourse	Drains the north of the borough, before joining the Norton Brook and then the River Tone in the west of Taunton.
	Mill Lease Stream	Main River	

Northern tributaries of the River Tone within Taunton town.	Kingston Stream	Main River	Originate in the Quantock Hills in the north and drain south towards Taunton.
	Priorswood Stream	Main River	
	Maiden Brook	Ordinary watercourse upstream of Taunton urban area. Main River within Taunton.	
	Allen's Brook	Ordinary watercourse upstream of Taunton urban area. Main River within Taunton.	
	Dyers Brook	Ordinary watercourse upstream of Dyer's Lane. Main River downstream.	
Southern tributaries of the River Tone within Taunton town.	Black Brook	Ordinary watercourse upstream of Taunton urban area. Main River within Taunton.	Originate in the Blackdown Hills in the south and drain north towards Taunton.
	Stockwell Stream	Ordinary watercourse	
	Sherford Stream	Ordinary watercourse upstream of Taunton urban area. Main River within Taunton.	

	Galmington Stream	Ordinary watercourse upstream of Taunton urban area. Main River within Taunton.	

Downstream of Taunton, the River Tone passes through a sluice gate at Newbridge which forms the tidal limit, approximately 5.7 km upstream of the Tone's confluence with the River Parrett. In the far east of this area, the Tone joins the River Parrett within the Somerset Levels and Moors.

In addition to the above, a small number of watercourses in the borough do not drain into the River Tone. In the south of the borough, the River Culm, which is classified an ordinary watercourse within the Study Area, drains into the catchment of the River Exe. The River Otter, also classified as an ordinary watercourse, drains southward through Devon towards the English Channel. The Fivehead River, classified as an ordinary watercourse, is part of the River Parrett Catchment and drains east into South Somerset.

SOUTH SOMERSET

The majority of South Somerset falls within the River Parrett Catchment. The River Parrett rises in West Dorset and flows northwest into the Somerset Levels and Moors before flowing out into the sea through the Parrett Estuary near Burnham-on-Sea. The River Parrett is tidal approximately 30 km from its mouth up to the hamlet of Oath. The most significant watercourses within South Somerset are detailed in Table 2-3.

Table 2-3 – Main tributaries of the River Parrett within South Somerset.

Category	Watercourse	Classification	Description
Main watercourse within the district	The River Parrett	Main River	Originates in West Dorset and flows northwest through the Somerset Levels and Moors and to the coast near Burnham-on-Sea. The River Parrett is joined by the River Isle and the River Yeo within the district.
Main tributaries of the River Parrett	River Isle	Main River	Drains the southwest of the district flowing in a north-easterly direction through Ilminster before

			joining the River Parrett in the vicinity of Midelney.
	River Yeo	Main River	Originates in Dorset and drains the southeast and east of South Somerset, flowing through Yeovil, and joining the River Parrett in the vicinity of Langport.
	River Cary	Main River	Originates in the east of the district and flows west within the north of the district. It flows into King's Sedgemoor Drain which joins the River Parrett at Dunball, outside of the Study Area.
Watercourses outside the Parrett Catchment	River Brue	Main River	Originates in the northeast of the district and flows west through Bruton before turning north, out of the Study Area, towards the coast.
	River Cale	Main River	Originates in the east of the district and flows south through Wincanton into Dorset.
	River Axe	Main River	Drains the south of the district flowing into Devon.

CATCHMENT CONSIDERATIONS

There are a number of significant watercourses which originate outside of the Study Area and continue downstream outside of the Study Area. In such instances, downstream impacts of flood risk management activities and strategic development within the Study Area need to be considered in relation to neighbouring authorities. Downstream local authorities include Mid Devon District, East Devon District, West Dorset District, Sedgemoor District and Mendip District.

There could also be instances where upstream flood risk management activities outside of the Study Area could impact upon flood risk in the Study Area. This includes Exmoor National Park, West Dorset, Mendip District and East Devon. Section 3.2 considers the Catchment Flood Management Plans (CFMPs) for these areas which provide a basis for considering cross-boundary catchment issues.

2.6 TIDAL AND COASTAL AREAS

The former West Somerset area is the only one of the three local authority areas with a coastline. Between Minehead and Blue Anchor, the coastline is characterised by an area of salt marsh protected from tidal flooding by defences. In Minehead this comprises a sea wall between the Quay and Warren Point. From Warren Point there is rock armour alongside part of the West Somerset Golf Club and then a shingle-bank to the outskirts of Blue Anchor where the B3191 reaches the coast. There is a continuous sea wall from here and through Blue Anchor as far as the Blue Anchor Hotel. The risk of coastal erosion along this frontage is very high and this is discussed further in Section 3.2 in relation the shoreline and beach management plans for the area.

Between Blue Anchor and Hinkley Point, the majority of the coastline comprises low cliffs which are designated as a Site of Special Scientific Interest (SSSI), with the exception of a few low-lying areas where watercourses discharge to the sea, such as at Kilve and Lilstock. Beyond Lilstock, the coast is designated as both SSSI and as a Ramsar – Wetland of International Importance.

Inland, the tidal limit of the River Parrett is at Oath Lock on the boundary of Taunton Deane and South Somerset subareas. Through management of the catchment, the tidal limit remains at Oath Lock, but the EA's modelled Flood Zone 3 outlines indicate that the tidal influence could extend up to Langport if the lock were not operational / assuming the absence of defences. Further south of Langport, the risk of flooding from the River Parrett is fluvial only.

Within the Taunton Deane subarea, the tidal limit of the River Tone is at Newbridge Sluice. The EA's Flood Zone 3 outlines indicates that the tidal influence extends approximately 1 km upstream of the sluice at Newbridge assuming the absence of defences. There is also a risk of fluvial and tidal flooding on the Sedgemoor Old Rhyne which discharges directly into the Parrett downstream of Oath Lock. Here, the tidal influence extends up to Listock.

3 POLICY AND STRATEGY CONTEXT

This section provides an overview of the national, regional and local strategy and policy context relevant to flood risk within the Study Area. The Level 1 SFRA is a key point of reference to the councils in developing their local flood risk policies and this section is designed to facilitate future policy development, as well as raise awareness of the policy that must be considered by developers wishing to build within the Study Area. Policy recommendations are given in Section 7 of this report.

3.1 NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK

The updated NPPF was published in February 2019 and sets out the Government's planning policies for England and how these should be applied. It provides a framework within which local authorities can prepare plans for housing and other development.

The NPPF must be taken into account when preparing local development plans and is a material consideration in planning decisions.

The PPG provides guidance on the implementation of the planning policies set out in the NPPF, including a framework for the production of SFRAs.

Section 14 of the NPPF states that strategic policies should be informed by an SFRA, and manage flood risk from all sources. In the preparation of an SFRA, the EA and any other relevant risk management authorities should be consulted. Local plans should apply a sequential, risk-based approach to the location of new development in order to avoid, where possible, flood risk to people and property, and manage any residual risks, taking into account the impacts of climate change.

Paragraph 157 states that in general, these requirements will be met by:

a) *applying the sequential test and then, if necessary, the exception test;*

b) *safeguarding land from development that is required, or likely to be required, for current or future flood management;*

c) *using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques); and*

d) *where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.*

The Sequential Test

In reference to the Sequential Test, Paragraph 158 of the NPPF states that:

The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

The Exception Test

In reference to the Exception Test Paragraph 159 of the NPPF states that, if following the application of the Sequential Test:

If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

Paragraph 160 states that:

For the exception test to be passed, it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh flood risk; and

b) 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.

All elements of the test will have to be passed for development to be allocated or permitted.

Flood risk vulnerability and Flood Zone compatibility

The assessment of flood risk considers the risk of flooding to a development site, from all sources and including an allowance for climate change, as well as the vulnerability of the proposed development to the impacts of flooding. The PPG summarises the proposed vulnerability classification for different types of development to flood risk. In addition to the use of the Sequential Test when determining the suitability of the site for development, a sequential approach should be adopted within a proposed development site, which proposes to locate the most vulnerable areas of a development to those areas of lowest flood risk within the site.

The PPG provides recommendations on the vulnerability of different types of development and the compatibility of each vulnerability classification within each of the EA's mapped fluvial and tidal Flood Zones. Table 3-1 summarises the vulnerability classifications as set out within the PPG.

Table 3-1 - NPPF Vulnerability Classifications

Vulnerability classification	Examples of Development
Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons. Wind turbines.
Highly Vulnerable	Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use.

	Installations requiring hazardous substances consent.
More Vulnerable	Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non–residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the More Vulnerable class; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works which do not need to remain operational during times of flood. Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-Compatible Development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel working. Ministry of Defence defence installations. Water-based recreation (excluding sleeping accommodation). Dock's, marinas and wharves. Navigation Facilities; Shipbuilding, repairing and dismantling. Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 3-2 below summarises the compatibility of each vulnerability classification within each of the mapped fluvial and tidal Flood Zones and where the Exception Test will be required. It is important to note that even where development is considered acceptable, the Sequential Test and sequential approach (as discussed above) should still be applied.

Table 3-2 - Flood Risk vulnerability and Flood Zone compatibility

EA Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required †	✓	×	Exception test required	✓
Zone 3b	Exception test required *	✓ *	×	×	×

✓ Development considered acceptable

× Development considered unacceptable

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to: remain operational and safe for users in times of flood; result in no net loss of floodplain storage; and not impede water flows and not increase flood risk elsewhere.

The PPG provides guidance on the implementation of the planning policies as set out in the NPPF. The application of the Sequential Test and Exception Test at the development level is discussed further in Section 7.

FLOOD RISK REGULATIONS

The Flood Risk Regulations (2009)[14] transposes the European Commission Floods Directive (2007/60/EC) into domestic law in England and Wales and implements its provisions.

The key objective of the Floods Directive is to coordinate the assessment and management of flood risks within Member States. Specifically, it requires LLFAs of Member States to assess if all watercourses and coastlines are at risk from flooding, map the flood extent and assets/people at risk

[14] UK Parliament (2009) Flood Risk Regulations 2009. Available online: http://www.legislation.gov.uk/uksi/2009/3042/contents/made

in these areas, and take adequate and coordinated measures to reduce this flood risk. In particular, it places duties on the LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessment (PFRA) reports that identifies Flood Risk Areas that warrant further examination through the production of maps and management plans.
- Flood Hazard and Flood Risk Maps that summarise identified local flood risks and flood hazards within the Flood Risk Areas.
- Local Flood Risk Management Plans that set out the actions and measures that will be taken to manage identified flood risks within the Flood Risk Areas.

The PFRA[15] for Somerset was published in 2011 and confirmed that there are no Flood Risk Areas located within Somerset County as defined by the Flood Risk Regulations. A Flood Risk Area is defined as a location that exceeds a threshold of 30,000 people at risk. An addendum to the PFRA[16] was produced in 2017 which confirmed that there are no Flood Risk Areas within Somerset based on the nationally derived thresholds.

FLOOD AND WATER MANAGEMENT ACT

The Flood and Water Management Act (2010)[17] provides the basis for implementing many of the recommendations from Sir Michael Pitt's Review of the major floods in 2007. The Review placed a series of responsibilities on local authorities with the primary aim of improving local flood risk management. The Flood and Water Management Act created the role of the LLFA. The LLFA for the whole Study Area is Somerset County Council. These responsibilities are detailed further in Section 3.6.

NATIONAL STRATEGY FOR FLOOD AND COASTAL EROSION RISK MANAGEMENT

The EA's National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England[18] sets out how the EA intends on meeting their obligations under the Flood and Water Management Act to *'develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England'.* A consultation is currently underway on producing an update to this Strategy.

The National Strategy states that the Government will work with individuals, communities and organisations to reduce the threat of flooding and coastal erosion by:

- Understanding the risks of flooding and coastal erosion, working together to put in place long-term plans to manage these risks and making sure that other plans take account of them;
- Avoiding inappropriate development in areas of flood and coastal erosion risk and being careful to manage land elsewhere to avoid increasing risks;

[15] Somerset County Council (2011) Preliminary Flood Risk Assessment Report – June 2011.
[16] Somerset County Council (2014) Preliminary Flood Risk Assessment: Somerset County Council – Addendum.
[17] UK Parliament (2010) Flood and Water Management Act 2010. Available online: http://www.legislation.gov.uk/ukpga/2010/29/contents
[18] Environment Agency (2011) National flood and coastal erosion risk management strategy for England. Available online: https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england

- Building, maintaining and improving flood and coastal erosion management infrastructure and systems to reduce the likelihood of harm to people and damage to the economy, environment and society;
- Increasing public awareness of the risk that remains and engaging with people at risk to encourage them to take action to manage the risks that they face and to make their property more resilient; and
- Improving the detection, forecasting and issue of warnings of flooding, planning for and co-ordinating a rapid response to flood emergencies and promoting faster recovery from flooding.

ENVIRONMENTAL PERMITTING (ENGLAND AND WALES) REGULATIONS

Under the Environmental Permitting Regulations (England and Wales) 2016[19], it is an offence to cause or knowingly permit the discharge of polluting materials to surface waters or groundwater, unless complying with an exemption or a Discharge Activities Permit that can be obtained from the EA as detailed in their guidance[20]. Under the Environmental Permitting Regulations, it is also a requirement to obtain a Flood Risk Activities Permit[21] (previously known as Flood Defence Consent) for any works on or near a main river, on or near a flood defence structure, in a floodplain, or on or near a sea defence.

LOCALISM ACT

The Localism Act (2011)[22] aims to transfer certain decision-making powers from central government to local government, communities and individuals. In relation to the planning of development, the Localism Act provides new rights to allow local communities to come together and shape new developments by preparing Neighbourhood Development Plans, Neighbourhood Development Orders and Community Right to Build Orders.

The Localism Act also supported and reformed the Community Infrastructure Levy (CIL), that provides councils with an alternative source of potential funding for infrastructure schemes. It is a tool that LPA's can use to deliver infrastructure that supports development anywhere in their administrative area. The charges vary across LPA's and are levied on the size and type of the new development. The money raised from the CIL could be used to fund flood defence works and flood alleviation schemes within the Study Area. CIL is currently in place in the former Taunton Deane area and South Somerset, but not in the former West Somerset area.

[19] UK Parliament (2016) Environmental Permitting Regulations 2016. Available online: http://www.legislation.gov.uk/uksi/2016/1154/contents/made

[20] Department for Environment, Food and Rural Affairs and Environment Agency (2016) Check if you need an environmental permit. Available online: https://www.gov.uk/guidance/check-if-you-need-an-environmental-permit

[21] Department for Environment, Food & Rural Affairs and Environment Agency (2018) Flood risk activities: environmental permits.

[22] UK Parliament (2011) The Localism Act 2011. Available online: http://www.legislation.gov.uk/ukpga/2011/20/contents/enacted

LAND DRAINAGE ACT

The Land Drainage Act (1991)[23] sets out the maintenance responsibilities of riparian owners to reduce local flood risks. Riparian owners, who are land owners with a watercourse either running through their land or adjacent to, have the responsibility to ensure that the free flow of water is not impeded by any obstruction or build-up of material within the watercourse. A riparian owner has the duty to accept the natural flow of water from upstream and has the right to convey the flows unimpeded downstream.

Under the Land Drainage Act, on designated Main Rivers, the EA has permissive powers to require landowners to undertake maintenance activities. On Ordinary Watercourses, the Parrett IDB has these permissive powers within their Board area and SCC have this power for Ordinary Watercourses outside the IDB area. A map of these boundaries is provided in Section 3.5.

In addition, as the Land Drainage Authorities, the IDB or County Council must give consent for any permanent or temporary works that could affect the flow within an Ordinary Watercourse under their jurisdiction in order to ensure that local flood risk is not increased[24]. The EA has a similar role for any permanent or temporary works that could affect the flow within a Main River (managed via Flood Risk Activities Permits detailed above).

The Land Drainage Act specifies that the following works will require formal consent from the appropriate authority:

- Construction, raising or alteration of any mill dam, weir or other like obstructions to the flow of a watercourse;
- Construction of a new culvert; and
- Any alterations to an existing culvert that would affect the flow of water within a watercourse.

THE WATER ACT

The Water Act (2003)[25] amended the Reservoirs Act (1975)[26] and requires the preparation of dedicated Flood Plans for large raised reservoirs, to be prepared by the asset owner. A large raised reservoir is defined in the Act as a structure 'designed to hold, or capable of holding, more than 25,000m^3 of water above that level (the natural level of any part of the land adjoining it).'

As of 2009 dedicated Flood Plans must be prepared by the reservoir owner for all large raised reservoirs that may pose flood risk. A Flood Plan is a set of documents that describe the arrangements to be put into operation in response to a sudden large release of water from a reservoir that could pose a threat to property and life downstream. They include an assessment of the impacts of dam failure, a review of the measures that can be taken by the reservoir operator to prevent the

[23] UK Parliament (1991) The Land Drainage Act 1991. Available online: https://www.legislation.gov.uk/ukpga/1991/59/contents
[24] Somerset County Council (Accessed online, 2019) Applying for consent to work on an ordinary watercourse. http://www.somerset.gov.uk/environment-and-planning/flooding/work-on-an-ordinary-watercourse/
[25] UK Parliament (2003) The Water Act 2003. Available online: https://www.legislation.gov.uk/ukpga/2003/37/contents
[26] UK Parliament (1975) The Reservoirs Act 1975. Available online: https://www.legislation.gov.uk/ukpga/1975/23

catastrophic failure and an assessment of the emergency response mechanism required to minimise risk to life and property should a failure occur.

WATER FRAMEWORK DIRECTIVE

The primary aim of the Water Framework Directive (WFD) is to improve/maintain the Ecological Status/Potential of all water bodies and to prevent deterioration in status of the water bodies and their associated WFD quality elements. Ecological Status/Potential is determined by a suite of biological, physio-chemical and hydromorphological quality elements.

The overarching objective of the WFD is for surface water bodies to attain overall 'Good Ecological Status (GES) or 'Good Ecological Potential' (GEP). GES refers to situations where the ecological characteristics show only a slight deviation from natural/near natural conditions. In such a situation, the biological, chemical, physio-chemical and hydromorphological conditions are associated with limited or no human pressure. Artificial and heavily modified water bodies have a target to achieve GEP, which recognises their important uses, whilst ensuring the quality elements are protected as far as possible.

The introduction of a new modification, change in activity or change to a structure on a water body needs to be considered in relation to whether it could cause deterioration in the Ecological Status or Potential of any water body. Regulatory bodies responsible for implementing the WFD are the Environment Agency (Main Rivers) and Local Authorities / LLFAs (Ordinary watercourses).

3.2 REGIONAL POLICY AND STRATEGY

SOMERSET LOCAL FLOOD RISK MANAGEMENT STRATEGY

In accordance with the Flood and Water Management Act (2010), SCC as LLFA is required to prepare a Local Flood Risk Management Strategy (LFRMS). The strategy[27] sets the framework for managing flood risk and identifies the range of measures the LLFA will take in partnership with others to manage flood risk. The LFRMS was developed following consultation with the relevant flood risk management authorities, including local authorities, the EA, the water and sewerage companies and the IDBs.

The primary focus of the strategy is on local flooding from surface water, groundwater or ordinary watercourses, with the aim of identifying areas at risk and taking action to reduce these risks. The LFRMS sets out seven objectives that flood risk management authorities in Somerset will work towards. Three of these are replicated below as these relate to flood risk and development planning:

- Work to achieve a year on year reduction in the impact of flooding from all sources. Any increase in the risk of flooding as a consequence of climate change will be mitigated where practicable;
- Development across the county will integrate consideration of flood risk and SuDS into planning and development management systems and always seek to reduce flood risk; inappropriate development which could increase flood risk will be avoided, as will inappropriate development in areas of significant flood risk; and

[27] Somerset County Council (2014) Local Flood Risk Management Strategy.

- Flood risk management will be fully considered in the local plan development process and identify flood defence infrastructure that development needs to contribute towards.

SOMERSET FLOOD ACTION PLAN

Following the prolonged wet weather and subsequent flooding in Somerset in the winter of 2013/14, the government asked SCC to coordinate the development of an Action Plan for a long-term sustainable future for the Somerset Levels and Moors. This has now expanded to cover the whole of Somerset. The resulting Somerset's 20 Year Flood Action Plan[28] was prepared by a partnership of organisations.

Various actions have been identified through the plan to reduce the frequency, duration, and severity of future flooding within Somerset. The first year of the plan focussed on assessing the cost effectiveness of these options, with detailed assessments and business cases to follow to facilitate investment choices.

The Action Plan was developed in accordance with the Heart of the South West Local Enterprise Partnership Strategic Economic Plan and through partnership working in the weeks following the flooding of 2013/14 to identify actions that could improve the flood risk situation in the Somerset. The actions identified in the plan can be split into the following categories:

- Risk reduction management:
  - Dredging and river management;
  - Land management; and
  - Urban run-off.
- Mitigation actions:
  - Infrastructure resilience (road, rail, sewerage, power and telecommunications); and
  - Building local resilience.

FLOOD RISK MANAGEMENT PLANS

The EU Floods Directive 2007 requires member states to produce Flood Risk Management Plans (FRMPs) to assess the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs and the actions being taken to manage those risks. FRMPs set out how risk management authorities (Table 3-4), including the Environment Agency, local flood authorities, district councils, Internal Drainage Boards and regional flood committees, will work with communities to manage flood risk over six-year cycles, with the current cycle spanning the period 2015 – 2021.

The study area is covered by the South West river basin district FRMP[29], which is further divided into a number of management catchments. The majority of the study area is within the South and West

[28] Somerset's 20 Year Flood Action Plan. Available online: https://www.somersetriversauthority.org.uk/flood-risk-work/somerset-20-year-flood-action-plan/

[29] Environment Agency (2016) South West River Basin District Flood Risk Management Plan 2015-2021

Somerset management catchment, with the remaining area within the East Devon and Dorset management catchments as shown in Figure 3-1.

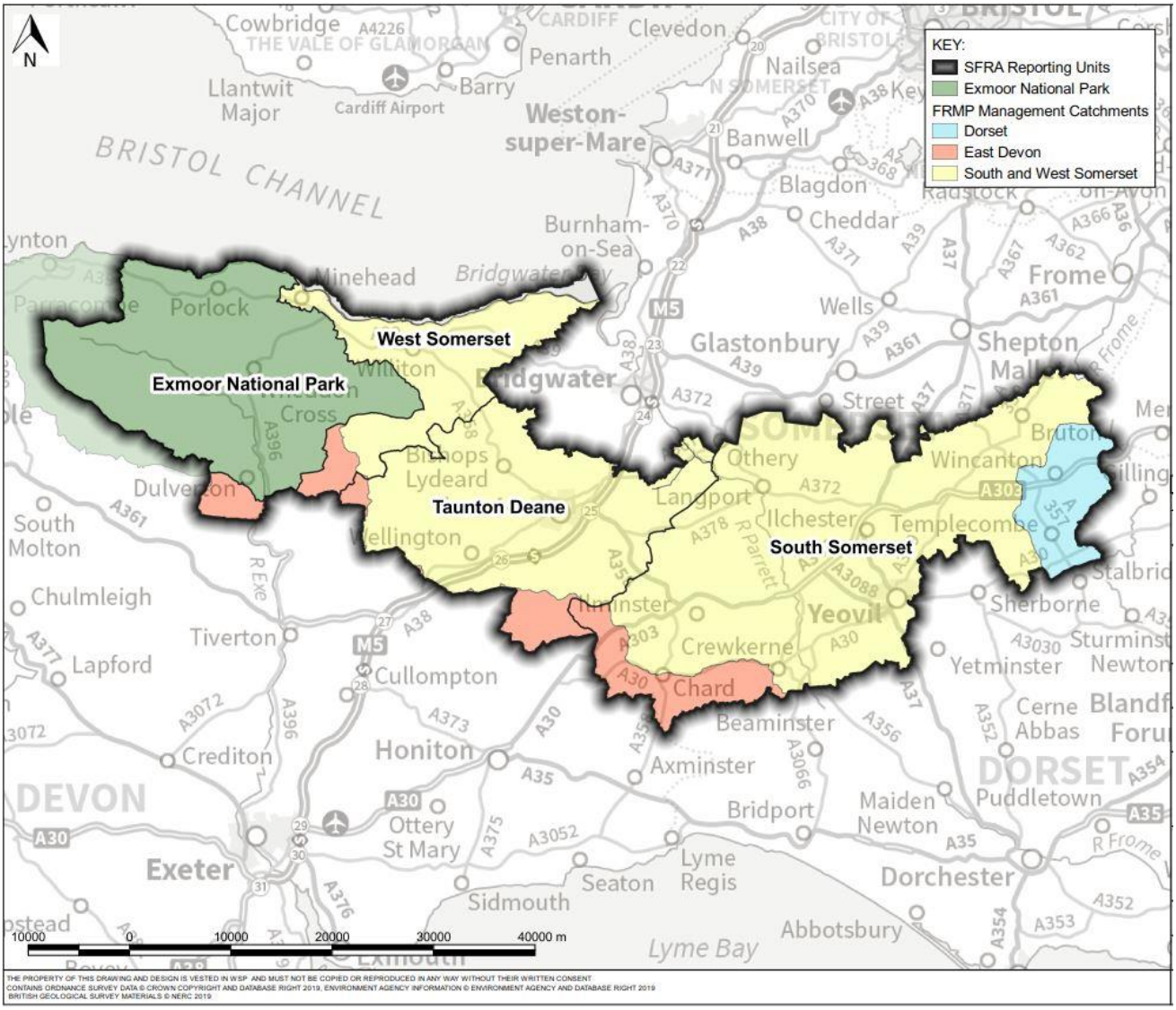

Figure 3-1 - FRMP management catchments

The FRMP sets out both high-level and area-specific guidance on flood risk management, with some important measures applying across the entire river basin catchment. Measures are included to prevent flood risk, prepare for flood risk, protect from flood risk and for recover and review following flood events.

South and West Somerset Management Catchment

This catchment is largely rural with a number of key urban centres of Taunton, Wellington, Yeovil Langport, Minehead and Williton. The majority of measures for the management of risk within the FRMP relate to flood risk management measures within these urban areas. The topography of this management catchment is variable with upland areas and lowland areas in the levels and moors. This presents a challenge for the management of flood risk due to the need to address the conflicting needs of the upper and lower catchment. Protecting properties and business within the

upper catchment needs to be balanced with the long-term impacts that any flood has on the lower catchment.

Flood risk management measures in this management catchment include:

- Continue with improvements to flood and erosion risk maps to provide improved information for land use planning and future coastal risk management;
- Promote property protection measures as a tool in flood risk management;
- Reduce urban runoff through planning policy, retrofit of SuDS, high quality SuDS on new development and strategic storage;
- Reduce flood risk in Taunton to enable redevelopment of the town; and
- Explore the potential for a flood alleviation scheme to protect 160 properties at risk of flooding in Williton or the implementation of property flood protection measures.

Dorset Management Catchment

This management catchment covers the east of South Somerset within the study area. The measures that are relevant in this catchment is to work at a strategic level and planning application level to steer development to areas at the least risk of flooding. This will be achieved by the inclusion of policies in planning documents for development in areas at risk of flooding to be resilient and for the implementation of SuDS. Advice on planning consultations shall ensure the location and layout of development does not increase flood risk to others and where possible reduces flood risk.

East Devon Management Catchment

This management catchment covers the south of the West Somerset subarea. There are no site-specific measures to manage flood risk within this part of the study area.

CATCHMENT FLOOD MANAGEMENT PLANS

CFMPs are a planning tool through which the EA aims to work in partnership with other key decision-makers within a river catchment to explore and define long term sustainable policies for flood risk management. Whilst CFMPs are still live documents, they have been partially superseded by FRMPs that are discussed in the previous Section of this report.

The majority of the Study Area is covered by the Parrett CFMP[30], including the majority of South Somerset, the former Taunton Deane and the south and east of the former West Somerset (Figure 3-2). The remainder of the Study Area falls within the following CFMPs:

- West Somerset CFMP[31];
- Exe CFMP[32];
- East Devon CFMP[33];
- Dorset Stour CFMP[34]; and

[30] Environment Agency (2009) Parrett Catchment Flood Management Plan – Summary Report December 2009.
[31] Environment Agency (2012) West Somerset Catchment Flood Management Plan – Summary Report June 2012.
[32] Environment Agency (2012) Exe Catchment Flood Management Plan – Summary Report June 2012.
[33] Environment Agency (2012) East Devon Catchment Flood Management Plan – Summary Report June 2012.
[34] Environment Agency (2012) Dorset Stour Catchment Flood Management Plan – Summary Report June 2012.

- North and Mid Somerset CFMP[35].

Figure 3-2 illustrates which parts of the Study Area fall within which CFMPs. Each CFMP is split into sub-areas, with each of these assigned a policy. The CFMP policies are defined in Table 3-3.

Table 3-3 – CFMP policies summary

Policy Unit	Policy description
Policy 1	Areas of little or no flood risk where the EA will continue to monitor and advise
Policy 2	Areas of low to moderate flood risk where the EA can generally reduce existing flood risk management actions
Policy 3	Areas of low to moderate flood risk where the EA is generally managing existing flood risk effectively
Policy 4	Areas of low, moderate or high flood risk where the EA is already managing flood risk effectively but where the EA may need to take further actions to keep pace with climate change
Policy 5	Areas of moderate to high flood risk where the EA can generally take further actions to reduce flood risk
Policy 6	Areas of low to moderate flood risk where the EA will take action with others to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits

[35] Environment Agency (2012) North and Mid Somerset Catchment Flood Management Plan – Summary Report June 2012.

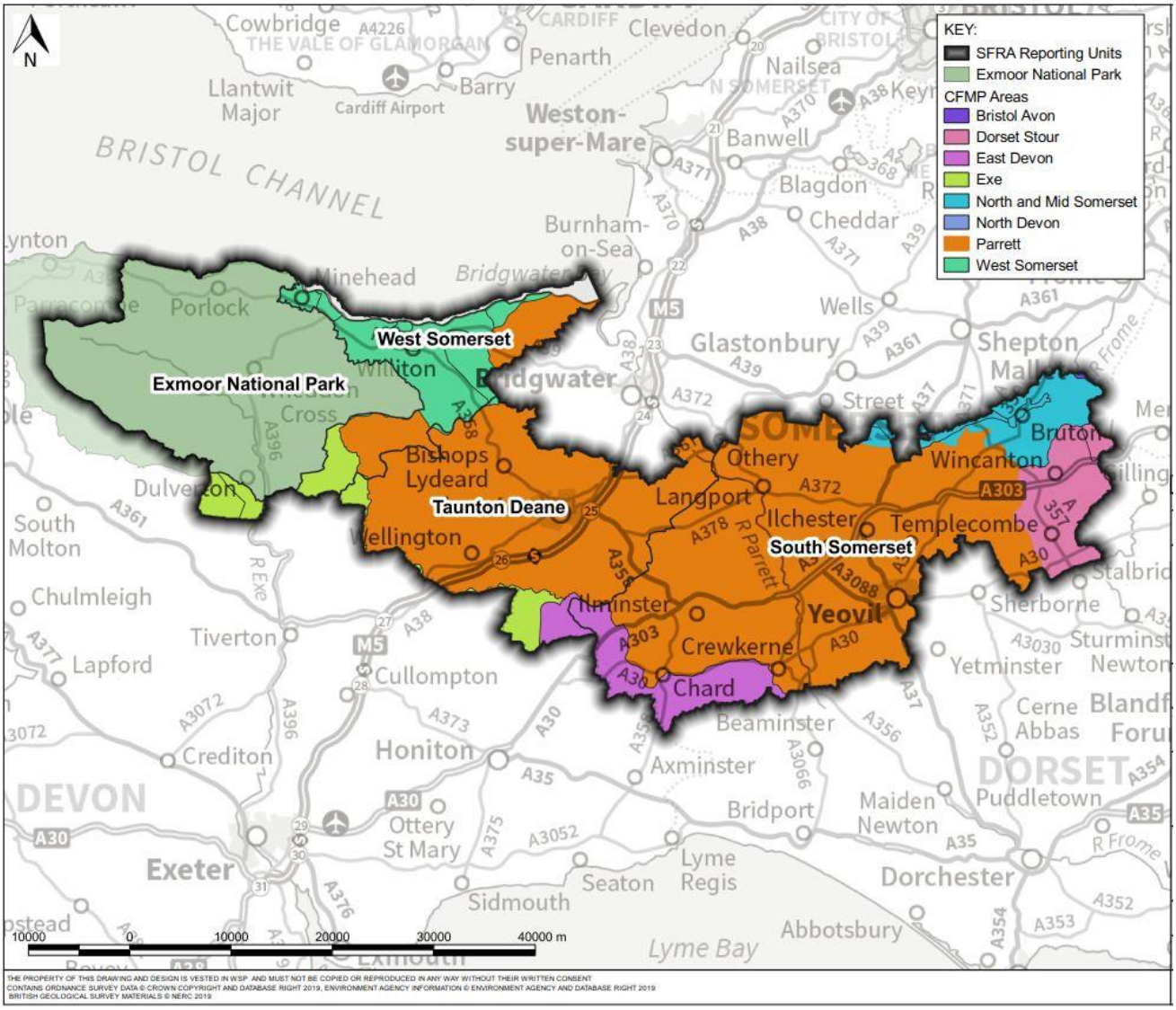

Figure 3-2 - CFMP study areas

Parrett CFMP

The Parrett CFMP was published by the EA in December 2009 and, within the Study Area, covers areas such as Taunton, Yeovil, Ilminster and Wellington. The CFMP divides the Parrett Catchment into 8 sub-areas based on similar physical characteristics, sources of flooding and level of risk. The most appropriate approach to managing flood risk has been identified in each sub-area through allocating one of six policy options. Figure 3-3 below shows the location of each sub-area within the Parrett CFMP and identifies which policy option applies.

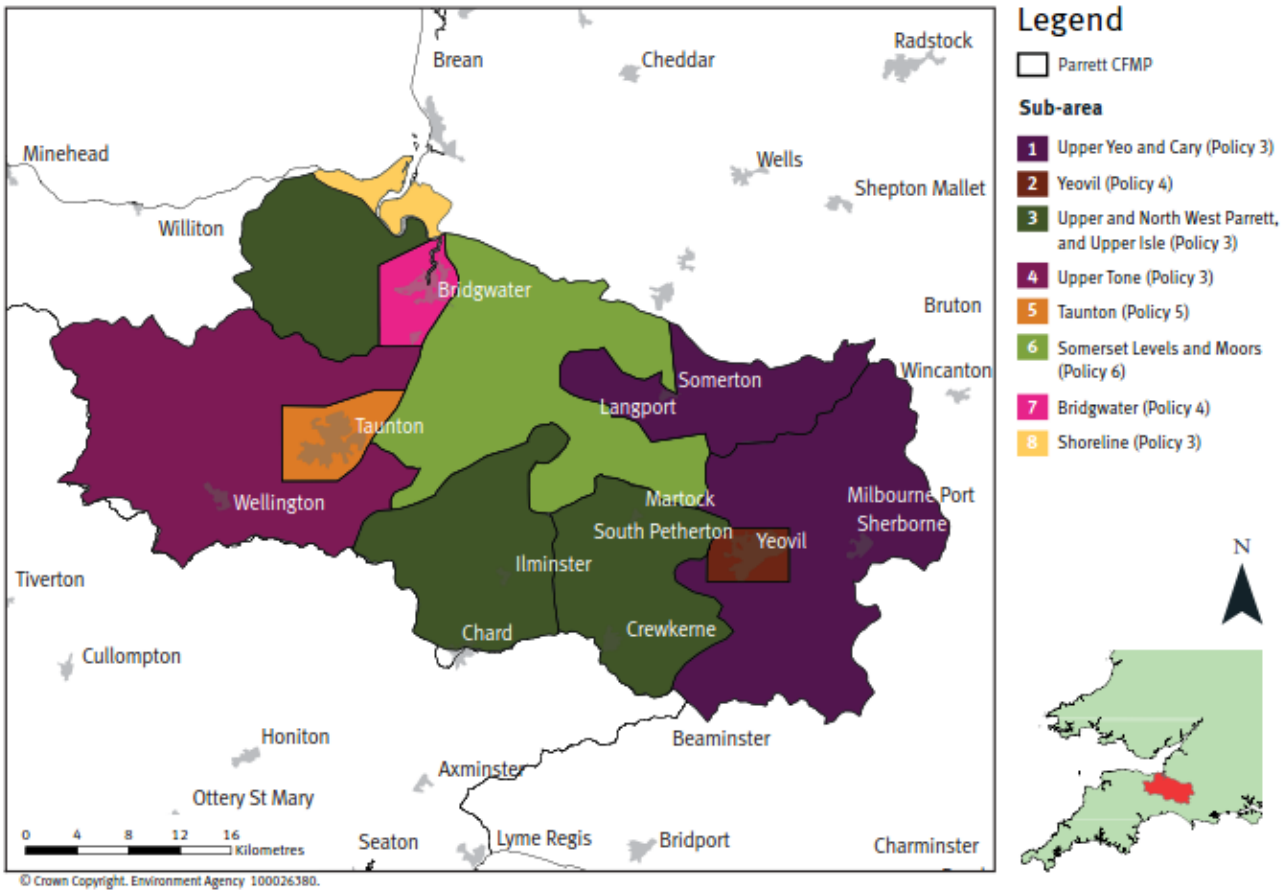

Figure 3-3 - Parrett CFMP sub-areas (Source: Environment Agency 2009)

Yeovil is located on relatively high ground compared to the River Yeo floodplain and the majority of flood risk issues in Yeovil are related to surface water and sewer flooding. Policy 4 is applied in this area.

The Somerset Levels and Moors, characterised by lowland floodplain, is assigned Policy 4. The purpose of this policy for the Somerset Levels and Moors is to redistribute floodwater to reduce the impacts of flooding.

The remaining policy sub-areas within the Study Area (Upper Yeo and Cary, Upper and North West Parrett and Upper Isle, the Upper Tone and the Shoreline) are assigned Policy 3.

In order to implement the above policies within the sub-areas, multiple actions have been identified. Some of these actions are reproduced below as these relate specifically to flood risk and development planning:

- Prepare development guidance for proposed developments in Taunton, identifying methods to reduce runoff rates and include Sustainable Drainage Systems in all new developments (applies to sub-area 5).
- Investigate identified marginal deficiencies in River Tone flood defences and implement improvements in connection with urban regeneration (applies to sub-area 5).
- Investigate the current future capacity of the existing surface water drainage systems in Yeovil, Taunton, Wiveliscombe and Wellington focusing on the effects of climate change. Develop

Surface Water Management Plans (SWMPs) with consideration of receiving watercourses and climate change (applies to sub-area 2, 4 and 5).

West Somerset CFMP

The West Somerset CFMP was published in June 2012 and, within the Study Area, covers the northeast of the West Somerset subarea including Minehead and Watchet. The CFMP divides this subarea into 8 based on similar physical characteristics, sources of flooding and level of risk. The most appropriate approach to managing flood risk has been identified in each sub-area through allocating one of six policy options. Figure 3-4 below shows the location of each sub-area within the West Somerset CFMP and identifies which policy option applies.

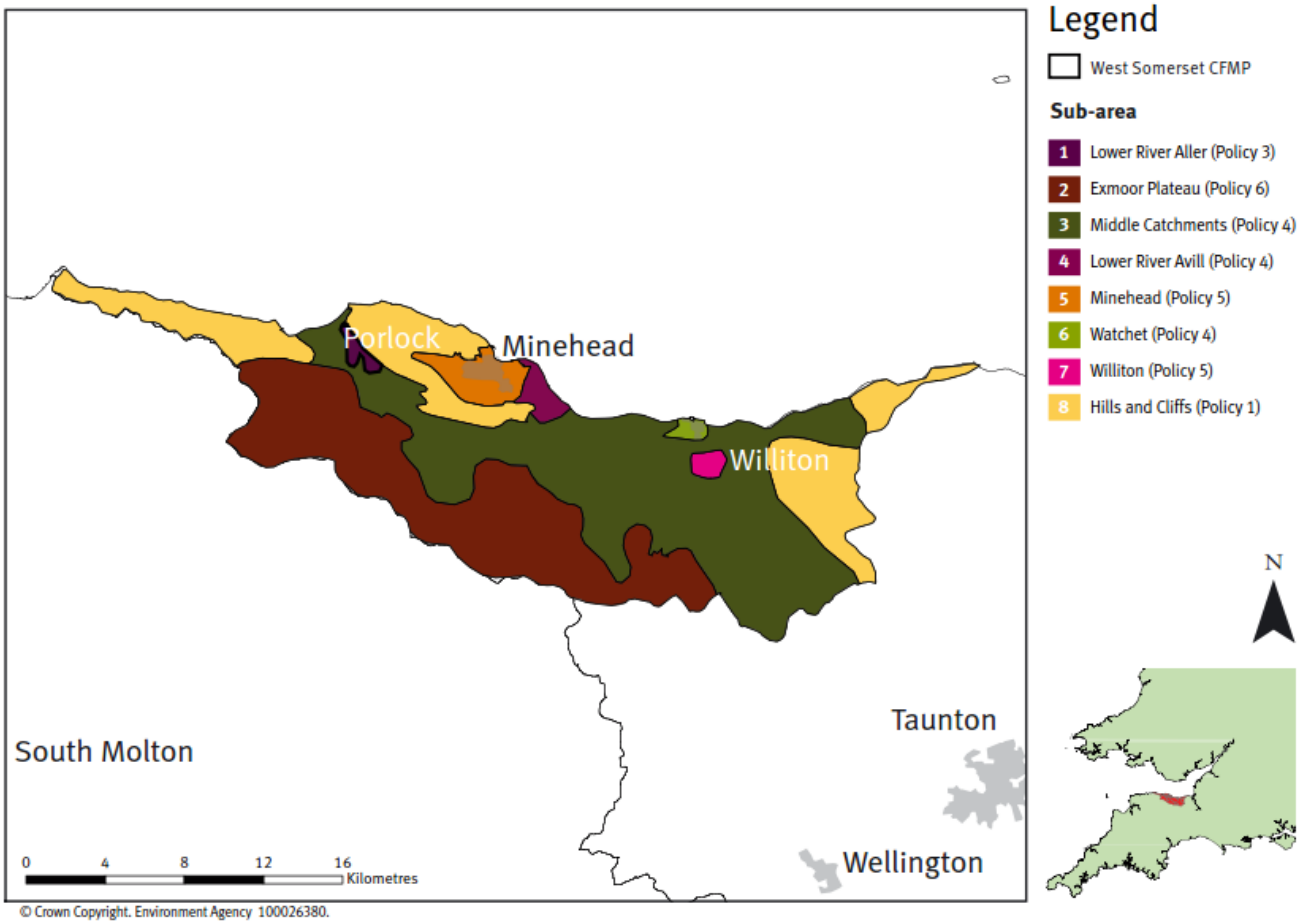

Figure 3-4 - West Somerset CFMP Sub-Areas (Source: Environment Agency 2012)

Policy 4 is applied to the eastern half of the Middle Catchments sub-area. The same approach is also applied to the Lower River Avill sub-area, which includes the east of Minehead, and the Watchet sub-area.

Minehead is situated within the floodplain of the Bratton Stream and its tributaries and also has a residual risk of flooding from the coast. The Minehead sub-area is assigned Policy 5. This policy also applies in the Williton sub-area where river flooding is exacerbated at the confluence where Monksilver Stream cannot easily discharge into the Doniford Stream when water levels in Doniford Stream are high.

The Hills and Cliffs sub-area, including the areas of Hinkley and the Quantock Hills are areas identified where Policy 1 applies. Flood risk in these areas is predominately from surface water run-off due to the steep topography.

The remaining sub-areas of the West Somerset CFMP do not fall within the Study Area. Some watercourses within the Exmoor Plateau sub-area feed down into catchments within the Study Area, where Policy 6 applies.

Several actions have been identified to implement the above policies, with those which relate specifically to flood risk and development planning reproduced below:

- Provide development control advice and promote SuDS to ensure that there is no increase in surface water run-off from new developments in Minehead (applies to sub-area 5).
- Promote the provision of a SWMP for Minehead and Williton (applies to sub-areas 5 and 7).
- Investigate flood defence schemes for Williton (applies to sub-area 7).
- Review emergency contingency planning in the light of climate change, especially for Butlins (applies to sub-area 5).
- Review the current and future standard of protection offered by the River Avill flood relief channel and improve as required (applies to sub-area 4).

Exe CFMP

The Exe CFMP was published in June 2012 and, in reference to the Study Area, covers the southeast of the former West Somerset and areas of Exmoor National Park excluded from the Study Area which drain south towards the River Exe. This CFMP also covers some areas within the south of the Taunton Deane subarea which drain south away from the Study Area. The CFMP divides the Exe Catchment into 7 sub-areas, with only two of these falling within the SFRA Study Area; Headwaters and High Ground and Mid Exe and Creedy.

The Headwaters and High Ground sub-area is an area of low to moderate flood risk where Policy 6 applies. The Mid Exe and Creedy sub-area covers the southwest of the Study Area where the watercourses drain south into the Exe Catchment; Policy 2 applies in this area.

The preferred actions detailed for these two sub-areas relate both to the Study Area and areas downstream within Devon outside of the Study Area. This part of the Study Area is not expected to be a significant potential development location. Most of the preferred actions relate to natural flood risk management through environmental enhancement.

East Devon CFMP

The East Devon CFMP was published in June 2012 and, in reference to the SFRA Study Area, covers the southeast of the Taunton Deane subarea and the south of South Somerset where the land drains south to the River Axe and the River Otter. The CFMP divides the catchment into 8 sub-area, only one of which falls within the Study Area; Upper Otter and Axe. This area is assigned Policy 6.

There is one action from this area reproduced below that specifically relates to flood risk and development planning within the Study Area:

- The EA will ensure that development at Chard does not increase run-off or decrease water quality. Ensuring that all new development incorporates SuDS will support this action.

Dorset Stour

The Dorset Stour CFMP was published in June 2012 and, in reference to the SFRA Study Area, covers the east of South Somerset including the catchment of the River Cale and the town of Wincanton. The CFMP divides the catchment into 9 sub-areas, with the most eastern areas of South Somerset falling into the Upper Stour and Blackmore Vale sub-area and the Stourhead sub-area.

The Upper Stour and Blackmore Vale sub-area is assigned Policy 6. This sub-area responds rapidly to rainfall and the floodplain is largely constrained to the river channels. The Stourhead sub-area is assigned Policy 3.

Several actions have been identified to implement the above policies. Three of these actions are reproduced below as these relate more specifically to flood risk and development planning within the Study Area:

- Develop a Blackmore Vale and Upper Stour Strategy to investigate locations for flood attenuation and wetland creation;
- Strengthen development control advice, including the use of SuDS, through the local development framework policies to ensure no increase in runoff from new developments and seek opportunities to reduce runoff where possible; and
- Develop a SWMP for Wincanton.

North and Mid Somerset CFMP

The North and Mid Somerset CFMP was published in June 2012 and, in reference to the SFRA Study Area, covers the northeast of South Somerset including the catchment of the River Brue and the River Pitt. The CFMP divides the catchment into 9 sub-areas, two of which falls within the Study Area; the Uplands sub-area and the Congresbury and Bruton sub-area.

The main sub-area within the Study Area is the Uplands which is assigned Policy 1. The main source of flooding in this sub-area is from surface water and flooding from small rivers. No specific actions have been identified for this sub-area.

The Congresbury and Bruton sub-area is assigned Policy 4. Bruton has a history of surface water flooding and there is a residual risk of fluvial flooding as a result of a breach of the flood storage area upstream.

Several actions have been identified to implement the above policies, two of these actions are reproduced below as these relate more specifically to flood risk and development planning within the Study Area:

- Assess the future standard of the Bruton Flood Alleviation Scheme, taking account of the potential impacts of climate change.
- Prepare flood emergency plans for Bruton, taking account of the potential impacts of climate change and including scenarios of overtopping and breach of flood defences embankments.

SHORELINE MANAGEMENT PLAN – HARTLAND POINT TO ANCHOR HEAD

The Shoreline Management Plan (SMP) for Hartland Point to Anchor Head[36] covers the whole Study Area coastline within the West Somerset subarea and provides the policy framework from which detailed schemes and strategies are developed to address coastal risks from flooding and erosion. This Plan also covers the Somerset Coastline near Bridgwater where the tidal defences are located that provide protection to areas in the Taunton Deane subarea near North Curry and Stoke St Gregory and in South Somerset near Langport.

The SMP for Hartland Point to Anchor Head sets out preferred management policies for the short-term (0-20 years), medium-term (20-50 years) and the long-term (50-100 years). Policies are set out by location for the coastal stretch within the Study Area from Minehead (Location Reference 7d19) to Stolford to Wall Common (Location Reference 7d34).

The long-term plan for the area is to continue to minimise flood risk to Minehead, including that from the Warren to Ker Moor frontage, whilst achieving a more sustainable defence line along the adjacent frontages to the east. At Minehead, the policy for the long term is to hold the line and to maintain and further improve the existing defences to continue protection for Minehead. Between Minehead and Blue Anchor, the policy is to hold the line over the short- and medium-term, but to move to a policy of managed realignment as it becomes unsustainable to maintain the line of the existing defences.

In the short- to medium-term, the plan for Blue Anchor is to hold the line, but in the long-term the plan is to move towards a policy of 'no active intervention' as it will increasingly become technically difficult to maintain the present defences. Between Blue Anchor and Hinkley Point the long-term plan is for process to evolve naturally, which means that some currently defended areas may experience increased flood and erosion risk in the medium to long term as existing defences deteriorate and fail. However, at Hinkley Point and Watchet the long-term plan it to continue to defend these areas against the risk of flooding and erosion.

Through this reach there is the potential for some erosion of the coastline over the next 100-years, but this is in the locations of more natural coastline and away from the key population centres. The key towns will continue to be protected from coastal erosion by hard defences. There is the potential for realignment of coastal defences to the east of Minehead over the longer term.

BEACH MANAGEMENT PLAN

A Beach Management Plan (BMP) has been prepared for the section of the former West Somerset coastline from the Culver Cliffs, located to the west of Minehead, to Blue Anchor in the east[37]. Coastal flood and erosion risk management along this section is the responsibility of the Environment Agency, SWT, SCC and private landowners. The key objective of this BMP is to manage the risk of coastal flooding and erosion to property and other assets along the Minehead to

[36] North Devon and Somerset Coastal Advisory Group. Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head, Shoreline Management Plan (Final), Halcrow, October 2010.
[37] CH2M (2018) Minehead Beach Management Plan Report (Final)

Blue Anchor frontage for the next 20-30 years within the context of the long-term (100 year) policy to provide a technically, economically, environmentally and socially sustainable management approach. The approach to future management through the areas area is:

- West of Minehead and Minehead Harbour – The defences for the west of Minehead will be improved in the near future by the construction of a new toe along the length of the wall to reduce the risk of undermining. This will be supported by recycling of sediment from east to west along this frontage before it goes around the breakwater towards the harbour. A trigger level based on sediment build-up against the harbour will be used to guide when this beach recycling activity occurs. It may be that in future there is a need to consider raising the level of the seawall in this area, and the approach set-out in this preferred option would not preclude this.
- Minehead Town - The preferred option is for ongoing beach recycling and maintenance works to the seawall and groynes to maintain the sea wall performance. This will require sediment recharge at some point to maintain the sediment between the groynes to ensure the beach continues to fulfil its role as part of the overall defence system. The defences may become less effective with sea level rise and improvements to defences may be required to maintain their current performance.
- The Warren and Dunster Beach – Subject to investigations, the preferred option will see the construction of a set-back defence within the next 10 years. This will reduce the risk of widespread flooding as a result of a breach occurring. As part of this preferred option, it is expected that periodic ad hoc intervention will occur along the existing shoreline of The Warren to reduce the risk of erosion and as a result the risk of breach.
- Ker Moor – Works in the immediate future will involve placing rock armour immediately to the east of the River Avill Flood Relief Channel by the Environment Agency, in order to manage the existing outflanking risk posed in this area. Along the rest of Ker Moor, no works are expected to occur for flood and coastal erosion risk management purposes. The implication of this will be the increasing risk of erosion and flooding posed to the West Somerset Railway line, which will need to undergo realignment to move it out of the erosion risk area in the future.
- Blue Anchor – The highways authority (SCC) has confirmed that they are committed to maintaining the road along this frontage and so the coastal defences that protect it. The preferred option is that the existing seawall and rock armour along the highway will therefore be maintained. This will be supported by construction of additional rock armour revetment to extend the existing rock armour further west. A new seawall at the eastern end of Blue Anchor will secure the defence line in this area. This will be supported by construction of additional rock armour revetment to extend the existing rock armour further west. A new seawall at the eastern end of Blue Anchor will secure the defence line in this area. The preferred option does not preclude additional, adaptive works at a later date if required.

3.3 LOCAL POLICY

LOCAL PLANS

Adopted West Somerset Local Plan to 2032

The Adopted West Somerset Local Plan to 2032 was adopted in November 2016, superseding the West Somerset District Local Plan Adopted in 2006. The Adopted Plan forms part of the Development Plan for SWT covering the former West Somerset LPA's area and provides the basis for decisions on spatial planning within the area up to 2032.

The main policy concerning flood risk is Policy CC2 – Flood Risk Management which is as follows:

Development proposals should be located so as to mitigate against, and to avoid increased flood risk elsewhere, whilst helping to provide for the development needs of the community in accordance with the flood risk management sequential test, and where appropriate, the application of the flood risk management exception test.

Development must be designed to mitigate any adverse flooding impact which would arise from its implementation, and where possible should contribute towards the resolution of existing flood risk issues.

This policy has been developed to protect new development from flood risk and existing development from additional flood risk as the result of development.

Policy CC6 – Water Management also requires that:

Development that would have an adverse impact on:

- *accessibility to existing watercourses for maintenance and*
- *areas at risk of flooding by tidal, fluvial and/or surface water runoff*

will only be permitted if adequate and environmentally acceptable measures are incorporated that provide suitable protection and mitigation both on-site and through displacement to adjoining land.

There are also policies that relate to coastal change and protection, specifically Policy CC3 – Coastal Change Management Area requires that:

Development within the coastal change management areas, as defined on the policies map, will be limited to temporary, tourism-related development.

No development will be permitted within parts of the coastal change management area which are vulnerable to rapid coastal erosion.

Exceptionally, where the use of such development locations are necessary for sustainable development purposes, other types of development may be permitted where they would be protected by new or existing sea defences which are to be maintained in the long term.

This policy has been developed to protect new and, where possible, existing development from flood risk arising from increasing sea levels and the effects of coastal erosion.

In addition, policy CC4 – Coastal Protection Zones requires that:

Development within the coastal zone and outside of settlements where the plan's policies provide for development will only be permitted for uses and activities for which a coastal location is essential and they cannot be located elsewhere. Account will be taken of;

- *impact on the coastal environment;*
- *scale of the development;*
- *cumulative impact on surrounding land and property; and*
- *measures taken to minimise and mitigate these matters.*

The purpose of this policy is to protect the undeveloped coastal landscape from inessential development which would be damaging to its character.

In reference to development in Minehead/Alcombe, under Policy MD1, where appropriate, proposals must:

contribute towards resolving the flood risk issues which affect the settlement including improving the sea defences protecting the eastern end of the town.

In reference to development in Watchet and Williton, under Policies WA1 and WI1, where appropriate, proposals must:

contribute towards resolving the flood risk issues which affect the settlement.

In reference to strategic allocations in these main settlements, the current Adopted Local Plan also requires that the developments noted under Policy MD2, WA2 and WI2 must be facilitated by the appropriate integrated provision of flood risk management infrastructure.

Taunton Deane Core Strategy

The Taunton Deane Core Strategy was adopted in 2012 and sets the vision for SWT for the former Taunton Deane area and the strategic objectives, spatial strategies and policies over the period up to 2028.

The main policy concerning flood risk is Policy CP8 – The Environment which states that:

The Council will seek to direct development away from land at risk of fluvial or other causes of flooding (including areas likely to be subject to flood risk in the future as a result of climate change) adopting a sequential approach to the location of development as set in the Strategic Flood Risk Assessment Level 2.

The Core Strategy says that risk should be reduced by safeguarding land from development that is required for current and future flood management.

In relation to surface water drainage, Policy CP8 states that:

Development sites will need to ensure that flood risk is not exacerbated from increased surface water flows by ensuring that existing greenfield rates and volumes are not increased off-site through the adoption of multi-functional SuDS. The Council will seek to reduce flood risk and mitigate for the impacts of climate change within Taunton Deane (and in particular the Taunton urban area) through the provision of a strategic flood attenuation scheme to which development sites will need to contribute.

The Core Strategy also emphasises the use of green spaces to contribute to flood alleviation and modification to existing infrastructure (such as de-culverting) to alleviate flooding.

Policy CP1 requires that proposals should demonstrate that the issue of climate change has been addressed in relation to flood risk, by:

The adoption of the sequential approach and exception test to flood risk in accordance with Policy CP8 (Environment) and incorporation of measures in design and construction to reduce the effects of flooding.

South Somerset

The South Somerset Local Plan (2006-2028) sets out the long-term planning framework for South Somerset up to the year 2028. The Local Plan was adopted by SSDC on 5th March 2015.

The main policy concerning flood risk is Policy EQ 1 – Addressing climate change in South Somerset, which states that:

The Council will support proposals for new development where they have demonstrated how climate change mitigation and adaptation will be delivered, through inclusion of the following measures (as appropriate):

- *Development will be directed away from medium and high flood risk areas through using South Somerset's Strategic Flood Risk Assessment as the basis for applying the Sequential Test. The area of search to which the Sequential Test will apply will be South Somerset wide, unless adequately justified otherwise in relation to the circumstances of the proposal;*
- *Where appropriate, the Exception Test can be applied only if this is consistent with wider sustainability objectives;*
- *Development should reduce and manage the impact of flood risk by incorporating Sustainable Drainage Systems, and through appropriate layout, design and choice of materials;*
- *Climate change should be considered in the design of new development, incorporating measures such as…flood resilience.*

The Local Plan also says that a sequential, risk-based approach should be applied, taking account of the impacts of climate change.

Development should incorporate SuDS, especially in areas such as Yeovil where there are surface water flooding issues.

In relation to Yeovil, the Local Plan also recommends that FRAs (and subsequent mitigation measures) are undertaken for sites on the edge of the floodplain and adjacent to Dodham Brook.

SURFACE WATER MANAGEMENT PLANS

SWMPs are prepared to outline a strategy for surface water management in a given location in consultation with the partners and risk management authorities who are responsible for surface water management (Section 3.6).

The purpose of the SWMP is to identify surface water flooding wetspots, and to identify and assess options for prioritised wetspots. The SWMP also provides some policy guidance in relation to surface water flood risk, which is detailed below for Minehead and Taunton. Further details of the surface water risk across the study area is provided in Section 6.6.

Surface Water Management Plan for Minehead and Taunton

The Minehead SWMP[38] and Taunton SWMP[39] both recommended that the following are emphasised in the local planning documents:

- Development proposals must demonstrate that surface water will be managed in a sustainable and coordinated way. Proposals should be supported by either a Surface Water Management Statement or Plan, depending on the scale of the development; and

[38] Somerset County Council. Minehead Surface Water Management Plan: Detailed Assessment and Options Appraisal Report, Hyder Consulting, August 2012

[39] Somerset County Council. Taunton Surface Water Management Plan: Detailed Assessment and Options Appraisal Report, Hyder Consulting, March 2013

- All developments should aim to achieve a reduction in existing runoff, but must not increase runoff.

The following recommendations are also made in both SWMPs in relation to planning and development in the identified wetspots:

- Where key flow paths through a site can be identified from the mapping provided, these flow paths should be integrated into the design of the surface water attenuation structures within a new catchment;
- Careful consideration of the use of architectural design such as drop kerbs in new developments within wetspots;
- Limit, and where possible better, the rate of discharge from new development sites to greenfield runoff rates; and
- Careful consideration with regards to installation of additional attenuation and soakaway basins. Provide a suitable storage capacity to reduce negative impacts.

Both SWMPs also recommend that a specific supplementary planning document is developed for Taunton and Minehead (separately) to integrate the evidence identified within the SWMP detailed assessment.

3.4 SUSTAINABLE DRAINAGE

Sustainable drainage systems or SuDS are a collection of water management practices that aim to align modern drainage systems with natural water processes. SuDS aim to replicate as closely as possible the natural drainage of a site before development and to treat runoff to remove pollutants so reducing the impact on the receiving water body. A range of guidance and standards on the use of SuDS is outlined in this section.

NON-STATUTORY TECHNICAL STANDARDS FOR SUSTAINABLE DRAINAGE

The Non-Statutory Technical Standards for Sustainable Drainage Systems[40] set out the core technical standards for Sustainable Drainage Systems (SuDS) proposed within England. These standards should be used in accordance with the NPPF and the PPG.

Whilst the standards should be considered for new and existing development of any size, they are considered to be of particular importance to major development as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2010[41].

The standards include guidance on controlling flood risk within a development boundary and elsewhere, peak flow and runoff volume control, and the structural integrity of SuDS.

[40] LASOO – Non-statutory Technical Standards for Sustainable Drainage – Practice Guidance.
[41] UK Parliament (2010) The Town and Country Planning (Development Management Procedure) (England) Order 2010. Available online: http://www.legislation.gov.uk/uksi/2010/2184/contents/made

WEST OF ENGLAND SUSTAINABLE DRAINAGE DEVELOPER GUIDE

SCC in partnership with the West of England authorities prepared guidance[42] for developers, planners, designers and consultants on the requirements for the design and approval of SuDS across the West of England and Somerset. It provides information on the planning, design and delivery of SuDS to provide multiple benefits in terms of surface water management, improvements to water quality and benefits to the environment.

It provides guidance on the broad requirements for sustainable drainage across the area and provides additional and complementary information in relation to implementing the requirements of the Non-Statutory Technical Standards for Sustainable Drainage. SCC are in the process on providing additional guidance on how sustainable drainage should be implemented in Somerset based on the area's specific characteristics.

THE SUDS MANUAL – CIRIA (C753)

The SuDS Manual published by CIRIA[43] provides comprehensive guidance on the planning, design and implementation of SuDS. It was originally published in 2007 and then updated in 2015 to incorporate the very latest research, industry practice and guidance, to assist in the planning, design, construction, management and maintenance of good SuDS. The manual provides guidance on runoff estimation, design of attenuation and infiltration systems, designing for exceedance and pollution control. In addition, it provides guidance on planning for the future operation and maintenance of SuDS which is important to ensure suitable arrangement can be put in place to manage the infrastructure for the lifetime of the development. It also supports the cost-effective delivery of multiple benefits via the use of SuDS.

SEWERS FOR ADOPTION 8

Water UK has prepared and published a pre-implementation version of Sewers for Adoption 8 (SfA8)[44]. SfA8 sets out how a drainage system should be designed if it is going to be adopted by a statutory Water Company in England and Wales. It is anticipated to come into effect by mid-2019 as part of the sector's implementation of the Ofwat Code on Adoption Agreements.

It provides details of the standards that sewers must meet if they are to be adoptable by water and sewerage companies in England and for the first time provides guidance on requirements for adoptable SuDS. It also provides requirements for details for access to SuDS, reliability, structural design and management of exceedance flows.

3.5 PARRETT INTERNAL DRAINAGE BOARD ADVICE AND GUIDANCE

The Parrett IDB has produced an advice and guidance document which sets out their policy statement and standing advice for LPAs and Developers[45]. This guidance should be referred to for

[42] West of England Sustainable Drainage Developer Guide Section 1 – March 2015.
[43] CIRIA (2015) The SuDS Manual
[44] Water UK (2018) Sewers for Adoption – A Design and Construction Guide for Developers.
[45] Parrett Internal Drainage Board – Policy Statement and Standing Advice to Local Planning Authorities and Developers.

any development within the IDB area of special drainage need, and such developments will need to take account of drainage when addressing flood risk matters.

Developments outside the IDB area, but within the same catchment where there is a possibility for increased runoff and volume of surface water entering into the IDB area, will also be considered by the IDB.

The IDB has consenting and enforcing powers through the Land Drainage Act 1991 and the guidance notes that:

Construction in or within a watercourse is likely to require a legal consent from the Board, which is referred to as Land Drainage Consent. This includes any construction within 9m of a watercourse and any surface water or treated effluent discharge into a watercourse in its District.

For a full list of the IDB's requirements for developers and LPAs, the applicant should refer to the IDB's Standing Advice document. The geographic extent of the Parrett IDB is shown in Figure 3-5.

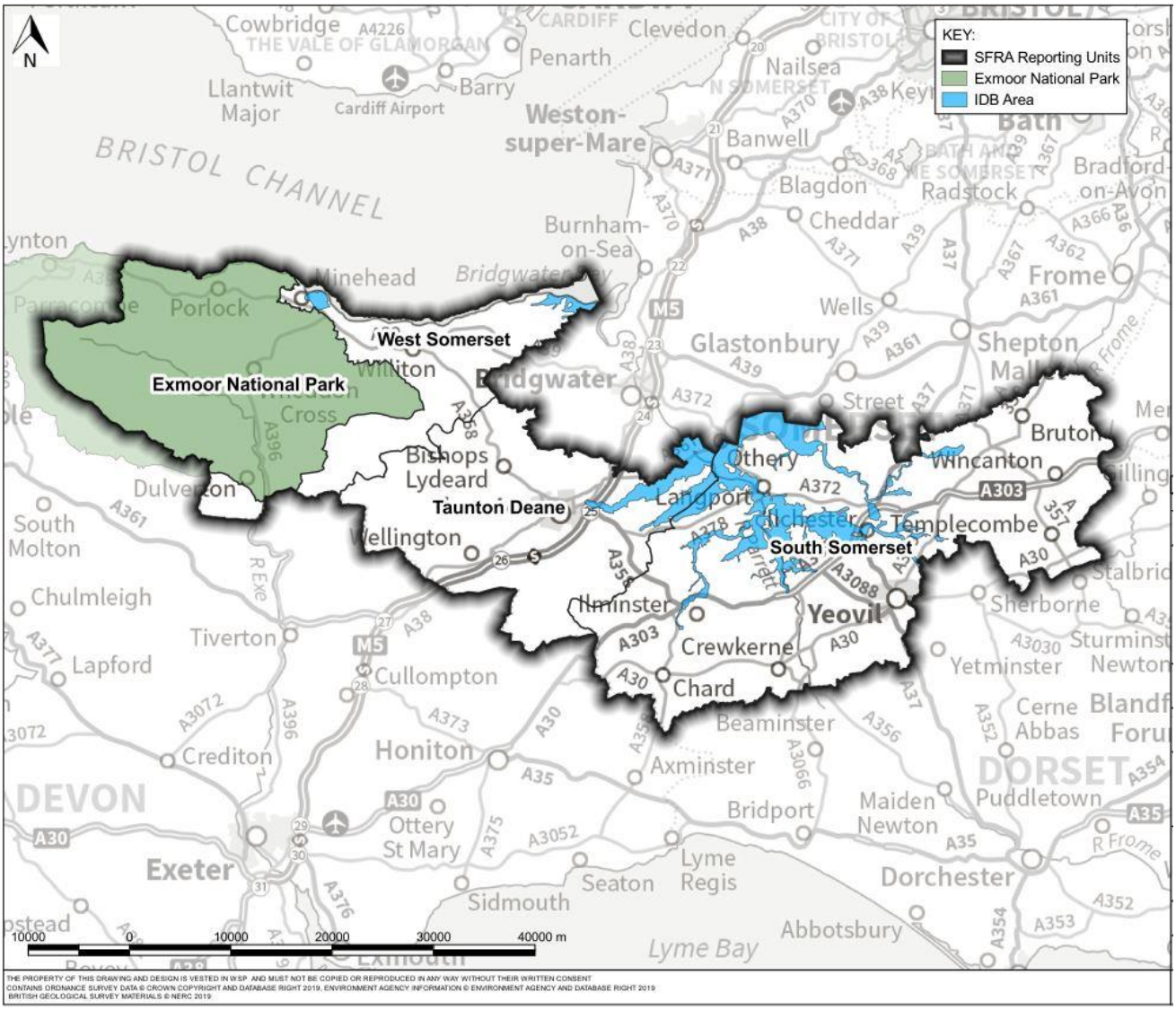

Figure 3-5 – Parrett Internal Drainage Board area

3.6 ROLES AND RESPONSIBILITIES

Table 3-4 provides a summary of key roles and responsibilities of the relevant Flood Risk Management Authorities. It is important to note that this table only provides a small extract of the full responsibilities of each party.

Table 3-4 – Flood risk roles and responsibilities within the Study Area

Authority	Roles and Responsibilities
Environment Agency	The EA has a strategic role in all flood risk matters but is directly responsible for the prevention, mitigation and remediation of flood risk for Main Rivers, large reservoirs and coastal areas. The EA's main roles and responsibilities include: ▪ Strategic overview of the management of all sources of flooding; ▪ Operational responsibility for managing the risk of flooding from Main Rivers and reservoirs; ▪ Consultee for strategic plans including this SFRA; ▪ Responsible for flood forecasting and flood warning; ▪ Issuing levies to local authorities to support the implementation of flood defence schemes and managing the allocation of funding for flood defence and flood resilience schemes; ▪ Power for enforcing, consenting and carrying out works for Main Rivers; ▪ Produce flood risk mapping and manage historical flood records/data; ▪ Enforcement authority for Reservoirs Act 1975; ▪ Issuing of environmental permits for flood risk activities; and ▪ Consultee for the majority of development located in Flood Zones 2 and 3 and all development within 20m of a main river.
Somerset County Council	SCC is the LLFA as defined by the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009. As LLFA, SCC's main roles and responsibilities include: ▪ Developing a strategy to tackle local flood risks, involving flooding from local sources; surface water, ordinary watercourses (i.e. ditches, rhynes, and streams), groundwater, canals, lakes and small reservoirs; ▪ Building partnerships and ensuring effective working between flood risk management authorities; ▪ Investigating all significant flooding incidents in accordance with Section 19 of the Flood and Water Management Act; ▪ Maintaining a register of flood defence assets; and ▪ Acting as statutory consultee for surface water for major developments. SCC has set up the Somerset Water Management Partnership and the Somerset Rivers Authority Technical Group to enable all authorities that have flood risk responsibilities to work more closely together.
Borough and District Councils	The Local Authorities have powers to undertake flood risk management work to ordinary watercourses and those with a shoreline have a responsibility for coastal erosion.

	▪ Power to designate structures and features that affect flooding or coastal erosion; ▪ Power to do works on ordinary watercourses; and ▪ Power to implement and maintain flood defences on ordinary watercourses. As LPA's the Councils are required to develop policies which address flood risk in support of their local development plans and policies. They are required to undertake technical studies to support this function such as preparing this SFRA.
The Internal Drainage Board	The Parrett IDB is a drainage body as set out under Section 72 of the Land Drainage Act 1991. The IDB's main roles and responsibilities include: ▪ Land drainage authority within their operational area; ▪ Consultee for development proposals within their operational area; ▪ Manage water levels within their area to minimise flood risk and supply water to people, property and land; ▪ Power for enforcing, consenting and carrying out works for ordinary watercourses located in their operational area; ▪ Maintenance and improvement of IDB maintained watercourses within their operational area; and ▪ Exercise a general supervision over matters relating to drainage of the land within their area.
Wessex Water and South West Water	Within their operational areas, the sewerage undertaker's responsibilities include: ▪ Maintain and manage sewerage systems to manage the impact and reduce the risk of flooding and pollution to the environment; ▪ Statutory consultee for any proposed discharge to the public sewerage system; ▪ Provide advice to LLFAs on how water and sewerage company assets impact on local flood risk; and ▪ Work with developers, landowners and LLFAs to understand and manage risks.
Riparian owners	The Land Drainage Act sets out the responsibilities of riparian owners. Riparian owners, who are land owners with a watercourse either running through their land or adjacent to, have the responsibility to ensure that the free flow of water is not impeded by any obstruction or build-up of material within the watercourse. A riparian owner has the duty to accept the natural flow of water from upstream and has the right to convey the flows unimpeded downstream.
Somerset Rivers Authority	The Somerset Rivers Authority (SRA) is a partnership body launched in January 2015 in response to the floods of 2013/14. The SRA now oversees the delivery of the Somerset 20 Year Action Plan. The SRA was set up to raise extra money, fund work and encourage increased levels of collaboration between flood risk management authorities. The SRA partners develop a programme of works each year that partner bodies cannot fund directly.

4 DATA COLLECTION AND REVIEW

4.1 OVERVIEW

This section provides a summary of the data collection and review process undertaken for this SFRA. Following the review and processing of the available data, the data provided was used to produce flood risk maps (see Section 5 below) and to assess flood risk in the Study Area (see Section 6 below). This section also gives consideration to the limitations and gaps that were identified in the data at the time of drafting. Further information will become available in the future, such as updates to the EA's mapping, which should be used to keep the SFRA up-to-date. Advice on the use of flood risk datasets in site-specific FRAs is provided in Section 7.

This SFRA was completed between September 2018 and April 2019. This included consultation, data collection and review and collation/processing of the data to produce the maps and inform the SFRA reporting.

4.2 INFORMATION/DATA REVIEW

STRATEGIC DOCUMENTS

The following strategic documents have been reviewed in relation to flood risk in the Study Area:

- West Somerset Council and Exmoor National Park Level 1 Strategic Flood Risk Assessment;
- West Somerset Council Level 2 Strategic Flood Risk Assessment;
- Taunton Deane Level 1 and 2 Strategic Flood Risk Assessment;
- South Somerset District Council Level 1 Strategic Flood Risk Assessment;
- Somerset County Council Preliminary Flood Risk Assessment;
- Somerset County Council Preliminary Flood Risk Assessment Addendum;
- Somerset County Council Local Flood Risk Management Strategy;
- South West River Basin District – Flood Risk Management Plan 2015-2021;
- The Parrett Catchment Flood Management Plan;
- The West Somerset Catchment Flood Management Plan;
- The Exe Catchment Flood Management Plan;
- The East Devon Catchment Flood Management Plan;
- The Dorset Stour Catchment Flood Management Plan;
- The North and Mid Somerset Catchment Flood Management Plan;
- Surface Water Management Plan for Minehead;
- Surface Water Management Plan for Taunton;
- Shoreline Management Plan – Hartland Point to Anchor Head; and
- Minehead Beach Management Plan.

ENVIRONMENT AGENCY FLOOD MAPS

The EA Flood Maps provide a comprehensive overview of flood risks from fluvial, tidal, surface water and reservoir sources. These maps are updated following periodic review and/or following changes to flood risk management infrastructure. The EA flood maps that have been used as a part of this Level 1 SFRA include:

- Flood Map for Planning;
- Risk of Flooding from Surface Water map;

- Risk of Flooding from Reservoirs map;
- Historic Flood Map;
- Flood Warning Areas map; and
- Areas Susceptible to Groundwater flooding.

The mapping data for the above were downloaded from the data.gov.uk website in late 2018 / early 2019 or received directly from the EA to inform this SFRA.

Flood Map for Planning

Information regarding fluvial and tidal Flood Zones that are key to the development policies discussed within this SFRA has been obtained from the EA's Flood Map for Planning.

Within the Study Area, many areas of the Flood Map for Planning (i.e. the Flood Zones) have been created using a national generalised model, known as JFLOW. Where more detailed modelling has been undertaken in certain areas, the outputs of these models are typically incorporated into the Flood Map for Planning. However, in some locations where detailed models are available, the EA has decided not to include the detailed model outputs, but rely on the national modelling instead. Further details of the mapping approach for this SFRA are documented in Section 5.2.

For the purposes of the SFRA and planning policy, it is necessary to split EA Flood Zone 3 into Flood Zone 3a and 3b for application of the Sequential Test. The methodology for splitting Flood Zone 3 into Flood Zones 3a and 3b is presented in Section 5.2.

Along with the Flood Zones, the EA's Flood Map for Planning also shows EA flood defences and Areas Benefitting from Defences (ABD), typically defining areas that are protected up to a 1 in 100 (1%) year fluvial event or a 1 in 200 (0.5%) year tidal event. The EA also holds GIS datasets of the Flood Storage Areas which are illustrated on the Flood Map for Planning.

Risk of Flooding from Rivers and Sea Map

The EA's Risk of Flooding from Rivers and the Sea Map[46] illustrates similar extents of fluvial and tidal flooding to that illustrated within the EA's Flood Map for Planning. However, this mapping takes account of the presence and condition of any defences when defining flood extents. This mapping is a national approach to modelling risk and is produced on a coarse grid of 50m x 50m cell size.

The purpose of these maps is to principally inform national flood risk assessments and the mapping is not intended to inform development control. The EA's Risk of Flooding from Rivers and the Sea Map is therefore not used within this SFRA and should not be used to inform site-specific FRAs.

Risk of Flooding from Surface Water Map

Information regarding surface water flood risk has been obtained from the EA's Risk of Flooding from Surface Water map[47]. The information provided within the SFRA relates to the extent of surface

[46] Environment Agency (2019) GOV.UK Long term flood risk information – Flood risk from rivers or the sea. Available online: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

[47] Environment Agency (2019) GOV.UK Long term flood risk information – Flood risk from surface water. Available online: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

water flooding during different storm events, defined as high, medium, low and very low as discussed in Section 5.4.

Further information regarding the depth and velocity of surface water flooding can be obtained directly from the EA's Risk of Flooding from Surface Water map as provided on the gov.uk[48] website.

Smaller watercourses with a catchment of typically less than 3 km^2 are not specifically modelled and hence are not represented within the EA's Flood Map for Planning. Although the conveyance effect of ordinary watercourses or drainage channels is not explicitly modelled in the Surface Water mapping, it can give an *indication* of the risk of flooding from such smaller watercourses not included in the Flood Map for Planning. Where the EA's Risk of Flooding from Surface Water map indicates that a watercourse may pose a flood risk to a development, it will be necessary to undertake more detailed hydraulic modelling to better define flood risk in these areas.

Flood Warning Map

The EA's Flood Warning Map shows areas that benefit from the EA's flood warning schemes. These schemes have been set up for a number of areas that are considered to be at particular risk from flooding. Within these areas, the EA can warn residents in advance when flooding may be likely and how severe the flooding could be. The EA constantly monitor rainfall and river levels to forecast the possibility of flooding, and if flooding is forecast, will issue flood warnings and alerts. Flood warnings are issued to specific areas where flooding is expected. Flood alerts cover larger areas and are issued more frequently to areas when flooding is possible.

Risk of Flooding from Reservoirs Map

The EA's Risk of Flooding from Reservoirs map[49] shows the likely extent of flooding in the event of reservoir failure. Although the likelihood of such an occurrence is low, as all large reservoirs are stringently governed under the Reservoirs Act 1975, a large volume of water could escape with little or no warning if a failure were to occur. As such, following a recommendation in the Pitt Review, the EA completed a programme of breach assessments to ascertain the areas at potential risk from large raised reservoirs that have a capacity of 25,000 m^3 or greater.

Historic Flood Map

The EA's Historic Flood Map is a GIS dataset showing the maximum extent of all individual recorded flood outlines from rivers, the sea and groundwater sources. Records began in 1946. Compared to the EA's Recorded Flood Outlines dataset, the Historic Flood Map only shows outlines which are 'considered and accepted' if the following criteria are met:

- Photographic/video evidence with the location referenced;
- Recorded flood levels with the location referenced;
- Evidence that the outline represents the time of peak water level; and

[48] https://flood-warning-information.service.gov.uk/long-term-flood-risk

[49] Environment Agency (2019) GOV.UK Long term flood risk information – Flood risk from reservoirs. Available online: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

- Evidence that the source of flooding is from rivers, the sea or groundwater and not surface water /overland runoff.

The absence of coverage by the Historic Flood Map does not mean that the area has never flooded, only that the EA does not hold validated records of flooding in that area. It also does not necessarily mean that properties in that location have flooded internally.

Areas Susceptible to Groundwater Flooding

The EA has provided its Areas Susceptible to Groundwater Flooding dataset, which is a gridded 1 km spatial dataset in which each square kilometre is assigned a susceptibility to groundwater emergence based on the geological and hydrological conditions. The mapping uses information from the BGS but was developed by the EA for use by LLFAs to support preparation of PFRAs. The data should not be interpreted as identifying areas where groundwater is actually likely to flow or pond, and therefore result in flooding, but is useful at a strategic scale to identify where further studies may be useful.

ENVIRONMENT AGENCY DETAILED HYDRAULIC MODELLING

The EA's Flood Map for Planning has been modified in several places with detailed hydraulic modelling data. The hydraulic modelling data was requested from the EA for the Study Area and provided in GIS format.

The following hydraulic models have been provided by the EA:

- West Somerset subarea:
  - Minehead (2010) – Minehead Rivers Flood Risk Mapping Study Phase 2;
  - River Avill (2008) – River Avill West Somerset Streams Flood Zone Compliance;
  - Washford (2013) – Washford River Flood Mapping;
  - Williton (2016) – Williton Flood Hydrology and Modelling Update;
- Taunton Deane subarea:
  - Taunton (2018) – Taunton Northern Tributaries Flood Risk Modelling;
- South Somerset:
  - Martock (2015) – Martock Hydrology and Modelling Study;
  - River Cale (2005) – River Cale Strategic Flood Risk Mapping;
  - Somerset Levels and Moors, River Brue (2016) – Somerset Levels and Moors Appraisal Brue River System, Lowlands. Hydraulic modelling report.
  - Somerset Levels and Moors, River Parrett (2016) – Somerset Levels and Moors Appraisal Parrett River System, Lowlands. Hydraulic modelling report.
  - Yeo and Cam (2017) – River Yeo and Cam Modelling and Mapping Study.

A review of the hydraulic model data was undertaken to highlight any data gaps and/or discrepancies with the EA's Flood Map for Planning. The review showed that in most locations, where detailed hydraulic modelling data exists for the 1 in 100 (1%) year fluvial event or a 1 in 200 (0.5%) year tidal event, these outlines have been used to produce Flood Zone 3 rather than the national generalised JFLOW modelling. However, in some locations, certain sections of the floodplain that have detailed modelling are still represented using JFLOW. This is discussed further

in Section 5 which outlines the mapping methodology used for Flood Zone 3a and 3b within the SFRA.

A further discrepancy that was noted between models was whether the undefended modelled flood extents alone were used to map the Flood Zones, or whether the defended flood extents were also included to capture any areas of displaced flood water in the defended scenario. This is discussed further as part of the mapping of Flood Zones 3a and 3b in Section 5.

During the writing of this SFRA, the Taunton Northern Tributaries model was under development. Undefended modelled outlines have been provided by the EA for the 1 in 100 year event but the defended results were not ready for inclusion in this Study, although these were expected to be available by the end of February 2019. For Flood Zone 3a, the undefended outlines have been included in this SFRA's mapping in a region defined by the EA, with the areas outside of this area matched to the existing Flood Zone 3.

HISTORICAL FLOOD INCIDENTS

The EA holds historic flood records in its Historic Flood Map and Recorded Flood Outlines datasets (see above).

Historic flood records have also been provided by SCC, split into each of the Local Authority areas and classified by flood source type. The SCC data is from a variety of sources such as the EA, Wessex Water, South West Water, parish councils, the previous SFRAs/flood risk studies undertaken, residents and the media.

Historic records of flooding as a result of sewer or infrastructural failure have been provided by Wessex Water and South West Water (see below).

TOPOGRAPHIC DATA – LIDAR

The EA's LiDAR data has been downloaded from the DEFRA Survey Data Download[50] for the Study Area. LiDAR is an airborne mapping technique which uses a laser to measures the distance between the aircraft and the ground. The EA's Composite Digital Terrain Model (DTM) has been used in this SFRA to evaluate the topography of the Study Area. The DTM in a 'bare earth' model which means that buildings and areas of vegetation and trees have been removed to represent the underlying ground levels. The composite dataset is derived from a combination of the EA's full dataset which has been merged and re-sampled to give the best possible coverage. This means that datasets sampled at different points in time have been merged to produce a continuous grid.

[50] DEFRA Survey Data Download. Accessed online, January 2019. https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

FLOOD DEFENCES AND INFRASTRUCTURE

The EA's Spatial Flood Defence layer has been downloaded from data.gov.uk[51]. This dataset shows the EA maintained linear flood defences that prevent flooding, both man-made (such as flood walls) and natural (such as shingle ridges and dunes). This dataset contains information about the design crest levels, the standard of protections offered by the defence and the condition based on routine inspections.

With respect to flood risk management infrastructure not maintained by the EA, SSDC has provided a screen maintenance schedule including details of infrastructure such as flap valves, trash screens and outfalls. The IDB has also provided a GIS layer with IDB control structures. Both of these datasets have been filtered to remove structures with a less obvious flood risk management function (e.g. culverts, inlets and catchpits). Structures that have been displayed in the mapping include:

- Bunds;
- Flap valves;
- Outfalls;
- Penstocks;
- Pumping stations;
- Screens;
- Siphons;
- Sluices;
- Spillways;
- Stoplogs;
- Tilting weirs;
- Timber doors; and
- Weirs.

SCC also provided records of flood defence assets; those that are not duplicated by the EA Spatial Flood Defence Layer data have been mapped as described in Section 5.3. Ditches and culverts have not been included in the mapping.

Any applicant should consult with the relevant flood risk management authorities, as defined in Section 3.6, as part of a site-specific FRA for specific details with regards to watercourses, culverts or flood risk management infrastructure within or adjacent to the proposed development.

The EA's Flood Map for Planning Flood Storage Areas dataset shows the areas that act to attenuate a flood peak to a level that can be accepted downstream. This dataset relates to existing flood alleviation schemes.

[51] Environment Agency (2019) Spatial Flood Defences (including standardised attributes). Accessed online, 2018: https://data.gov.uk/dataset/6884fcc7-4204-4028-b2fb-5059ea159f1c/spatial-flood-defences-including-standardised-attributes

Information about proposed alleviation schemes has also be acquired from the SRA, the Local Authorities and from the FCERM Programme[52]. A summary of these schemes is detailed in Section 6.5.

SEWERAGE COMPANY FLOOD DATA

Wessex Water Ltd and South West Water Ltd are the statutory water undertakers responsible for the public sewer systems within the Study Area. Wessex Water is responsible for the majority of the Study Area, whilst South West Water is responsible for areas in the south of the Study Area, as illustrated in Figure 4-1.

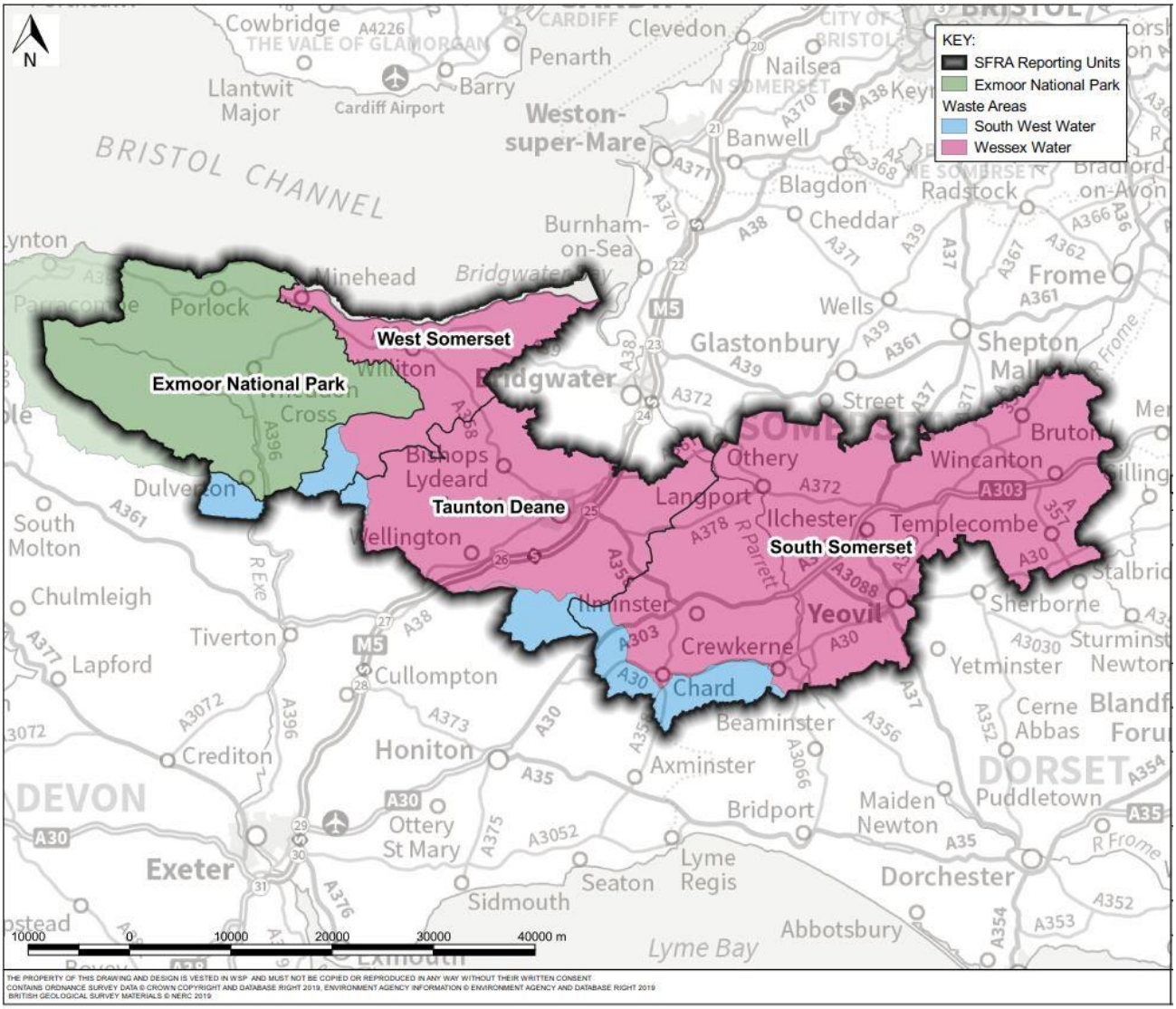

Figure 4-1 - Sewerage company areas of operation

[52] Environment Agency (2018) Flood and Coastal Erosion Risk Management Programme – Capital Investment Programme of Work 2018/19-2020/21 as consented by Regional Flood and Coastal Committees.

Wessex Water has provided historic sewer records for the Study Area in tabular format, with each flood record provided at the postcode level. The data provided also contains information about the source of flooding and whether any schemes have been completed to remediate the flooding issue identified.

South West Water has provided details of the number of historic sewer flood records by postcode area.

GEOLOGY AND HYDROGEOLOGY

The following sources have been used to identify key geological and hydrogeological units in the Study Area as described in Section 2.4:

- BGS GeoIndex Database
- BGS Solid and Drift Geology Map Sheets[53]:
  - **West Somerset subarea**
    - Map Sheet 278 Minehead
    - Map Sheet 279 Weston-super-Mare
    - Map Sheet 294 Dulverton
    - Map Sheet 295 Taunton
  - **Taunton Deane subarea**
    - Map Sheet 295 Taunton
    - Map Sheet 311 Wellington
  - **South Somerset**
    - Map Sheet 312 Yeovil
    - Map Sheet 311 Wellington
    - Map Sheet 296 Glastonbury
    - Map Sheet 297 Wincanton
    - Map Sheet 313 Shaftesbury
- DEFRA 'Magic Maps' online GIS portal
- Ordnance Survey Mapping
- Collation of BGS data in relation to geological and hydrogeological data

These maps have been downloaded from the sites specified above and provide details for assessment of the risk from groundwater flooding in the Study Area.

[53] British Geological Survey 1:63,360 / 1:50,000 geological map series https://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&mapName=&series=E50k&scale=&pageSize=100& , Accessed online, February 2019.

4.3 LIMITATIONS

There are a number of limitations to using various datasets from the different sources. Much of the modelling of watercourses in the Study Area uses national generalised modelling, i.e. JFLOW. The outputs of this technique are quite indicative and often do not provide the level of detail that is required to inform site-specific FRAs. In addition, small watercourses / drainage ditches with a catchment less than 3 km^2 are not included in the modelling. The approach for this SFRA has been to use the best information available at the time of preparation.

The use of hydraulic modelling data also has a number of limitations. Hydraulic models will use the most up to date data that is available at the time the modelling was produced. Once any datasets have been updated, the hydraulic modelling will need to be updated in line with the new datasets. The majority of hydraulic models held by the EA do not use the current climate change allowances that were published by the EA in February 2016[54]. Similarly, these models may not use the most up to date methods of calculating catchment hydrology.

As new flood risk management work is undertaken on new developments constructed, the hydraulic models may need to be updated. Of particular importance for this SFRA is that the defended scenarios are still being developed by the EA for the Taunton Northern Tributaries model and therefore the mapping included in this SFRA will need to be updated with these outputs once this modelling is complete. The mapping shown in the SFRA is therefore a snapshot of the risk at the time of writing, and the latest results should always be requested and used when undertaking site-specific assessments. The SFRA mapping should be updated periodically to maintain it as a live document to account for any changes.

It should also be noted that it is not possible to predict all flood scenarios and flooding may still occur in areas that have not been identified to be at risk. This may be due to blockages / changes to maintenance regime within a catchment. This is one of the reasons why the historic records are compared to the modelled outputs and means that the findings discussed in this SFRA are therefore the likely flood risk locations based on the current available information.

As noted above, there are inconsistencies in the use of the detailed modelling data in the mapping of Flood Zones 2 and 3. This SFRA aims to address these issues by adopting a standard approach as set out in Section 5 below.

[54] Environment Agency (2016) Flood risk assessments: climate change allowances.

5 SFRA FLOOD MAPPING

This section describes how the data outlined in the previous section has been used in the production of mapping and GIS deliverables for this Joint Level 1 SFRA. The methodologies, assumptions and limitations outlined above and below should be understood before the mapping is used for planning purposes.

5.1 MAPPING OVERVIEW

For each Local Authority, between one and three Strategic Maps have been produced which illustrate the flood risk constraints on a broad scale in order to aid with the identification of areas at risk. Each Local Authority then has between 2 and 8 Local Maps which zoom in on areas that are considered to be the larger settlements and potential locations for future development. Three Key Maps have been produced which show the area covered by each map view to aid with navigation through the maps (see mapping series 1000 in Appendix A).

A mapping series has been produced for all of the map types described in the sections below, but the maps are grouped in the appendices by location rather than map type/series for ease of use. The following map series have been produced:

- 2000 - Flood Zones 2 and 3;
- 2100 - Fluvial Flood Zones 3a and 3b;
- 2200 - Areas Benefitting from Flood Defences;
- 2300 - Tidal Flood Zones 3a and 3b;
- 3000 - Risk of Flooding from Surface Water;
- 4000 - Flood Warning and Alert Areas;
- 5000 - Risk of Flooding from Reservoirs;
- 6000 - Areas Susceptible to Groundwater Flooding; and
- 7000 - Historical Flooding.

Table 5-1 below details the location reference of the maps produced for each Local Authority.

Table 5-1 - SFRA Flood Risk Maps location references

Local Authority	Strategic Maps	Local Maps
Somerset West and Taunton	WS_01 – West Somerset subarea TD_01 – Taunton subarea	WS_02 – Williton & Watchet WS_03 – Minehead TD_02 – Taunton town TD_03 – Wellington
South Somerset	SS_01 – Southwest strategic SS_02 – East strategic SS_03 – Northwest strategic	SS_04 – Chard SS_05 – Ilminster SS_06 – Wincanton SS_07 – Yeovil SS_08 – Crewkerne SS_09 – Langport

		SS_10 – Ilchester SS_11 – Bruton

Each mapping series includes maps for each of the locations detailed in Table 5-1. For example, the drawing number for the Flood Zones 2 and 3 map for the West Somerset subarea map would be WS_2001.

5.2 FLUVIAL AND TIDAL FLOODING

FLOOD ZONES

In accordance with the NPPF, the SFRA should enable the LPAs to apply the Sequential Test to development. The EA's Flood Zones should be used when applying the Sequential Test, including climate change assessments where this is available.

Flood Zones 1, 2 and 3, as mapped in map series 2000 in Appendices B and C, largely correspond with the EA's Flood Map for Planning as set out on the gov.uk webpages, with the exception of areas where modelled data has been provided that has resulted in Flood Zone 3a, and consequently Flood Zone 3, being redefined (see below). In these locations, Flood Zone 2 has also been redefined to avoid locations where Flood Zone 3 is bigger than Flood Zone 2.

The EA's Flood Map for Planning indicates the 'natural' fluvial or tidal floodplain ignoring the presence of defences. The Flood Map for Planning is principally used to inform land use planning and defines Flood Zones that align with the terminology of the NPPF and its supporting PPG to indicate the predicted annual probability of flooding from fluvial and tidal sources. In summary, all land within England is categorised into one of the following Flood Zones:

- Flood Zone 1 (low probability) - less than 1 in 1,000 (0.1%) annual probability of flooding from fluvial or tidal sources.
- Flood Zone 2 (medium probability) - between 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of flooding from fluvial sources, or between 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of flooding from tidal sources.
- Flood Zone 3 (high probability) - greater than 1 in 100 (1%) annual probability of flooding from fluvial sources, or greater than 1 in 200 (0.5%) annual probability of flooding from tidal sources.

The EA's Flood Map for Planning does not distinguish between Flood Zone 3a and Flood Zone 3b (the Functional Floodplain). This split is necessary to support the planning process and so the methodology for mapping Flood Zone 3a and 3b is set out below. Areas not shown as Flood Zones 2 or 3a/3b are classified as Flood Zone 1.

FLOOD ZONES 3A AND 3B

Mapping of Flood Zones 3a and 3b for the Study Area is included in map series 2100 and 2300 in Appendices B and C.

Flood Zone 3b

The Functional Floodplain (i.e. Flood Zone 3b) comprises land where water has to flow or be stored in times of flood and only water compatible development should be located in this Flood Zone.

The starting point for identifying the Functional Floodplain is land that would naturally flood in a 1 in 20 (5%) year event (or is designed to flood, such as an attenuation scheme, in a 1 in 1,000 (0.1%)

year event). However, the area identified as Functional Floodplain should take into account the effects of any defences or flood risk management infrastructure.

Within this SFRA, Flood Zone 3b has been defined using the 1 in 20 year defended modelled flood extent where detailed modelling is available, to take into account the effects of any defences. Where detailed modelling is not available, i.e. in areas of JFLOW or where the 1 in 20 year defended scenario has not been modelled, assumptions have to be made about the extent of Flood Zone 3b. The approach adopted has been to match the extent of Flood Zone 3b to the extent of Flood Zone 3a and this is shown in the mapping legend within the maps. An example of this is given in Figure 5-1 below. This approach has been adopted as it is consistent across the area and is a conservative assumption. Should additional model data become available in these locations, the SFRA mapping can be updated as a live document.

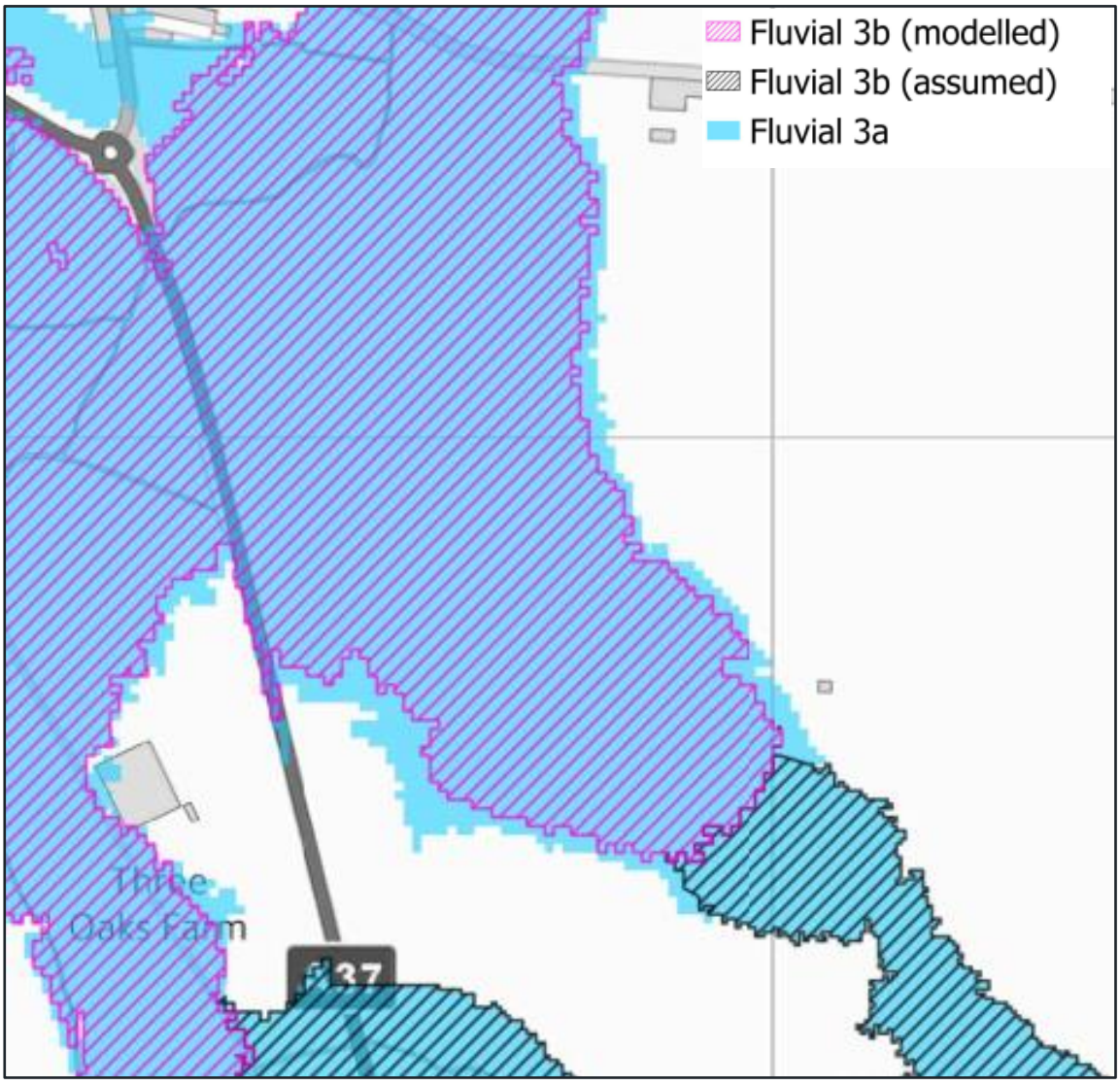

Figure 5-1 - Example of transition between modelled and assumed Flood Zone 3b

The EA's detailed hydraulic modelling typically covers the key settlement areas. Whereas rural and upland watercourses are typically based on JFLOW modelling, or smaller watercourses with a catchment less than approximately 3 km^2 may not be modelled.

The following should be noted in reference to the mapping of Flood Zone 3b in this SFRA:

- Where two detailed EA models overlap, i.e. **the Yeo and Cam and the River Parrett models** and **the River Parrett and Martock models**, Flood Zone 3b has been based on the largest combined outline from the 1 in 20 year defended flood extents. There are no defences at Williton and therefore no defended scenario; in this location Flood Zone 3b has been based on the undefended 1 in 20 year flood extent.
- Tidal Flood Zone 3b has been based on the 1 in 25 year flood extent, where available, or has been based on Flood Zone 3a.
- ABD areas should not be classified as Flood Zone 3b as these are protected for flooding up to the 1 in 100 year fluvial event or the 1 in 200 year tidal event. These areas have therefore been removed from the Functional Floodplain.
- As identified by the PPG, Flood Storage Areas should be identified as Flood Zone 3b as no development other than potentially water compatible development is appropriate for Flood Zone 3b. Flood Storage Areas have been identified separately on the mapping legend in series 2100 and 2300 of Appendices B and C, but should be treated as Flood Zone 3b with respect to planning decisions.

Flood Zone 3a

Flood Zone 3 in the EA's Flood Map for Planning was the starting point for identification of Flood Zone 3a in this SFRA. Flood Zone 3a refers to land that is predicted to flood in an event with a greater than 1 in 100 annual probability of fluvial flooding or a greater than 1 in 200 annual probability of tidal flooding, except where these areas are classified as Functional Floodplain (as above).

Where available, Flood Zone 3a has been based on the largest combined outline of the undefended and defended modelled 1 in 100 year flood extents. Including the defended flood extents ensures that any floodwater displaced outside the natural floodplain by the defences is included in Flood Zone 3. A comparison between the detailed modelling and Flood Zones 2 and 3 showed that, for the majority of the detailed models, both the undefended and defended results have been used in the Flood Map for Planning. The only exceptions were within the Williton, Washford and Taunton Northern Tributaries model areas. For the Taunton model this is because the defended modelling has not yet been finalised, for Williton because there are no defences and in Washford only the undefended model results are used in the Flood Map for Planning. The defended 1 in 100 year flood extents have therefore been included in the mapping of Flood Zone 3a within this SFRA for all areas where modelled data is available other than the Williton and Taunton Northern Tributaries models.

In areas where two detailed models overlap, i.e. the Yeo and Cam and the River Parrett models and the River Parrett and Martock models, Flood Zone 3a has been based on the largest combined outline.

In some areas included in the detailed hydraulic modelling, Flood Zone 3 in the EA's Flood Map for Planning is based on a mixture of national generalised JFLOW modelling and the detailed modelling. For this SFRA, where the modelled 1 in 100 year flood extents differ from Flood Zone 3 in the Flood Map for Planning, the largest combined modelled and JFLOW outlines have been used to represent Flood Zone 3a. The modelled outlines from the River Isle model have not been used because the modelling was undertaken in 2002 and new modelling is being undertaken by the EA in this area. Results from that modelling should be available in 2020.

During the writing of this SFRA, the Taunton Northern Tributaries model was under development. Undefended modelled outlines have been provided by the EA for the 1 in 100 year event but the defended results were not ready for inclusion in this Study. For Flood Zone 3a, the updated undefended outlines were mapped in a region defined by the EA, with the areas outside of this area matched to the existing Flood Zone 3.

All of the above mean that in some locations Flood Zone 3a as displayed in this SFRA will be different from Flood Zone 3 as derived from the Flood Map for Planning in the gov.uk webpages. This SFRA should be kept up to date as a live document such that the SFRA Flood Zones are the most up to date source of information for applying the Sequential Test. Flood Zone mapping (i.e. Flood Zones 3a, 3b and 2) and climate change mapping should be updated when revised datasets are available or when flood map challenges are agreed. The SFRA should therefore be used as a starting point to provide information for the applicant to complete an FRA and to apply the Sequential Test, but these should also draw on the relevant local information from other data sources where this is more appropriate (see Section 7).

In tidal areas, the EA provided tidal Flood Zone outputs from its Somerset North Coast Tidal model. Tidal Flood Zone 3a was based on the tidal Flood Zones provided.

CLIMATE CHANGE

All proposed new developments in the Study Area must consider the potential impacts of climate change on flood risk in accordance with the EA's latest climate change recommendations published in February 2016. However, it should be noted that updated climate change guidance is being prepared by the EA based on the revised UKCP18 climate projections for the UK. The most up to date climate change allowances should be used at the time of an application and may supersede the information in this SFRA. A discussion of the potential impacts of climate change in the study area is presented in Section 6.4 and a summary of the current climate change recommendations within the Study Area is provided in Section 7.2.

The majority of development in the Study Area would be expected to extend beyond 2070 and therefore the '2080s' allowances have been considered to be the most relevant in relation to the climate change mapping. This would equate to a 1 in 100 plus 40% increase in peak flows where the Higher Central allowance is used (e.g. for residential development in Flood Zone 3a). The EA's climate change recommendations for peak river flows in the Study Area are replicated and discussed further in Section 7.2.

Climate change mapping has been prepared to inform this SFRA. This is based on a purely qualitative methodology and no updated hydraulic modelling has been undertaken. This approach is considered appropriate for a Level 1 SFRA and for the purpose of a) identifying the potential effects of climate change and, b) identifying where development is likely to be required to be supported by more detailed analysis. Detailed climate change modelling should be undertaken in all key development areas where this is not currently available.

With respect to fluvial flood risk, modelled climate change outlines for the 1 in 100 plus 40% event are available for the **Yeo and Cam (2017) modelling**. All other detailed modelling studies do not have modelled outlines for this climate change scenario, or have only mapped the 1 in 100 plus 20% increase in peak flows as per previous climate change guidance.

Given that detailed hydraulic modelling of the 1 in 100 plus 40% climate change event is only currently available in the Yeo and Cam model area, the 1 in 100 plus 40% climate change flood extents have been mapped on the Flood Zone 2 and 3 mapping in map series 2000 of Appendix C for South Somerset. In the absence of detailed modelling data, the present day Flood Zone 2 (as shown in map series 2000 of Appendices B and C) should be used as the indicative extent of future Flood Zone 3 for the 2080s (2070-2115). To test this assumption, a review of the peak flows input into the EA models was undertaken to compare the peak flows for the 1 in 1,000 year modelled event in relation to the 1 in 100 year event. This review showed that, in general, the peak flow in the 1 in 1,000 year event is between 1.4 and 1.9 times the peak flow in the 1 in 100 year event. Whilst this is in general larger than the 1 in 100 plus 40% event it provides an appropriate indication of the potential future risk and highlights where future assessment is required. If a development site is located within an area deemed to be at risk (either in Flood Zone 2 or within the modelled 1 in 100 plus 40% outline), any application for planning permission will need to adequately assess this risk in more detail.

Modelled climate change scenarios have not been undertaken as part of the EA's North Coast Tidal modelling and therefore the tidal climate change mapping is purely based on Flood Zone 2 at this stage. The EA's climate change recommendations for sea level rise are replicated and discussed in Section 7.2.

The mapping prepared to inform this Level 1 SFRA is purely to indicate the likely effects of climate change for the purpose of informing the need for further detailed analysis. If a development site is located within an area deemed to be at risk, the applicant will need to adequately assess the risk posed by climate change in more detail.

5.3 AREAS BENEFITTING FROM FLOOD DEFENCES

The Flood Map for Planning also identifies Areas Benefitting from Defences. These are classed as areas that are protected by defences in a 1 in 100 (1%) year event from fluvial sources, or a 1 in 200 (0.5%) year event from tidal sources.

The EA's ABD dataset has been mapped alongside the following datasets (see Section 4) in map series 2200 of Appendices B and C:

- EA Spatial Flood Defences – EA maintained assets such as flood banks, walls etc;
- Local Authority records of flood risk management infrastructure;
- SCC records of flood risk management infrastructure; and
- IDB control structures.

It should be noted that not all of these structures contribute to an area being classified as ABD in the EA's mapping, for example some defences might provide a reduction in flood risk but not to the required standard. ABD is assigned only to areas that would flood, but are prevented from doing so, in a fluvial event with a 1 in 100 (1%) annual probability of occurrence or a tidal event with a 1 in 200 (0.5%) probability of occurrence. In the mapping of ABD, the EA has also assumed that the flood defences/structures act perfectly and provide the same level of protection as when first assessed.

5.4 SURFACE WATER FLOOD RISK

The surface water mapping as set out in series 3000 of Appendices B and C is based on the EA's Risk of Flooding from Surface Water mapping which was downloaded from the relevant data.gov.uk webpages.

The EA's Risk of Flooding from Surface Water map shows the approximate overland flow routes and areas that would flood as a result of rainfall being unable to soak into the ground or enter a drainage system, leading to overland flow. The probability of flooding from surface water is defined as being high, medium, low or very low, typically defined as follows:

- Very Low - less than 1 in 1,000 (0.1%) annual probability of flooding from surface water sources.
- Low - between 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of flooding from surface water sources.
- Medium - between 1 in 30 (3.33%) and 1 in 100 (1%) annual probability of flooding from surface water sources.
- High - greater than 1 in 30 (3.33%) annual probability of flooding from surface water sources.

The Risk of Flooding from Surface Water map has been produced by the EA using a combination of nationally produced surface water flood mapping and appropriate locally produced mapping from LLFAs[55]. As such, depending on the location, the modelling may not accurately represent all flow paths (for example pipe drainage systems or small culverts on watercourses may not be included). The purpose of the map is to highlight those areas potentially at risk of flooding. Where flooding is shown, this should prompt further consideration of the actual risk. Periodic updates of the maps are issued as more accurate information becomes available.

The EA's Risk of Flooding from Surface Water maps do not fully represent flooding that occurs from ordinary watercourses, drainage systems, public sewers, rivers or groundwater. It should not be taken as definitive mapping of flood risk from ordinary watercourses as the conveyance effect of ordinary watercourses or drainage channels is not explicitly modelled. However, the mapping can give an indication of the risk from such smaller watercourses not included in the EA's Flood Map for Planning. Where the EA's Risk of Flooding from Surface Water map indicates flood risk from a watercourse that may pose risk to a development, it will be necessary to undertake more detailed hydraulic modelling to better define these areas.

These maps indicate present day flood risk from surface water. Further details on climate change and development are discussed in Section 7.

5.5 HISTORICAL FLOOD INCIDENTS

The following historic records have been incorporated into the Historic Flooding Records maps in series 7000 of Appendices B and C:

- EA Historic Flood Map;
- SCC flood records;
- Wessex Water historic sewer records; and
- South West Water historic sewer records.

The EA's Historic Flood Map contains flood outlines from flooding from rivers, the sea or groundwater sources.

[55] Environment Agency (2013) What is the updated Flood Map for Surface Water?

The datasets provided by SCC, Wessex Water and South West Water were georeferenced by postcode only and so have been mapped at the postcode level. Postcode areas are highlighted on the mapping where the post code area contains a history of flooding.

For more specific records of flooding at or in proximity to a development site, Applicants are advised to undertake their own searches in consultation with the key stakeholders as part of the pre-application process.

5.6 RESERVOIR FLOOD RISK

The EA's Risk of Flooding from Reservoirs map shows the likely extent of flooding in the event of reservoir failure. Although the likelihood of such an occurrence is low, as all large reservoirs are stringently governed under the Reservoirs Act 1975 (as amended by the Flood and Water Management Act 2010), a large volume of water could escape with little or no warning if a failure were to occur. As such, following a recommendation in the Pitt Review, the EA completed a programme of breach assessments to ascertain the areas at potential risk. The EA's reservoir flood maps, are mapped in series 5000 of Appendices B and C. It should be noted that the risk of flooding from reservoirs are only displayed on the local maps and not the strategic maps (Section 5.1) due to restrictions put in place by DEFRA.

The Probable Maximum Flood is used to assess the risk of flooding from reservoirs. As such climate change does not impact on the flood extents from this source of flooding.

5.7 GROUNDWATER FLOOD RISK

The EA's Areas Susceptible to Groundwater flooding dataset has been mapped in series 6000 of Appendices B and C. This is a gridded 1 km spatial dataset in which each square kilometre is assigned a susceptibility to groundwater emergence based on the geological and hydrological conditions.

5.8 OTHER

Flood Warning and Alert Areas have been mapped in series 4000 of Appendices B and C using the EA's dataset, as described in Section 4.2.

6 FLOOD RISK REVIEW

This section provides a summary of flood risk in the Study Area from all sources of flooding now and in the future, and provides a summary of existing and proposed flood defence management schemes which may impact flood risk. Further commentary on how flood risk should be addressed within new development is provided in Section 7.

6.1 HISTORICAL FLOODING

Information with respect to historical flooding was requested from the relevant flood risk management authorities. This information, together with information in other flood risk management documents (previous SFRAs and CFMPs) has been used as the basis of the assessment.

The most significant historic flood events which have affected the study area are:

- November 1954;
- October 1960;
- February 1990;
- December 2000;
- November 2012; and
- Winter 2013/14.

Historic flood records for the Study Area are illustrated in map series 7000 in Appendices B and C. It is recommended that information regarding historical flooding is requested from SCC as part of any site-specific FRAs for new development.

SCC undertake flood investigations and publish reports on flood events on their website[56]. The need for these is determined based on factors including the likely source of the flood and the number of properties affected. Additional flood investigation reports are published periodically following flood events.

WEST SOMERSET

The most significant historical flooding events in the West Somerset subarea have been from tidal flooding, mainly as a result of operational failure and breach or overtopping of the defences. The EA's Recorded Flood Outlines and Historic Flood Map datasets have been reviewed and the most significant historic flood events in the former West Somerset are detailed in Table 6-1 below.

SCC records indicate that approximately 50 properties in Williton were affected by flooding in December 2000 from surface water and fluvial sources following a period of heavy rainfall. SCC records also include details of a surface water flood event in Williton in October 2000 which resulted in flooding of Station Road.

[56] Somerset County Council. Flood Investigations. Available online: https://www.somerset.gov.uk/waste-planning-and-land/flood-investigations/

In November 2012, several settlements in the district including Williton experienced fluvial flooding from ordinary watercourses, Main Rivers and localised surface water flooding issues. During this event, flooding also occurred from the Washford River in Watchet.

Table 6-1 – Historic Flood Events in West Somerset

Date of Event	Location/Details	Cause
March and November 1954	Flooding in Minehead	Fluvial flooding
October 1960	Flooding in Williton.	Channel capacity exceeded (no raised defences)
December 1960	Coastal flooding near Hinkley Point, largely confined to the moors.	Overtopping of defences.
December 1981	Coastal flooding in Minehead, mainly impacting the area occupied by Butlins holiday resort. Coastal flooding near Hinkley Point and in Stolford.	Overtopping of the defences. Operational failure/breach of the defences.
February 1990	Flooding in Minehead associated with the Bratton Stream.	Channel capacity exceeded (no raised defence).
October 1996	Coastal flooding in Minehead, mainly impacting the area occupied by Butlins holiday resort and the east of Butlins.	Operational failure/breach of defence.
October and December 2000	Flooding in Williton.	Channel capacity exceeded (no raised defences)
November 2012	Flooding on ordinary watercourses and main rivers in locations across the district.	Channel capacity exceeded (no raised defences) / Other
January 2014	Flooding near Hinkley Point, largely confined to the moors.	Overtopping of defences.
February 2014	Fluvial/groundwater/surface water flooding near Hinkley Point, largely constrained to the moors.	Local drainage/surface water and groundwater/high water table.

The previous Level 1 SFRA details a flood event in Carhampton in 1994 during which approximately 5 properties flooded as a result of blocked river structures. SCC also holds records of flooding in Carhampton in 1999, 2008, 2010, 2012, 2013 and 2014 from surface water flooding and/or watercourse flooding. Some of these events were also attributed to blocked / inadequate capacity of the surface water drainage system.

SCC's records also include several flood events in Washford in recent years – 1999, 2008, 2010 and 2010 – from different sources including the Washford River, surface water, blocked structures and blocked / inadequate capacity of the surface water drainage system.

SCC holds records of tidal flooding in Minehead in 1910, 1936, 1981, 1989, 1990 and 1996.

TAUNTON DEANE

The Somerset Levels and Moors were subject to significant flooding in the autumn/winter of 2000 and 2013/14. The flooding in 2000 was the worst flooding since 1960 and according to the Parrett CFMP affected more than 350 properties in the River Parrett Catchment. In 1960, approximately 500 properties were flooded in Taunton. Since this event, Taunton has undergone significant flood defence and alleviation works and during the October 2000 event the flooding within Taunton was less extensive as a result.

The EA's Recorded Flood Outlines and Historic Flood Map datasets have been reviewed and the most significant historic flood events in the Taunton Deane subarea are detailed in Table 6-2 below.

Table 6-2 - Historic Flood Events in Taunton Deane

Date of Event	Location/Details	Cause
October 1960	Extensive flooding within Taunton and downstream of Taunton within the Somerset Levels and Moors. Flood defences works were carried out following this flood event such as re-alignment of the river and raised defences.	Channel capacity exceeded (no raised defences).
July 1968	Flooding on the River Tone downstream of Taunton and the M5 as a result of a severe summer storm affecting the settlements of Ham and Creech St Michael.	Channel capacity exceeded (no raised defences).
January 1978	Flooding on the River Tone and the Somerset Levels and Moors.	Channel capacity exceeded (no raised defences).
January 1995	Extensive flooding in the Somerset Levels and Moors and on the River Tone downstream of Taunton.	Mostly overtopping of defences. Some areas where channel capacity exceeded (no raised defences).
January 1999	Extensive flooding in the Somerset Levels and Moors and within the west of Taunton on the River Tone.	Channel capacity exceeded (no raised defences).
October 2000	Extensive flooding in the Somerset Levels and Moors and some flooding within Taunton	Overtopping of the defences.

Feb 2009	Smaller event on the River Tone resulting in flooding in the west of Taunton.	Mostly overtopping of defences. Some areas where channel capacity exceeded (no raised defences).
April 2012	Extensive flooding in the Somerset Levels and Moors coinciding with flooding upstream within and upstream of Taunton on the River Tone.	Mostly overtopping of defences. Some areas where channel capacity exceeded (no raised defences).
November 2012	Extensive flooding in the Somerset Levels and Moors and some small areas of flooding in isolated parts of the River Tone Catchment upstream.	Overtopping of the defences.
January 2014	Extensive flooding in the Somerset Levels and Moors and extending upstream to areas such as Bathpool, Ruishton and Creech St Michael. Some flooding also occurred in parts of Taunton.	Overtopping of the defences.

With respect to Taunton itself, SCC records show that at least 360 properties were affected by flooding in October 1960, over 30 properties in January 1999 and at least 150 properties in October 2000; the main source of flooding in these events was the River Tone. These flood events also affected the settlements of Ham, Creech St Michael, and Ruishton. Some of these areas were also affected by flooding in December 2000.

SCC holds multiple records of flooding in Wellington in recent years associated with flooding from the Back Stream, the Westford Stream and the River Tone, surface water flooding and blocked / inadequate capacity of the surface water drainage system. In November 2012, flooding affected at least 5 properties and roads in the town.

SCC records also show that Wiveliscombe has a history of flooding from streams, surface water, flash flooding, culvert blockages and drainage problems.

SOUTH SOMERSET

The Somerset Levels and Moors were subject to significant flooding in the autumn/winter of 2000 and 2013/14.

The EA's Recorded Flood Outlines and Historic Flood Map datasets have been reviewed and the most significant historic flood events in South Somerset are detailed in Table 6-3 below.

Table 6-3 - Historic Flood Events in South Somerset

Date of Event	Location/Details	Cause
October 1960	Flooding on the River Brue in the northeast of the district.	Channel capacity exceeded (no raised defences).
May 1979	Flooding on the River Parrett, River Yeo and the River Isle mainly in moorland areas.	Channel capacity exceeded (no raised defences).
December 1979	Flooding on the River Yeo impacting Ilchester.	Channel capacity exceeded (no raised defences).
December 1989	Flooding on the River Isle	Channel capacity exceeded (no raised defences) in some areas and overtopping of defences in others.
February 1990	Flooding on the River Parrett, River Yeo and the River Isle mainly in the Somerset Levels and Moors.	Channel capacity exceeded (no raised defences) in some areas and overtopping of defences in others.
February 2009	Flooding on the River Parrett, River Yeo and the River Isle mainly in the Somerset Levels and Moors.	Channel capacity exceeded (no raised defences).
March 2009	Flooding on the River Yeo and the River Parrett, mainly in the Somerset Levels and Moors.	Overtopping of defences.
November 2012	Flooding on the River Yeo and the River Parrett, mainly in the Somerset Levels and Moors.	Overtopping of defences.
January 2014	Flooding on the River Parrett, River Yeo and the River Isle. Extensive flooding in the Somerset Levels and Moors.	Overtopping of defences.

Several of the events detailed in Table 6-3 above also coincided with flash flooding and surface water flooding in the upper catchments. On the 21st November 2012, surface water flooding affected several areas including Chard, Crewkerne, Ilminster, Norton-sub-Hamdon, Martock, Somerton and Yeovil. In some of these locations, such as Ilminster, surface water flooding combined with flooding from nearby streams occurred as a result of blocked culverts and inadequate drainage capacity.

SCC's records detail several events that affected settlements across the district in February 1990, October 2000 and May and December 2008, with these predominantly caused by surface water flooding and flash flooding. Some upper catchments also experienced flooding in tandem with the 2013/14 winter flooding that impacted most significantly upon the Somerset Levels and Moors.

SCC has undertaken Flood Investigation Reports for Ilminster, Bruton, Misterton and Norton-sub-Hamdon, where properties were affected by flooding in July 2017, November 2011, February 2016

and February 2016, respectively. In general, these events resulted from significant surface water runoff in 'flashy' catchments following intense rainfall, in some locations worsened by flooding from streams and blocked structures, in addition to inadequate drainage capacity.

6.2 FLUVIAL FLOODING

WEST SOMERSET

Fluvial flooding in the West Somerset subarea is associated with the Main Rivers and ordinary watercourses which flow through the district, as detailed in Section 2.5. In the upper reaches of the catchments, the floodplains are generally confined in steep-sided valleys. In the lower reaches of the catchments, the floodplains are less confined and extend further across the flat coastal plains.

The urban areas most at risk of fluvial flooding are Minehead, Watchet, Marsh Street and Williton.

In Minehead, the Bratton Stream flows from Exmoor National Park into the west of the town before discharging into the Bristol Channel. With respect to Flood Zone 3, the greatest amount of out-of-bank flow is between The Avenue and Hopcroft Road. The Bratton Stream is culverted in its final reaches through the town before discharging to the Bristol Channel. Downstream of Ponsford Road, the risk of flooding becomes tidally influenced.

The existing West Somerset Local Plan's site allocations to the south of Periton/Hopcroft Road in Minehead are currently located in Flood Zone 1. A tributary of Bratton Stream passes between the two sites which has not been modelled in the EA's Flood Map for Planning. Site-specific modelling of this watercourse may be required as part of a FRA undertaken for any proposed development in these locations.

To the southeast of Minehead, the River Avill splits into two branches upstream of the A39; one channel following its natural course and the second a flood relief channel built in early 1960's following the flood events of 1954 and 1960. The flood relief channel conveys flows at times of greater flow, providing protection from fluvial flooding downstream. In Marsh Street to the southeast of Minehead, Flood Zone 3 flood flows are largely constrained to the River Avill channel. The River Avill discharges to the sea through a pipe and control chamber which helps to prevent tide locking of the watercourse. Whilst Flood Zone 3 is largely constrained to the river channel, the Flood Zone 2 extent is much more extensive and provides an indication that the standard of protection in this area may need to be increased to keep pace with climate change.

The Washford River flows from southwest to northeast through Watchet. Watchet experienced flooding in 1960, after which alleviation works, including channel widening, channel regrading and the construction of new flood walls, were undertaken. In Watchet, the floodplain of the Washford River is more extensive on its south-western bank. In general, ground levels rise up from the river valley such that the majority of Watchet is outside of Flood Zone 2 and 3 with the exception of land to the south of the West Somerset Railway which falls within Flood Zone 2 in the vicinity of the former papermill.

In Williton, the Doniford Stream flows from south to north towards the Bristol Channel and is joined by the Monksilver Stream. There is a risk of fluvial flooding in Williton from the Monksilver Stream which passes through the town. There is a history of flooding in Williton which has been exacerbated by modifications to the channel (culverts and bridges etc.) resulting in restrictions to flow.

A small ditch, known as the Feeder Stream, splits off from the Monksilver stream and runs around the northwest of Williton before meeting the Doniford Stream immediately downstream of the village and was historically used to feed the system of sluices on land north of the A30. This ditch allows some flood water to bypass Williton. Some areas within the west and south of Williton are classified as Functional Floodplain.

Smaller settlements where there is a risk of fluvial flooding include Washford, Sampford Brett, Bilbrook, Withycombe, Monksilver, East Quantoxhead, Kilve, Shurton and Stogursey.

With respect to the impacts of fluvial flooding on significant transport infrastructure in the West Somerset subarea, the A39 provides the main route through the district. The River Avill, Pill River, Washford River and the Monksilver Stream and Doniford Stream pass under this road in culvert. Flooding is predicted on the A39 in the present day Flood Zone 3b (Functional Floodplain) from the Pill River between Carhampton and Bilbrook and where the Monksilver Stream enters Williton. The A358 is also at risk of fluvial flooding where it enters Williton. The West Somerset Railway also falls within Flood Zone 3b from the Pill River and the Doniford Stream in Williton.

TAUNTON DEANE

The majority of watercourses within the Taunton Deane subarea drain into the catchment of the River Tone. In the uplands, the watercourses generally have steep gradients and flashier response times to rainfall. Rainfall response in the upper reaches of the Tone is attenuated to some extent by the Clatworthy Reservoir which the River Tone passes through. In the upper reaches, narrow valleys constrain the risk of fluvial flooding to areas immediately adjacent to the river; flooding is generally short-lived and few properties are at risk.

The floodplain of the River Tone begins to widen where it turns northeast at Greenham. As the River Tone flows east, it is joined by the Westford Stream/Back Stream at Wellington. Flood Zone 3 shows properties in Westford, Rockwell Green and the west of Wellington to be at risk of flooding. There is a history of flooding in Wellington both from fluvial and surface water sources. An upstream storage area in Westford provides some protection to properties downstream although no detailed modelling has been completed by the EA in this area. In the main, Wellington is raised up relative to the floodplain. The Flood Zones in Wellington are not based on detailed hydraulic modelling and therefore any development within Flood Zone 2 or 3 or shown to be at risk of flooding on the EA's Risk of Flooding from Surface Water mapping should include detailed modelling in the FRA.

As the River Tone flows northeast towards Taunton, the floodplain widens further and the River Tone is joined by the Hillfarrance Brook from the west. The Hillfarrance Brook passes through the village of Hillfarrance and much of this village falls within Flood Zone 3. Some defences are present within Hillfarrance and these are discussed further in Section 6.5.

Further downstream as the River Tone approaches Taunton, the river is joined by the Norton Brook from the northwest, the main tributary of which is the Halse Water. A flood storage area on the Halse Water/Norton Brook provides attenuation for larger flood events and slows the rivers response. The Norton Brook is included in the EA's Taunton modelling, with revised defended model scenarios to be published shortly.

There is a risk of fluvial flooding to large areas of land to the west of Taunton on the Norton Brook and the Back Stream. As the River Tone enters Taunton, it is joined by several tributaries from the north and the south. These tributaries have a flashier response relative to the River Tone as a result

of their smaller catchments and steeper gradients. When water levels in the River Tone are high, this can result in these tributaries being unable to discharge. There is a risk to proposed development from the northern tributaries such as the Mill Lease Stream, and from the southern tributaries, such as the Galmington Stream and the Sherford Stream.

A significant area of Taunton in the areas of Tangier, North Town and Priorswood falls within Flood Zone 3, including strategic development areas. The risk of fluvial flooding within Taunton is exacerbated by the presence of culverted watercourses and structures which are prone to blockage.

The Taunton Strategic Flood Alleviation Scheme plans to reduce the risk of flooding in Taunton to enable development. Any site-specific FRA for development within Flood Zone 2 or 3 along the River Tone and its tributaries would likely need to involve obtaining the latest modelling for Taunton from the EA and/or undertaking site-specific detailed modelling, to include climate change. Consultation should also be undertaken with the EA at the early stages of planning in reference to the Taunton Flood Alleviation Scheme.

Downstream of Taunton, the floodplain of the River Tone widens as it enters into the Somerset Levels and Moors. The tidal limit of the River Tone is at Newbridge, but the floodplain of the River Tone remains fluvially influenced down to the confluence with the River Parrett. Whilst the River Tone's floodplain is widest in the Somerset Levels and Moors, this area is more rural and fewer properties are at risk. A high tide combined with high fluvial levels in the River Parrett could contribute to locking of the River Tone and subsequent flooding upstream.

A few watercourses within the borough do not form part of the River Tone Catchment. These include:

- The Fivehead River, a tributary of the River Isle which is part of the River Parrett Catchment;
- The Sedgemoor Old Rhyne which drains into the River Parrett;
- The River Otter; and
- The River Culm.

The Fivehead River mainly passes through rural areas with the exception of some small settlements. Settlements within or in proximity to the fluvial floodplain of the Fivehead River include Staple Fitzpaine, Whitty and Hatch Green. The flood risk associated with the Sedgemoor Old Rhyne is discussed in the tidal Section 6.3 below. The River Otter and River Culm leave the south of the Study Area near to the upper reaches of their catchments and as such their floodplains are narrow.

With respect to the impacts of fluvial flooding on significant transport infrastructure in the Taunton Deane subarea, the M5 motorway is the main transport route through the borough, with junctions at Wellington and Taunton. Various watercourses are culverted under the M5, including Haywards Water, an unnamed watercourse near West Buckland, Sherford Stream, Black Brook and the River Tone. In the vicinity of Taunton, the M5 is not impacted by the present day Flood Zone 3b extents in the vicinity of Taunton. Further upstream, where the smaller tributaries are culverted under the M5, the M5 is shown to be intersected by Flood Zone 3b. It should be noted that no detailed hydraulic modelling has been undertaken for these watercourses and therefore these structures may not have been modelled in sufficient detail and the risk may be different from shown.

Taunton Road, which enables access from Wellington to the M5, is intersected by Flood Zone 3b from the Haywards Water, but as above no detailed hydraulic modelling has been undertaken for this watercourse and therefore the risk may be different from shown. Within Taunton itself, sections of the A3038, A3027, A358 and the A38 are intersected by the Flood Zone 3b from the River Tone

and/or its tributaries. Some sections of the railway line are also shown to be at risk of fluvial flooding, such as in the vicinity of Norton Fitzwarren.

SOUTH SOMERSET

The majority of South Somerset falls within the catchment of the River Parrett. There is a risk of fluvial flooding from the River Parrett and its tributaries. The Parrett has a wide floodplain in its lower reaches, with the majority of this area set over to agricultural land with little development. In the uplands of the catchment, the rivers are generally steep-sided and respond rapidly to short and intense rainfall. In the lowlands, the Somerset Levels and Moors are characterised by extensive floodplains where the rivers are embanked and, in some places, perched above the floodplain. Flooding in the Somerset Levels and Moors is generally caused by longer, lower intensity storms. High tides can reduce the capacity of the river channels resulting in water backing up within the Parrett Catchment, as was seen in the 2013/14 event.

The most significant flooding events in the Parrett Catchment were the 1960, 2000 and 2013/14 flood events. Many flood defence schemes have been built within the Parrett Catchment such as the Sowy River, which takes overflow from the River Parrett to the King's Sedgemoor Drain and, pumping stations across the Moors. In addition, significant dredging works to de-silt the channel were undertaken in response to the 2013/14 flood event.

The River Yeo is a tributary of the River Parrett which flows past Yeovil; Yeovil sits on a raised plateau relative to the floodplain of the Yeo such that the main risk of fluvial flooding to the town is from smaller streams and surface water/sewer flooding. Detailed hydraulic modelling is not currently available for these streams. On the River Yeo, Ilchester has experienced fluvial flooding in the past and the edges of the village are within Flood Zone 3. To the east of Ilchester, there is a wide fluvial floodplain largely confined to the southern bank of the Yeo as ground levels rise more steeply up from the north of the channel.

In South Petherton, Martock and Crewkerne, these urban areas are mostly outside the fluvial floodplain, but the Parrett CFMP notes localised problems in these settlements exacerbated by small culverted watercourses. The south of Martock is at risk of fluvial flooding, especially to the southwest where an area is classified as Functional Floodplain.

On the River Isle, there is a risk of fluvial flooding in the west of Ilminster and to smaller settlements upstream such as Donyatt. Detailed hydraulic modelling is not available for the River Isle at Ilminster. Risk from these watercourses would need to be assessed in more detail if any development is proposed.

In the east of the district, the River Cale is not within the River Parrett Catchment but drains south out of the district. Where the River Cale passes through Wincanton there is a risk of fluvial flooding, particularly to the southwest of the town.

Where the EA has not undertaken detailed modelling (i.e. Ilminster and ordinary watercourses in Yeovil, such as the Dodham Brook), any development within Flood Zone 2 or 3 or shown to be at risk of flooding on the EA's Risk of Flooding from Surface Water mapping should include detailed modelling as part of the site-specific FRA.

The A303 is a major trunk road through the district and various watercourses are culverted under the A303 including the River Isle, River Parrett, River Yeo, River Cam and the River Cale. In several locations, the road is intersected by Flood Zone 3b such as at Ilchester from the River Yeo, near

South Petherton from the River Parrett and around Ilminster. Access and egress into Ilminster from the west could also be impacted by fluvial flooding from the River Isle.

There is a risk of fluvial flooding to the railway line to the east of Yeovil which provides rail access to the town. The railway line is intersected by present day Flood Zone 3b to the south of Yeovil Pen Mill station.

6.3 TIDAL FLOODING

Tidal flooding can be result from high tides, storm surges and wave action. High sea levels can result in tide locking whereby fluvial watercourses and sewers cannot discharge to the sea. This can result in flooding upstream of the outlets.

WEST SOMERSET

The majority of the West Somerset subarea coastline is dominated by steep cliffs. Tidal flooding in the district is typically confined to the flatter coastal plains as areas of steeper topography restrict the tidal flood flows inland. The main settlements affected by tidal flooding are Minehead and Watchet.

Within Minehead, the Bratton Stream discharges to the sea via a flapped outfall. Tide locking can occur in this watercourse. The EA's modelling shows that downstream of Ponsford Road there is a combined fluvial and tidal risk from the Bratton Stream.

Along the Minehead coast, if the tidal defences were not present, there would be a significant risk of tidal flooding. The Flood Zone 3 tidal flood extent covers much of the coastal area including Butlins holiday resort. However, the Minehead coastline is protected by flood defences such that the majority of the tidal Flood Zone 3 within Minehead is classified as ABD. The risk of tidal flooding in Minehead is primarily a residual risk should the defences overtop or breach, however in the future the defences would need to be upgraded to keep pace with climate change. There is a risk that a breach of the defences to the east of Minehead, between Warren Point and Dunster Beach, could result in flooding of the town.

The A39 runs along the south of Minehead and provides an access route, along with smaller roads such as Seaward Way, to higher ground to the west and the south. The A39 generally falls outside of tidal Flood Zone 3 with the exception of a section between Alcombe and Marsh Street which is at a residual risk of flooding should the defences fail or overtop. Seaward Way is also within Flood Zone 3, but is classifies as an ABD. These routes would provide safe access and egress in the present day defended scenario. Between Minehead and Blue Anchor, the West Somerset Railway line passes through tidal Flood Zone 3.

There is a combined risk of fluvial and tidal flooding where the Pill River discharges to the sea near Blue Anchor. Defences are present along the coast but the land just south of the B3191 is not shown to benefit from these defences and is within the Functional Floodplain. Further inland the land is classified as ABD.

There is also a risk of combined fluvial and tidal flooding between Hinkley Point and Stolford in the east of the district. Defences are present along the coast, resulting in much of the floodplain shown to benefit from these defences.

Along the coastline, there is the potential for a breach or failure of the sea defences. Where a breach or failure of the defences were to occur this would allow water to flow into the area behind

the defences and presents a residual risk of flooding to development in this area. A breach scenario in the defences to the east of Minehead is presented in the existing Level 2 SFRA for this area.

TAUNTON DEANE

To the northeast of Taunton, the River Tone passes through a sluice gate at Newbridge which forms the tidal limit. The River Tone flows northeast before joining the River Parrett at Burrowbridge.

Further south, the Sedgemoor Old Rhyne joins the River Parrett from the west downstream of the lock at Oath and on this tributary the tidal influence extends up to Helland.

An extensive network of rhynes in the Somerset Levels and Moors help to drain the land and EA pumping stations help to manage water levels in the Moors. These areas of Flood Zone 3 are predominantly rural and are classified as ABD and therefore are not designated as Functional Floodplain. There is a residual risk of flooding in these areas should the defences fail or from prolonged periods of tide locking which are likely to increase when the impact of climate change is taken into account.

With respect to significant transport infrastructure, a railway line passes through the Somerset Levels and Moors through the defended combined tidal/fluvial floodplain of the River Tone. As this area is protected by defences, the risk of flooding to the railway line is a residual risk.

SOUTH SOMERSET

The lower reaches of the River Parrett are tidal up to approximately 30 km from the coast. The tidal limit of the River Parrett is at Oath Lock on the boundary of the former Taunton Deane area and South Somerset. Through management of the catchment, the tidal limit remains at Oath Lock, but the EA's modelled Flood Zone 3 outlines indicate that the tidal influence could extend up to Langport if the lock were not operational / assuming the absence of defences. Further south of Langport the risk of flooding from the River Parrett is fluvial only.

The tidal floodplain of the River Parrett in the north of South Somerset is predominantly rural moorland such as Aller Moor. An extensive network of rhynes in the Somerset Levels and Moors help to drain the land and EA pumping stations help to manage water levels in the Moors. These areas of tidal floodplain are classified as ABD and therefore are not designated as Functional Floodplain. There is a residual risk of flooding in these areas should the defences fail or from prolonged periods of tide locking which are likely to increase when the impact of climate change is taken into account.

With respect to significant transport infrastructure, a railway line passes through the Somerset Levels and Moors through the defended combined tidal/fluvial floodplain of the River Parrett. As this area is protected by defences, the risk of flooding to the railway line is a residual risk.

6.4 CLIMATE CHANGE

The scientific community agrees that the global and local climate is changing and this is likely to have an impact on flooding. Sea levels are observed to be rising and winter rainfall is likely to become more intense.

The latest climate change recommendations were published by the EA in February 2016 and must be used when assessing the future flood risk to all new developments. Updated climate change guidance is being prepared by the EA based on the revised UKCP18 climate projections for the UK. The most

up to date climate change allowances should be used at the time of an application. The current allowances are discussed in Section 7.3.

For a summary of the mapping methodology in relation to climate change refer to Section 5.2; the present day 1 in 1,000 year results are used as a surrogate for the 1 in 100 year climate change scenario in many locations where the most up to date climate change scenarios have not been modelled. This approach is unlikely to be sufficient for tidal flood risk, and therefore further assessment of the risk of tidal flooding taking account of climate change is recommended.

The mapping provides an indication of possible changes in flood risk across the Study Area as a result of climate change. The mapping prepared to inform this Level 1 SFRA is purely to indicate the likely effects of climate change for the purpose of informing the need for further detailed analysis. If a development site is located within an area deemed to be at risk (either in Flood Zone 2 or within the modelled 1 in 100 plus 40% outline), the applicant will need to adequately assess this risk in more detail.

Every applicant in an area at risk of flooding should consult with the EA with respect to applying the EA's climate change guidance within a detailed site-specific FRA. The approach should be agreed with the relevant stakeholders through pre-application discussions.

WEST SOMERSET

Based on the assumptions detailed above, the flood extents indicate that the risk of flooding in Minehead in the lower reaches of the Bratton Stream could increase significantly as a result of climate change. The risk of flooding increases most dramatically between Townsend Road and Ponsford Road.

Downstream of the A39, the fluvial flood extents associated with the River Avill indicate a significant increase in flood risk when climate change is considered. This suggests that this area, including Dunster Marsh and the West Somerset Railway Line may be at risk of fluvial flooding in the future if the defences are not upgraded.

To the west of Watchet, the fluvial flood extents associated with the Washford River indicate a significant increase in flood risk when climate change is considered.

Where detailed climate change modelling is unavailable in these areas, proposed development within Flood Zone 2 or 3 will likely require site-specific modelling of climate change as part any FRA, in accordance with the EA's latest guidance.

In relation to tidal flooding, the Level 2 SFRA for West Somerset found that when climate change was considered (based on previous climate change guidance), the risk of overtopping of the defences greatly increases at Minehead. Since the writing of the Level 2 SFRA, remodelling of the Flood Zones has been undertaken as part of the Somerset North Coast Flood Warning Improvements modelling[57]. The study concluded that, in general, the standard of protection of the coastal/tidal defences is high based on present day sea level conditions, but the condition of the

[57] Environment Agency and JBA (2012) Somerset North Coast Flood Warning Improvements.

defences and the increase in risk in the future due to climate change were not considered in the study. Given the above, any development that is currently at risk or at a residual risk of flooding (i.e. in Flood Zone 3 – ABD) will need to consider the impacts of climate change in relation to the performance of the defences.

Further assessment of tidal flood risk taking into account the impact of climate change is recommended. Climate change will result in increased extreme sea levels that could either cause direct overtopping of the sea defences or result in an increase in the rate and volume of wave overtopping of the defences.

In addition, increased sea levels could result in all watercourses discharging to the coast becoming tide locked for longer periods. If the watercourses remain tide locked for longer periods, this would result in the fluvial river levels increasing which could limit the discharge rates from drainage systems that discharge to the watercourses causing an increased risk of infrastructure flooding in lowland areas. Tide locking of watercourses is known to occur near Seaward Way in Minehead during periods of prolonged wet weather in the present day.

TAUNTON DEANE

In the Taunton Deane subarea, the EA is currently rerunning its Taunton Northern Tributaries modelling which will include climate change scenarios. In the absence of this modelling, the present day Flood Zone 2 has been used as an indication of the possible impact of climate change on flooding within Taunton, as discussed in Section 5.2.

Within Taunton, the fluvial flood extents indicate that the most significant increase in flood risk as a result of climate change could occur in Norton Fitzwarren, Tangier/North Town and around the A3038 near Firepool. The flood extents also indicate a significant increase in risk to the railway line through Taunton town centre when climate change is considered.

The present day Flood Zone 2, used as a surrogate for climate change, does not include an allowance for the present day defences at Taunton or the potential improvements in this area as a result of the Taunton Flood Alleviation Scheme. Much of the proposed development in Taunton town centre will become viable only when the proposed alleviation scheme has been implemented. Any proposed development within Taunton will need to consider climate change in relation to the current and future standard of protection offered by the defences. Any site-specific FRA for development within Flood Zone 2 or 3 along the River Tone and its tributaries would likely need to involve obtaining the latest modelling for Taunton from the EA and/or undertaking site-specific detailed modelling. Consultation should also be undertaken with the EA at the early stages of planning in reference to the Taunton Flood Alleviation Scheme.

SOUTH SOMERSET

In South Somerset, the flood extents indicate that the most significant increase in flood risk as a result of climate change could occur in the Somerset Levels and Moors.

The Yeo and Cam includes detailed modelling of the 1 in 100 plus 40% climate change event for the River Yeo. This gives an indication of the likely increase in flooding due to climate change in the vicinity of Ilchester, Yeovilton, West Camel and Queen Camel, amongst other small settlements. Further upstream, Yeovil remains largely outside the floodplain of the River Yeo once climate change is considered.

When the impacts of climate change are considered, there is a risk that fluvial flooding from the River Yeo could impact on the A303 near Ilchester, restricting access to Yeovil and the south west.

Within Wincanton, the fluvial flood extents show a significant increase in flood risk immediately to the north of the A303 when climate change is considered. Flood Zone 2 has been used as a surrogate for climate change in this location, which is based on the national generalised JFLOW modelling here. Therefore, any new development in present day Flood Zone 2 or 3 will require detailed modelling as part of the FRA to include climate change scenarios in consultation with the EA.

6.5 FLOOD ALLEVIATION SCHEMES

EXISTING FLOOD DEFENCES AND SCHEMES

West Somerset

In the West Somerset subarea, the majority of existing formal defences are along the coastline, in the vicinity of Minehead, Blue Anchor, Watchet and Hinkley Point.

Along Minehead's sea front, coastal defences are present in the form of a stepped revetment, re-curved wave return wall and groynes, with details of the flood defences shown on series 2200 of Appendices B and C. These works were completed in 2001 with a design standard of protection up to a 1 in 100 (1%) year event at that time. This defence extends along the Minehead seafront from Minehead Harbour to Minehead and West Somerset Golf Club. To the northwest of this, a beach and sea wall continues around the harbour, also with a design standard of protection up to a 1 in 100 (1%) year event. To the southeast of the Golf Club, the defences comprise sand dunes and earth embankments, also recorded to have a design standard of protection up to a 1 in 100 (1%) year event.

However, in the Somerset North Coast Flood Warning Improvements modelling[58], the area classified as ABD behind these defences has been updated. The assessment shows that the defences provide sufficient protection in some areas to produce a tidal ABD. However, the land immediately behind the defences is not within the ABD area due to the risk from wave overtopping.

The Level 2 SFRA for West Somerset included hydraulic modelling of fluvial and tidal flooding, including consideration of the defences at Minehead. The study found that when climate change was considered, the risk of overtopping of the defences greatly increases at Minehead, with the earth embankments to the southeast of Minehead most at risk of overtopping. Since the writing of the Level 2 SFRA, remodelling of the Flood Zones has been undertaken as part of the Somerset North Coast Flood Warning Improvements modelling study. This study concluded that, in general, the standard of protection of the coastal/tidal defences is high based on present day sea level conditions. However, the condition of the defences and the increase in risk in the future due to climate change was not considered in this study. Based on the above, it is recommended that a further review of the flood defences at Minehead is carried out in relation to climate change and the

[58] Environment Agency and JBA (2012) Somerset North Coast Flood Warning Improvements.

future standard of protection. The previous West Somerset Level 2 SFRA made recommendations for a second line of defences at Minehead but this has yet to be taken forward.

The River Avill was realigned within a concrete channel in the 1960s and its natural course drains into the sea via a pipe beneath the coastal defences. The pipe is connected to a control chamber to prevent tide locking. The River Avill splits into its natural course and a flood relief channel just upstream of the A39. The flood relief channel attenuates flood flows from the River Avill, protecting properties downstream. The River Avill flood relief channel has a design standard of protection up to a 1 in 100 (1%) year event. The West Somerset CFMP identifies actions to continue with existing flood risk management in the Lower River Avill and to review the current and future standard of protection of the River Avill Flood Relief Channel and to improve as required.

Coastal defences are present at Blue Anchor with a recorded design standard of protection up to the 1 in 100 (1%) year event in the form of a series of sea walls, with toe-protection provided by rock armour. Coastal defences are also present at Watchet, in the form of sea walls, breakwaters and harbour walls, with a recorded design standard of protection up to the 1 in 100 (1%) year event. In the southwest of Watchet on the Washford River, the fluvial defences are recorded to have a design standard of protection up to the 1 in 10 (10%) year event. Defences here comprise of a regraded bank.

At Hinkley Point, coastal defences protect the power station from coastal flooding and have a design standard of protection up to the 1 in 1,000 (0.1%) year event. The defences here comprise of a wave return sea wall with gabions behind. Further east along the coastline, the design standard of protection drops to up to a 1 in 50 (2%) year or 1 in 100 (1%) year events with the defences comprising of rock revetment and sea walls.

The preferred policy in the short term for Minehead to Blue Anchor, as set out in the SMP, is to ‘hold the line’. In the longer term, the preferred policy for this section of coast moves towards ‘managed realignment’ but with the intention to retain the ‘hold the line’ approach for Minehead and Dunster Beach to Ker Moor. At Watchet, the preferred policy in both the short and the long term is to ‘hold the line’. This is also the preferred policy for Hinkley Point with the exception of areas where the coast remains undefended which will be allowed to evolve naturally. The SMP identifies the potential for coastal erosion over the next 100 years, but this will be limited in the key towns due to the presence of hard defences.

Taunton Deane

The most significant flood defences in the Taunton Deane subarea are those that protect the town of Taunton. Upstream of Taunton on the Norton Brook, the Norton Fitzwarren Dam embankment attenuates water within a flood storage area, providing some protection to Norton Fitzwarren downstream.

In Taunton a significant flood defence scheme was built in the 1960s, with the defences raised further in the 1990s. As the River Tone passes through Taunton, flood embankments and flood walls are present along much of the River Tone’s banks, with a design standard of protection mostly up to a 1 in 100 (1%) year event, but up to the 1 in 75 (1.33%) year event in places. Downstream of Firepool, the river enters into a stretch of two-stage channel which enables the river to convey high flows away from the town centre more quickly. Improvements to the flood defences in Taunton are currently under development, with this discussed further in the following section of this report. Both

the Parrett CFMP[59] and the previous Level 1 and Level 2 SFRA[60] identified weaknesses in the River Tone defences which need to be addressed.

Upstream of Taunton, a storage area is present on the Westford Stream, with a flood storage embankment/dam with a design standard of protection up to the 1 in 40 (2.5%) year event, providing a degree of protection to properties downstream.

In the village of Hillfarrance, a flood embankment diverts water into a flood diversion channel around the north of the village. Both the flood embankment and diversion channel have a recorded design standard of protection up to the 1 in 100 (1%) year event.

Downstream of Taunton, flood defences are present around Ruishton, Ham and Creech St Michael with varying design standards of protection. These largely comprise of natural high ground, embankments and flood walls. The flood defences in Ham were completed in 2008, whilst those in Creech St Michael were completed in 2009/10.

Within the Somerset Levels and Moors, several areas of the moors are set aside as flood storage areas, accompanied by EA operated pumping stations. The pumping stations manage water levels in the Moors so that they can be used to store floodwaters. In addition, the IDB maintains rhynes and drainage ditches in the Moors and operate a series of control structures within the Moors which work to maintain water levels in the IDB areas. A significant flood storage area is present in the lower reaches of the River Tone within Hay Moor and Curry Moor.

South Somerset

In South Somerset where the River Isle passes Ilminster, raised embankments are present with a design standard of protection up to the 1 in 20 (5%) year event.

On the River Yeo, raised embankments and flood walls are present at Ilchester, with a design standard of protection of between the 1 in 50 (2%) year and the 1 in 100 (1%) year event.

Within the Somerset Levels and Moors, several areas of the Moors are set aside as flood storage areas, accompanied by EA operated pumping stations. The pumping stations manage water levels in the Moors so that they can be used to store floodwaters. In addition, the IDB maintains rhynes and drainage ditches in the Moors and operate a series of control structures within the Moors which work to maintain water levels in the IDB areas.

At the confluence of the River Isle and the River Parrett, West Moor is set aside as a flood storage area. To the west, the River Yeo passes Ilchester before flowing through a flood storage area within Wet Moor and Wit Moor. The River Yeo joins the River Parrett near Langport where embankments are present at Langport Eastover with a design standard of protection up to the 1 in 100 (1%) year event. North of Langport is another flood storage area within the Moors. Moving downstream, embankments are present along stretches of the River Parrett with a design standard of protection up to the 1 in 100 (1%) year event. North Moor and Aller Moor are also set aside as flood storage

[59] Environment Agency (2009) Parrett Catchment Flood Management Plan – Summary Report December 2009.
[60] JBA (2011) Taunton Deane Borough Council Strategic Flood Risk Assessment.

areas. These areas store water in times of flood when the embanked rivers flowing through the Moors overtop.

In addition to the above, the Sowy River is an artificial flood relief channel which was constructed in the 1960s to relieve flooding on the River Parrett at Langport and Aller Moor. The channel was designed to take overflow from the River Parrett to the King's Sedgemoor Drain, outside of the Study Area.

In the east of the district, a flood storage area is present upstream of Bruton on the River Brue which is retained by Bruton Dam Spillway which has a design standard of protection up to the 1 in 100 (1%) year event.

The South Perrot reservoir is located to the south-east of Crewkerne, but is located just outside the study area at South Perrot. This is towards the upstream extent of the River Parrett catchment and will provide benefits to the downstream catchment by providing flood storage.

PROPOSED FLOOD DEFENCES AND SCHEMES

This section of the report deals with proposed flood defences and schemes within the Study area. The schemes are grouped on the authorities leading the works rather than geographically.

One of the most significant schemes proposed within the area is the Taunton Strategic Flood Alleviation Improvements Scheme, with work led by Somerset West and Taunton, but supported by all flood risk organisations. In 2014, a Phase 1 Options Study for the Taunton Strategic Flood Risk Management Scheme[61] was completed. This study included hydraulic modelling of the existing and future flood risk in Taunton and identified that the existing defences in Taunton offer variable standards of protection. A number of strategic options were assessed as part of the 'Do Something' scenario with the results showing that a combination of strategic options will be required to achieve the appropriate standard of protection to mitigate the increase in flood risk as a result of climate change. This included a detailed appraisal of the options to determine a strategic flood risk solution for Taunton and analysis to establish preferred options. Various local measures are now being designed to reduce flood risk in the town centre in the short, medium and long term. These include options for flood defence work within the town and also in the catchment upstream of the town.

The EA oversees the FCERM Capital Investment Programme. Within their current capital investment programme, which finishes in 2021, there are four schemes within the SFRA Study Area, all classified as 'Potential scheme at the appraisal stage'. This classification means that these projects are expected to start construction in future years, subject to approval of a full business case. These schemes are detailed in Table 6-4 **Error! Reference source not found.** below.

[61] JBA (2014) Taunton Strategic Flood Risk Management Phase 1 Options Study.

Table 6-4 – FCERM schemes within the Study Area

Project Name	Local Authority	Scheme details
Henley Sluice	South Somerset	This scheme is classified as a 'Potential Scheme at the appraisal stage'. The forecast construction completion date for this scheme is 2018-2021.
West Moor Reservoir: Measures in interests of safety under Reservoirs Act	South Somerset	This scheme is classified as a 'Potential Scheme at the appraisal stage'. The forecast construction completion date for this scheme is post 2021.
Wet Moor Reservoir: Measures in interests of safety under Reservoirs Act	South Somerset	This scheme is classified as a 'Potential Scheme at the appraisal stage'. The forecast construction completion date for this scheme is 2018-2021.
Natural Flood Management Scheme – Williton, Monksilver & Doniford catchments	West Somerset	This scheme is classified as a 'Potential Scheme at the appraisal stage'. The forecast construction completion date for this scheme is 2018-2021. The scheme will involve the implementation of natural flood management interventions to reduce flood risk in Williton, Monksilver and Stogumber and several other rural communities. Stakeholder engagement has been undertaken in 2018 with opportunities for natural flood management identified in the mid and upper catchments.

Environment Agency (March 2018) FCERM Capital Investment Programme of Work 2018/19-2020/21; and Environment Agency (2019) Wessex Regional Flood and Coast Committee.

The SRA was formed in 2015 following the recommendations of the Somerset Levels and Moors Flood Action Plan after the major floods that affected Somerset in 2013/14. The SRA is a partnership of Local Flood Risk Management Authorities and oversees and funds works that meet the Flood Action Plan objectives that address flood risk and resilience across the whole of Somerset and not just the Levels and Moors. The SRA funds work over and above that which is already delivered by other partners, with scheme work delivered direct by the partner organisations.

Within the South Somerset and Taunton Deane subareas the 2019/20 Enhanced Programme includes pioneer dredging of the River Parrett from Oath to Burrowbridge. The detailed plans for this work began in January 2018 and hydraulic modelling indicates that this dredging will reduce flood risk to over 40 km^2 within the Parrett Catchment. These works will tie in with the SRA's proposed enhancement scheme for the River Sowy and King's Sedgemoor Drain.

The enhanced programme for 2019/20 also includes county wide de-silting of structures, with several locations identified in Taunton Deane and South Somerset, funding will be available for silt-traps to be emptied across the county to help alleviate highway flooding. Both programmes also set

out county wide enhanced gully emptying, drain jetting and road edge cleaning to ensure highway drainage systems are kept operational.

The 2019/20 programme also includes culvert inspections and remedial works within IDB areas to improve the conveyance of water and plans for land management and natural flood management works to retain water in the upper catchments and reduce peak flows across the county.

The 2019/20 programme includes various small schemes in the West Somerset subarea. This includes CCTV inspection and improvement works to a culvert in Sampford Brett and de-silting of the Sampford Brett Stream, near Williton. There is also SRA funding for remedial works to a culvert in Woolston Moor, with plans to undertake a CCTV inspection, remove debris and carry out any remedial works required. Small capital schemes including vegetation clearance and de-silting are planned for various streams in the West Somerset subarea to alleviate the risk of flash flooding in 'rapid response' catchments.

In addition to the above, the SRA 2019/20 enhanced programme identifies various schemes that are in the early stages of their development such as a flood alleviation study for the A38 near Wellington, a SuDS study in Yeovil and investigations into a flood attenuation pond on the Preston Brook in Yeovil. Various locations across the Study Area are also identified for the installation of silt traps. Several other county-wide schemes in addition to smaller schemes are identified in the SRA 2019/20 programme.

6.6 SURFACE WATER FLOODING

The most comprehensive source of information regarding surface water flood risk is the EA's Risk of Flooding from Surface Water map. A reproduction of the EA's Risk of Flooding from Surface Water Map is provided in map series 7000 in Appendix B and C. Historic flood records, as covered in more detail in Section 6.1, provide an indication of areas that have suffered from surface water flooding in the past. The areas at greatest risk are noted below for the three Local Authority areas, respectively.

In relation to the EA's Risk of Flooding from Surface Water Mapping, it is important to remember that surface water flood risk that is actually attributable to an ordinary watercourse is likely to be classified as fluvial flooding and is expected to be assessed and managed in a similar manner to the EA Flood Zones.

WEST SOMERSET

The settlements most at risk of surface water flooding in the West Somerset subarea are Minehead, Williton, Washford, Doniford and Carhampton. The most significant surface water events in these settlements include October 2000, December 2000 and November 2012 (Section 6.1). In many instances, surface water flooding coincides with flooding from ordinary watercourses and rivers, exacerbated by blocked structures and overwhelmed highway drainage. In some locations, such as Carhampton, surface water flood risk is exacerbated by runoff from agricultural land. At the coast, the outfalls can become tide locked restricting the rate at which the watercourses can drain into the Bristol channel.

Within Minehead, the EA's Risk of Flooding from Surface Water map shows overland flow routes in the west of the town to follow the topography of the Bratton Stream catchment. A significant area is also shown to be at risk centred around Mart Road due to this area sitting at a lower elevation than the surrounding areas.

The West Somerset CFMP recommended that SWMPs were produced for Minehead and Williton. A SWMP was subsequently completed for Minehead in 2012. Some of the main causes of surface water flooding were identified in the SWMP, as summarised below:

- Topography – Minehead sits in a bowl relative to the surrounding area;
- Overland flow and ponding in natural depressions;
- Drainage – limited hydraulic capacity of the sewer network;
- Out of channel flows from watercourses due to tide locking;
- Poor maintenance of drainage systems in some locations; and
- Dense urban area.

The Minehead SWMP identified preferred options for further investigation and some key mitigation strategies. Section 3.3 provides details of the SWMP recommendations in relation to surface water and development control. In particular this identified that following periods of prolonged wet weather drainage of areas to the east of Minehead is constrained.

Proposed development in these settlements may require site-specific hydraulic modelling or surface water and/or risk from ordinary watercourses where the EA's mapping and/or historic flood records indicate there to be a risk.

TAUNTON DEANE

The settlements most at risk of surface water flooding in the Taunton Deane subarea are Taunton, Wellington and Wiveliscombe. Both Wellington and Wiveliscombe have been impacted by multiple surface water events, in many instances coinciding with flooding from ordinary watercourses and rivers, exacerbated by blocked structures and overwhelmed highway drainage. SCC also holds records of surface water flooding in Bishops Lydeard, with the worst event recorded impacting 10 properties.

Surface water flooding is also a problem in Taunton due to its urban nature and the large number of ordinary watercourses and rivers draining towards its centre. The EA's Risk of Flooding from Surface Water map shows the risk of surface water flooding to largely correspond with the location of these streams and overland flow towards them from the urban catchment. Areas within Taunton shown to be at particular risk include areas around the Galmington Stream, Norton Fitzwarren and between the railway line and the Bridgwater and Taunton Canal, to the south of Maidenbrook.

The Parrett CFMP recommended that a SWMP was produced for Taunton. A SWMP was subsequently completed for Taunton in 2013. Some of the main causes of surface water flooding were identified in the SWMP, as summarised below:

- Overland flow and ponding in natural depressions;
- Drainage – limited hydraulic capacity of the sewer network;
- Surface water runoff from surrounding recreational/agricultural land;
- Lack of drainage outfalls in certain locations;
- Conveyance and out of bank flow associate with ordinary watercourses;
- Highway conveyance of surface water; and
- Urbanisation.

The Taunton SWMP identified preferred options for further investigation and some key mitigation strategies. See Section 3.3 which details the SWMP recommendations in relation to surface water and development control.

Proposed development in these settlements may require site-specific hydraulic modelling or surface water and/or risk from ordinary watercourses as part of the FRA where the EA's mapping and/or historic flood records indicate there to be a risk.

SOUTH SOMERSET

The settlements most at risk of surface water flooding in South Somerset are Yeovil, Chard, Ilminster, Crewkerne, Norton-sub-Hamdon, Martock, Somerton, Misterton, north of Bruton, South Petherton and Castle Cary. These settlements have all experienced surface water flooding historically, in many instances coinciding with flooding from ordinary watercourses and rivers, exacerbated by blocked structures and overwhelmed highway drainage. SCC has undertaken Flood Investigation Reports for Ilminster, north of Bruton, Misterton and Norton-sub-Hamdon, where properties have previously been impacted by flooding.

Multiple properties flooded in Yeovil in May 2008 as a result of surface water and sewer flooding. The EA's Risk of Flooding from Surface Water map shows several overland flow routes through the town draining south towards an ordinary watercourse which joins the River Yeo to the east of Yeovil. In particular, areas to the north of the A3088 and west of Queensway are at risk where a partly culverted watercourse from the west is joined by a watercourse from the north, prior to the ordinary watercourse entering into a culvert under the road junction.

Proposed development in these settlements may require site-specific hydraulic modelling of surface water and/or risk from ordinary watercourses as part of the FRA where the EA's mapping and/or historic flood records indicate there to be a risk. Engagement with the LLFA is recommended to understand the scope of any works with further details provided in Section 7.3.

6.7 GROUNDWATER FLOODING

Groundwater flooding can occur after periods of abnormally high rainfall when the natural underground drainage system cannot drain groundwater recharge away quick enough. This results in the groundwater table rising above the ground surface and causing damage to property and infrastructure. Those areas which tend to be most prone to groundwater flooding are typically situated in low areas on or near aquifers.

Groundwater flooding can occur in a range of geological settings and is typically associated with permeable geology such as chalks and gravels but can also be attributable to natural groundwater springs, and where permeable deposits sit over impermeable geology causing a perched water table to occur which can lead to groundwater emergence. A review of the local geology (superficial and bedrock geology) can provide an indication of areas that may be susceptible to groundwater flooding. Often the effects of groundwater flooding are indistinguishable from the effects of fluvial flooding; and may pose similar risks to those identified by the EA's Risk of Flooding from Surface Water Map or are not obviously attributable to groundwater e.g. surcharge of sewers. As a result, the recording of groundwater flooding is often inconsistent. Localised groundwater flooding can also be the result of inefficient drainage on development schemes (e.g. undersized or blocked groundwater drains) or by introducing groundwater flow barriers (e.g. cut-off walls) which block or reduce pathways towards a groundwater receptor.

The EA's Areas Susceptible to Groundwater flooding dataset has been mapped in series 6000 of Appendix B and C. This is a gridded 1 km spatial dataset in which each square kilometre is assigned a susceptibility to groundwater emergence based on the geological and hydrological conditions.

WEST SOMERSET

The nature of the underlying geology in the West Somerset subarea means that the susceptibility to groundwater flooding is attributable to areas where permeable deposits overlie less permeable deposits and surface water features are present. The EA recorded a single historic groundwater flooding incident in February 2014 because of groundwater rise via a watercourse west of Stolford. Springs are recorded along a tributary of Doniford Stream southwest of Williton and it is here that the boundary between the permeable Sherwood Sandstone Group and less permeable Mercia Mudstone Group is present. Groundwater flood risk within and surrounding Williton may be exacerbated by the nature of the local underlying geology.

The susceptibility to groundwater flood risk is not anticipated to be significant in areas to the southwest and east of Minehead and southwest of Watchet. The Mercia Mudstone Group, which is generally characterised by low permeability, dominates and therefore is unlikely to generate significant groundwater discharge volumes. Heavy or prolonged rainfall events are more likely to cause surface water flooding due to the lack of infiltration into this low permeability material.

TAUNTON DEANE

Groundwater flooding is not considered to be a significant risk, but the bedrock geology is strongly influenced by localised faulting that influences groundwater flow locally within the subsurface. Minor aquifers are present over most of the Taunton Deane subarea with most Principal aquifers occurring at significant depth. The EA recorded a single historic groundwater flooding incident in February 2014 because of groundwater rise via a watercourse northeast of Taunton. There is no clear relationship with specific aquifer bodies or with known points of groundwater emergence.

The Sherwood Sandstone Group is exposed at the surface at Wellington because of faulting in the area. Springs are recorded along minor and major watercourses at Wellington which suggests that groundwater levels are shallow and groundwater base-flow is occurring. Groundwater flooding could potentially be an issue within and surrounding Wellington.

Groundwater flooding is not considered a risk within and surrounding Taunton, Wiveliscombe and Bishops Lydeard.

SOUTH SOMERSET

Springs are recorded throughout the district and represent the natural emergence of groundwater at the surface. Springs generally flow to drains or small watercourses joining fluvial drainage systems. These are also mapped as ‘issues’ (on Ordnance Survey 1:50,000 scale maps) and drains which may represent (respectively) slow discharge and drainage of shallow or emergent groundwater. Under conditions of extreme rainfall, these areas of natural emergence may flow with greater discharge and represent a flooding hazard, although there is no historical record of any such problems. Springs indicate shallow groundwater levels with no capacity to store additional groundwater recharge hence water runs off at or near the surface. Many such spring flows are in rural areas where increased flows represent no real threat to existing urban areas where new development is likely to be proposed.

The complexity of the geology and number of aquifer units that occur wherein groundwater flooding may occur will be limited in extent and localised. The overall risk from groundwater flooding will be low.

6.8 SEWER FLOODING

Sewer flooding can occur as a result of inadequate capacity in the sewer network typically where urban areas have expanded to accommodate growth without upgrading the sewer network. Flood risk associated with the potential surcharging of the sewerage network is extremely hard to predict and there are currently no datasets available that provide an indication of areas that may be at risk of flooding from the sewerage network.

The majority of modern sewer systems are designed to accommodate the 1 in 30 year event whilst older sewers were not built to a particular design standard and may not accommodate the 1 in 30 year event. Urbanisation and climate change are likely to increase the risk of sewer flooding over time, as rainfall patterns change and surface water runoff increases due to a larger proportion of impermeable area within urban catchments. New development should always give consideration to likely overland flow paths should flooding from these systems occur.

As emergence from sewerage systems is likely to follow the ground's topography, it is recommended that consideration is given to the EA's Risk of Flooding from Surface Water map and other available topographic data as this will provide an indication of likely flow routes should surcharging of the sewerage system occur.

Wessex Water has provided records of sewer flooding in the Study Area that resulted from inadequate hydraulic capacity in the sewer system. The data also includes comments in relation to the problem and any alleviation works completed following the event.

SCC has also provided records of flooding from sewerage/drainage, some of which are not included in the sewerage undertakers' records. Several of SCC's records of sewer flooding include reference to severe weather and flash flooding, and many of the locations identified below have a known history of surface water flooding (see Sections 6.1 and 6.6). Surface water and sewer flooding can occur in combination where a high intensity rainfall event results in a high volume of surface water overwhelming the surface water drainage network.

A map of historic records is included in series 7000 in Appendix B and C, which highlights postcode areas where there is a known record of flooding. Specific information with respect to sewer flood records should be requested from the sewerage undertaker by the applicant as part of any FRA.

WEST SOMERSET

In the West Somerset subarea, several locations are susceptible to flooding of the sewer network. Locations where Wessex Water or SCC hold records of sewer flooding include:

- Minehead;
- Carhampton;
- Washford;
- Watchet;
- Crowcombe;
- Kilve;
- Old Cleeve;
- Bilbrook;
- Williton;
- Sampford Brett;
- Stogursey; and

- Stolford.

TAUNTON DEANE

In the Taunton Deane subarea, several locations are susceptible to flooding of the sewer network. Locations where Wessex Water or SCC hold records of sewer flooding include:

- Taunton;
- Ruishton;
- Creech St Michael;
- Bishops Lydeard;
- Wellington;
- Westford/Rockwell Green;
- Wiveliscombe;
- Milverton; and
- Kingston St Mary.

SOUTH SOMERSET

In South Somerset, several locations are susceptible to flooding of the sewer network. Locations where Wessex Water or SCC hold records of sewer flooding include:

- Yeovil;
- Chard;
- Combe St Nicholas;
- Crewkerne;
- Horton;
- Ilminster;
- South Petherton;
- Martock;
- Ilchester;
- Langport;
- Somerton;
- Wincaton.
- Queen Camel;
- Stoke-sub-Hamdon;
- Merriott;
- Castle Cary;
- Bruton; and
- Templecombe.

The sewer networks serving Yeovil, Chard, Crewkerne, Ilminster and Wincanton are combined and therefore have limited capacity. A combined sewer is where both surface water and foul water are conveyed within the same pipe. The majority of flood incidents in Yeovil are related to surface water and sewer flooding and these problems would be expected to worsen in the future if the sewerage system is not improved or measures not taken to prevent overland flow from entering the sewers.

SOUTH WEST WATER

Whilst Wessex Water are responsible for the majority of the Study Area, South West Water operate the drainage network within a small part of each of the three Local Authorities (Figure 4-1):

- West Somerset subarea – the south of West Somerset including Skilgate and Brushford.
- Taunton Deane subarea – two main areas in the southwest and northwest of Taunton Deane including Widcombe, Churchinford and Raddington. A couple of additional very small areas along Taunton Deane's western boundary also fall within South West Water's operating area.
- South Somerset – the southwest of South Somerset including Winsham and Forton.

South West Water has provided records at the postcode level, with these detailed in Table 6-5 below. No other information about these events has been provided. The South West Water historic records were therefore not included on the mapping in map series 7000 in Appendix B and C.

Table 6-5 – South West Water hydraulic overload flooding records between April 2008 and November 2018.

Postcode Area	Local Authority	Number of Flood Records
TA20	South Somerset	8
TA21	Taunton Deane subarea	5
TA22	West Somerset subarea	3

6.9 ARTIFICIAL FLOOD SOURCES

Structures such as raised reservoirs or raised canals (i.e. structures designed to hold, or capable of holding, water above the surrounding ground levels) can pose a significant flood risk if they were to fail.

The most significant risk of flooding from artificial sources is attributable to reservoir failure. The EA's Risk of Flooding from Reservoirs map shows the likely extent of flooding in the event of reservoir failure. The key purpose of these maps is to highlight those areas where developers and the public need to be aware of the potential risks should a breach of a reservoir occur and therefore the actions that should be taken. The maps provide information of the extent, depth and velocity of flow, which can be reviewed on the gov.uk webpages[62], that in turn can inform an assessment of hazard.

Reservoirs must undergo regular inspections to the requirements of the Reservoirs Act by suitably qualified engineers. On this basis therefore, the probability of structural failure of these reservoirs is considered to be low.

The EA's Risk of Flooding from Reservoirs mapping is currently displayed in map series 5000 in Appendix B and C.

There are currently no operational canals in the West Somerset subarea or South Somerset, however the Taunton and Bridgwater Canal is present in the Taunton Deane subarea and is described in further detail below.

[62] https://flood-warning-information.service.gov.uk/long-term-flood-risk

WEST SOMERSET

The main reservoirs which present a risk within the West Somerset subarea are:

- The Clatworthy Reservoir – capacity approximately 5 million cubic metres. This reservoir is managed by Wessex Water and impounds water from the upper River Tone and several other streams. In the event of breach or failure, flooding would extend along the path of the River Tone and into the Taunton Deane subarea.
- Wimbleball Lake – this reservoir is located within Exmoor National Park, but in the event of a breach has the potential to impact Exebridge which is within the SWT area.

TAUNTON DEANE

The two main reservoirs that contribute to a residual risk of flooding within the Taunton Deane subarea are:

- The Clatworthy Reservoir – located in the West Somerset subarea (see above). In the event of breach or failure, flooding would extend along the River Tone into the Taunton Deane subarea.
- The Norton Fitzwarren Dam – capacity approximately 700,000 cubic metres. This flood storage area located on the Halsewater was constructed in 2008 to allow for redevelopment downstream. In the event of a breach or failure, flooding would extend along the Halsewater towards Norton Fitzwarren and Taunton.
- Westford – flood storage area offering some protection to properties downstream.
- Luxhay, Leigh and Blagdon reservoirs – three reservoirs in the south of the Taunton Deane subarea. In the event of a breach or failure, flooding would extend north along the fluvial floodplain of an unnamed ordinary watercourse which joins the River Tone downstream of Bradford-on-Tone.

The Taunton and Bridgwater Canal originates at Firepool in Taunton where a weir takes flow from the River Tone into the canal. The canal continues east through Taunton to the north of the River Tone. At Bathpool a spillway is present which allows excess water to enter into the Kingston Stream/Allen's Brook. The majority of the River Tone's northern tributaries pass in culvert under the canal. The Taunton Northern Tributaries Flood Risk Modelling[63] study reports on evidence of floodwaters in the November 2012 event flowing over the Firepool Lock from the River Tone into the canal, and over the spillway at Bathpool into Allen's Brook. The 2018 modelling incorporates the canal and results suggest that in the larger return periods, flooding could occur north of the canal in Priorswood in Taunton, partly originating from overtopping from the canal.

SOUTH SOMERSET

The main reservoirs within South Somerset are:

[63] Environment Agency and JacksonHyder (2018) WEM Lot 1 Modelling, Mapping and Data – Taunton Northern Tributaries Flood Risk Modelling.

- West Moor Reservoir – capacity approximately 5 million cubic metres. This is a flood storage area on the West Moor Drain. In the event of a breach or failure, flooding would extend north into the Somerset Levels and Moors.
- Sutton Bingham – capacity approximately 2 million cubic metres. This reservoir is located in the south of South Somerset south of Yeovil. In the event of a breach or failure, flooding would extend north along the floodplain of the River Yeo and as far as Yeovilton, Ilchester and into the Somerset Levels and Moors.
- Flood storage areas within the Somerset Levels and Moors – The EA's Flood Storage Areas dataset classifies several large areas of the moors (such as Wet Moor, Aller Moor, South Lake Moor, and Perry Moor) as flood storage areas, with some of these extending into the Taunton Deane subarea. These areas store water in times of flood when the embanked rivers flowing through the moors overtop.
- Chard – capacity approximately 900,000 cubic metres. This reservoir is located to the northeast of Chard. In the event of a breach or failure, flooding would impact upon Ilminster and would extend north, following the floodplain of the River Isle.
- Bruton Dam (flood storage) reservoir – capacity approximately 500,000 cubic metres. This flood storage area and dam is located to the east of Bruton in the east of the Study Area. In the event of a breach or failure, flooding would impact upon Bruton and extend southwest along the floodplain of the River Brue.
- South Perrot (flood storage) reservoir – this reservoir is located to the south-east of Crewkerne, but just outside of the study area. This structure provides flood storage in the River Parrett catchment and will provide benefit to downstream areas located inside the study area.

Some smaller reservoirs are known to be present within the South Somerset but have not been considered here.

7 POLICY RECOMMENDATIONS AND GUIDANCE

It is essential that the risk of flooding is considered in the planning of new development, to protect the future occupants of these developments as well as people, property and infrastructure elsewhere – both now and in the future.

The risk of flooding is most effectively addressed through avoidance, which in very simple terms means guiding future development and regeneration away from areas at medium or high risk of flooding, both now and in the future, to areas at low risk of flooding. It is essential that development is sustainable for future generations and it is widely recognised that the risk of flooding cannot be considered in isolation. When designing and locating future development there are many tests and measures of 'sustainability' that must be suitably considered but, from a flooding perspective, developments should be made safe for their lifetime without increasing flood risk elsewhere.

This section of the SFRA sets out the way in which the LPAs expect new development to consider and address flood risk. The application of the Sequential and Exception Tests are detailed and information on the preparation of site-specific FRAs is set out.

The majority of the advice in this Section applies to all development proposals, regardless of size, nature or location. Where advice is only applicable to certain types of development, for example those located within Flood Zone 3, this is clearly identified.

This section presents the sequence of steps that should be taken to assess the suitability of a site for developments through to preparation of a site-specific FRA. These steps, in order are:

1. **Sequential Assessment**: Apply the Sequential Test to a proposed development site to determine whether the site can be located in an area of low flood risk. If there are other available and appropriate sites at a lower risk of flooding then development should not proceed. If required apply the Exception Test if the site is located in an area of medium or high flood risk.
2. **Site-specific FRA**: Identify the requirements for a site-specific FRA for a development site by assessing the risk of flooding at the site and defining the scope of the assessment, including the preparation of surface water management measures. The assessment should demonstrate that the risk of flooding can be managed for the lifetime of the development without increasing the risk of flooding elsewhere.
3. **Mitigating residual flood risk:** For developments where the risk of flooding remains, for example as a result of a breach event, appropriate measures to manage the residual risk of flooding should be implemented.

Important Note

Development management policies that are considered important to the LPAs and are specific to the Study Area are highlighted in red boxes. Applicants should take particular note of these requirements.

7.1 SEQUENTIAL AND EXCEPTION TEST

Effective and sustainable flood risk management is best carried out through the planning process. Planning policies which steer development away from areas that are susceptible to flooding is the first approach that should be considered in flood risk management.

The NPPF promotes a sequential approach that will guide the planning decision making process (i.e. the allocation of sites) through the application of the Sequential Test, as detailed in Section 3. The Sequential Test aims to steer new development to areas with the lowest probability of flooding from all sources and not just fluvial and tidal flooding using the Flood Zones. It also requires planners to seek to allocate sites for future development within areas of lowest flood risk. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding from all sources.

Where development cannot be located in areas with the lowest risk of flooding, the approach to applying the Sequential Test should be agreed through pre-application discussions with the relevant LPA. For the Sequential Test to be passed the Applicant will need to demonstrate that there are no other available and appropriate sites which are at lower flood risk than the one they are proposing. When applying the Sequential Test, the Applicant should consider alternative sites across the LPA district. The exceptions to this would be where the proposed development has a fixed catchment, for example a doctor's surgery or a school.

Figure 7-1 presents the application of the Sequential Test in relation to fluvial and tidal flooding, but risk from surface water and groundwater flooding can be considered using the same approach. For example, using the surface water flood risk classifications defined in Section 5.4, a 'very low' risk of surface water flooding is analogous to Flood Zone 1 and a 'high' risk of surface water flooding to Flood Zone 3.

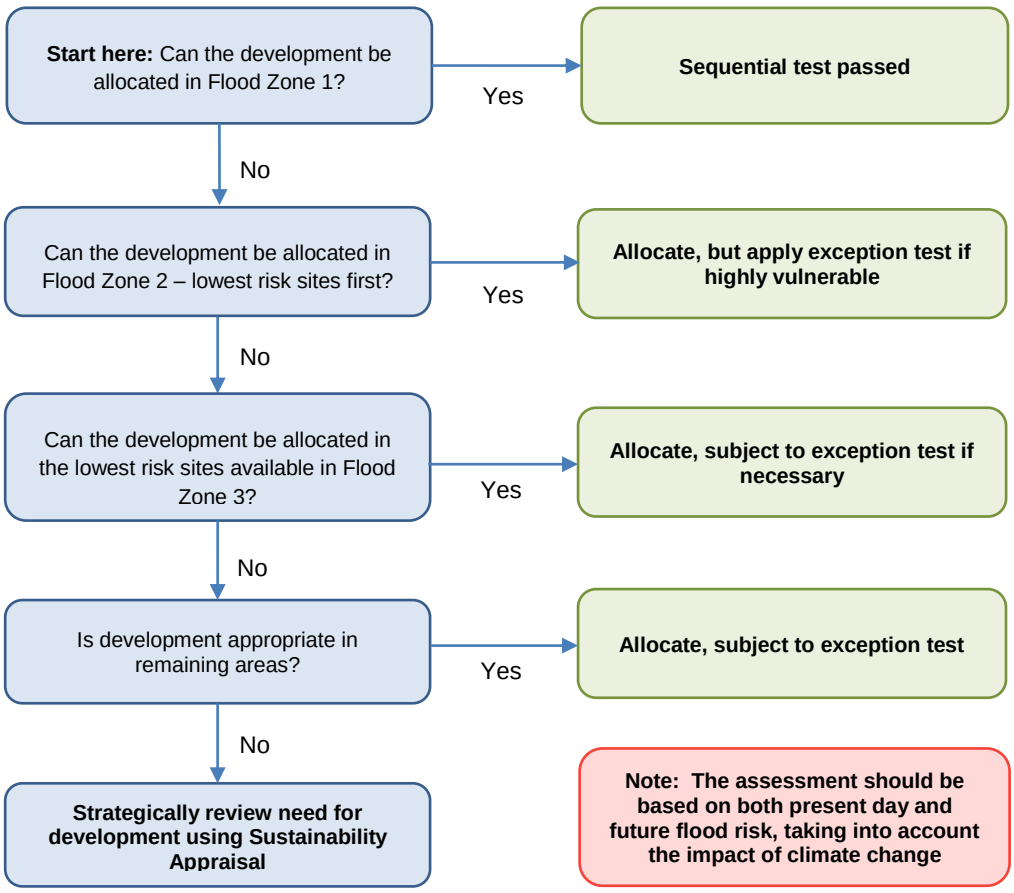

Figure 7-1 - Application of the Sequential Test to fluvial and tidal flooding

The flood risk assessment included in the SFRA (Section 6) should form the evidence base for applying the Sequential Test, but this can be supplemented with additional evidence as it becomes available, for example updates to the EA's Flood Map for Planning. Detailed modelling that has been completed for specific watercourses and development locations will also be used as part of the evidence base for the subsequent analysis of the Sequential Test and the Exception Test (where applicable). However, the SFRA flood mapping should be the start point for applying the Sequential Test.

When applying the Sequential Test to sites at risk of flooding from small watercourses, the Applicant should consider the possible extents of flooding present in both the Flood Zones and also the Risk of Flooding from Surface Water maps. Further guidance on this is provided in Section 7.2 below.

Important Note

The potential effects of climate change over the lifetime of the development should be taken into consideration when applying the Sequential Test. Climate change mapping should be used where this information is available.

The Sequential Test should also take into consideration risks associated with safe access and egress (for example, if a site is located in Flood Zone 1 and is a dry island surrounded by Flood Zone 3). This can be used to differentiate between sites that are at a comparable risk of flooding.

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 can be applied if appropriate. Appropriateness of the Exception Test is determined from the vulnerability tables set out in Section 3.1 (Table 3-1 and Table 3-2).

The potential effects of climate change over the lifetime of the development should be taken into consideration when applying the Sequential Test. Climate change mapping should be used where this information is available.

The Sequential Test focuses on the fluvial and tidal flood risk. However, it is essential that new or redeveloped sites take all sources of flood risk into account when applying the sequential approach to the development layout. Flooding from surface water, groundwater, surcharging of sewers, reservoirs and any other artificial sources may not have as much influence over the suitability of the land for development, however they need to be considered to protect the development against flood risk and ensure no increased flood risk elsewhere as a result of the development.

7.2 SITE SPECIFIC FLOOD RISK ASSESSMENTS

Where appropriate, applications should be supported by a site-specific FRA. LPAs require site-specific FRAs to be submitted for all developments in areas at risk of flooding or for those greater than a hectare regardless of flood risk classification. Larger developments in areas that are at lower risk of flooding will also require an FRA as a result of their potential to increase flood risk elsewhere.

The general requirements of a site-specific FRA have been clarified by the EA and are explained in detail on the www.gov.uk website[64] and in the planning application requirements for each LPA.

A site-specific FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account. If the proposed development is within an area identified to be at risk of flooding, Applicants should produce a Flood Warning and Evacuation Plan for the development as part of the FRA. Prior to producing this plan, further advice should be sought from the Somerset Civil Contingencies Partnership and from emergency services who can provide an advice note for developers on the requirements and contents of Flood Warning and Evacuation Plans.

For sites located in Flood Zone 1 or low risk from other sources, the site-specific FRA should focus on the sustainable management of surface water runoff generated by the proposed development and opportunities to reduce risk elsewhere, as detailed in Section 7.4.

The statutory requirement to complete a site-specific FRA is based on whether the development is in an area identified to be at risk of flooding and/or the size of the proposed development. However, the Applicant should demonstrate for all types of development that consideration has been given to all sources of flood risk including overland flow, groundwater, surcharging of sewers and other artificial sources. This may include consideration of runoff from areas of higher ground or from minor watercourses that may not be illustrated on published flood maps. It is recommended that the Applicant consults with the Somerset County Council LLFA team to ascertain if there are any known sources of local flood risk that may require further investigation.

The site-specific FRA should demonstrate the application of the Sequential Test and, if required, the Exception Test, for all proposed developments in Flood Zone 2 and Flood Zone 3, taking the potential effects of climate change into account and ignoring the presence of flood defences (Section 7.1). Within all site-specific FRAs, the development should demonstrate that a sequential approach has been taken that aims to steer the most vulnerable types of development to those areas within the site that are at least flood risk.

The site-specific FRA should be proportionate with the risk of flooding to the proposed development and the potential effects of the development on flood risk to others. For example, if surface water flooding is found to be a more significant risk than fluvial flooding, surface water risks should be investigated in more detail and be the focus of the FRA.

All developments are different and it is not possible to provide detailed guidance that can be applied universally on the content of a site-specific FRA. Guidance is provided by the EA on the gov.uk website. It is recommended that the LPA and other stakeholders are contacted early to discuss applications so that advice can be provided on a site by site basis. Further details on the requirements are provided in the West of England Sustainable Drainage Developer Guide and the

[64] https://www.gov.uk/flood-risk-assessment-for-planning-applications

non-statutory technical standards for SuDS (Section 3) in relation to surface water flood risk and surface water management.

7.3 ASSESSING FLOOD RISK TO A SITE

In accordance with the NPPF, all sources of flooding must be considered for all development proposals, for the present day and the future by taking into account the impact of climate change. This includes flooding from main rivers, ordinary watercourses, surface water, groundwater, the sewerage system, reservoirs and other artificial sources. In addition, the residual risk of flooding from overland flow, blocked culverts, temporary exceedance of drainage systems or failure of flood defence schemes should be considered where these are relevant considerations.

Important Note

All development proposals must give consideration to all sources of flooding in accordance with the NPPF, for the present day and the future by taking into account the impact of climate change. Within the Study Area, developers are also expected to give consideration to the residual risk of flooding, for example from culvert blockage, temporary exceedance of drainage systems and failure of flood defences.

The assessment of flood risk for sites should be based on relevant sources of information including the mapping and assessment included in this SFRA, other relevant data sources from stakeholders, and site-specific assessments. The latest available information should be used for this assessment wherever possible.

FLOOD RISK FROM SMALL WATERCOURSES

The EA's Flood Map for Planning generally does not include watercourses with a catchment area smaller than 3 km^2. As such these watercourses will not show as Flood Zone 3, however there may be a fluvial flood risk associated with these watercourses which needs to be treated in the same manner as fluvial flood risk from larger watercourses. The approach to dealing with these watercourses should be proportionate to the risk and will be assessed on a site by site basis. Review of the EA's Surface Water Flood Risk map can be used as the first step in assessing likely flood risk associated with smaller watercourses but detailed fluvial modelling may be required where the risk cannot be adequately quantified in other ways. It is recommended that initial advice is sought from the LPA as to the requirement and specification of any modelling for these smaller watercourses.

CLIMATE CHANGE

All proposed new developments in the Study Area must consider the potential impacts of climate change on flood risk in accordance with the EA's latest climate change recommendations published in February 2016. However, it should be noted that updated climate change guidance is being prepared by the EA based on the revised UKCP18 climate projections for the UK. The most up to date climate change allowances should be used at the time of an application and may supersede the information presented here. The approach to mapping the potential impacts of climate change in the study area are presented in Sections 5.2 and 6.4 respectively.

A summary of the current climate change recommendations for peak river flows within the Study Area is provided in Table 7-1 below. The Study Area is located within the South West River Basin District.

Table 7-1 – Peak river flow allowances for the South West River Basin District

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Central	10%	20%	30%
Higher Central	20%	30%	40%
Upper End	25%	40%	85%
Higher ++	25%	50%	105%

Environment Agency (2016) Flood risk assessments: climate change allowances; and Environment Agency (2016) Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities.

A summary of the current climate change recommendations for sea level rise within the Study Area is provided in Table 7-2 below.

Table 7-2 - Sea level rise allowance per year for the South West

Epoch	Annual sea level rise (mm)	Cumulative sea level rise in the epoch (mm)
1990 to 2025	3.5	122.5
2026 to 2055	8	240
2056 to 2085	11.5	345
2086 to 2115	14.5	435

It is important to note that studies, such as flood mapping and assessment studies, completed prior to the publication of the updated EA climate change guidance used previous climate change recommendations. Of particular note is the potential increase in fluvial flood flows and sea levels compared to previous recommendations that could significantly increase the mapped extents of fluvial flood risk during extreme events.

An assessment of the impact of climate change requires the lifetime of the development to be considered. The LPAs consider that a lifetime of 100 years is appropriate for residential development and essential infrastructure, and that a lifetime of 60 years is appropriate for other non-residential developments. Applicants can suggest an alternative design life for their development where this is considered appropriate, although it would be recommended that any deviations from the values stated above are discussed in advance of an FRA submission

The climate change allowance category that is considered most applicable to a development will depend on the vulnerability of the development to flood risk, (Table 3-1), present day risk of flooding and the lifetime of the development (Table 7-1 and Table 7-2). Further guidance on selecting the appropriate climate change allowance is provided in the EA guidance on climate change guidelines for FRAs.

These guidelines typically suggest that two allowances are considered, for example higher central and upper end. It is recommended that a climate change assessment adopts a 'design' and 'test' approach:

- The design scenario is the scenario for which the development and its associated mitigation should be designed for – for example setting finished floor levels an appropriate height above the design flood level or ensuring sufficient freeboard within a culvert design. This should normally be done with the lower climate change scenario proposed in the EA guidance.
- The test scenario is used to test the resilience of the development and potential risks elsewhere during more extreme flooding events – for example ensuring no flooding of vulnerable buildings during the test scenario and demonstrating no increased flood risk elsewhere if a culvert were to surcharge. This should normally be done with the higher climate change scenario proposed in the EA guidance.

For example, for residential development in Flood Zone 3 the EA guidance states that the higher central and upper end climate change allowances should be considered. In this case the higher central would be the design scenario and the upper estimate would be the test scenario.

For developments adjacent to rivers with a small catchment area of approximately 5 km^2 or less using the peak river flow allowances is not always appropriate. It is therefore suggested that the peak rainfall intensity allowances should be used for these small catchments. The peak rainfall allowances should also be used for to assess the impact of climate change to support the design of surface water drainage systems, in addition to the risk from smaller watercourses (Table 7-3). The 'design' and 'test' approach should be adopted as per the recommendations for larger catchments described previously.

Table 7-3 - Peak rainfall intensity allowances

Allowance Category	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

It is important to note that climate change assessments should be considered for all developments, even those in areas at a low risk of flooding in the present day. For example, an assessment of flood risk from an adjacent floodplain may be required to understand the risk to the development in the future or the risk to access and egress routes.

Hydraulic modelling of flood risks should be undertaken wherever appropriate as this will provide the greatest certainty of likely climate change effects and impacts to development. However, it is recognised that this level of assessment is not always applicable to all developments, particularly if no model currently exists of the watercourse that is the cause of flood risk or for minor developments.

Some options for assessing the effects of climate change are outlined below but should be agreed with the LPA and relevant stakeholders on a site by site basis. The level of assessment required by the LPA will be commensurate to the risk of flooding.

Quantitative Detailed Assessment

A 'detailed' assessment will usually require hydraulic modelling to be undertaken to inform the development and the design of appropriate mitigation. This can be achieved by re-running one of the existing EA hydraulic models, or constructing a new model for this purpose. Detailed hydraulic models are available for a number of watercourses within Somerset as summarised within Section 4.2. However, it is the Applicants responsibility to obtain and provide data that is considered appropriate to the size, nature and location of the development. Before any existing model is used it should be confirmed that the model is suitable for use at the specific site, particularly for large broad-scale models. Updates may be required to ensure the existing model reflects the local flood risk appropriately.

Quantitative Intermediate Assessment

Where building or updating a hydraulic model is not considered proportionate to the risk, an 'intermediate' approach to the assessment of the potential impacts of climate change may be adopted. Indicative flood levels can be generated by using existing modelled flood and flow data and, from this, interpolating a flood level based on the required peak flow allowance to apply to the 'design flood' flow. For example, if an existing model provides estimated flood levels for the 1 in 100, 1 in 100 plus 20% climate change allowance and 1 in 1,000 year events, then these levels could be interpolated to generate an estimated 1 in 100 year plus 70% climate change allowance event flood level. This method assumes that the 'base data' is still considered appropriate – i.e. that the information that is used to inform the interpolation is still representative of the catchment and watercourse. If the base data is no longer considered appropriate then it is likely that a detailed assessment would be required.

Where an existing model is not available or the modelling software that was used is not appropriate for this type of assessment, then it is likely that a detailed approach will be required. Alternatively, it may also be possible to incorporate more robust flood management measures into the design. For example, floor levels could be raised 600mm above the design flood level rather than 300mm above the design flood level as is typically acceptable where detailed modelling has been completed (refer to Table 6.6.1). This will need to be agreed with relevant stakeholders at the pre-application stage.

Qualitative Assessment

Where no detailed modelling data is available a qualitative approach to the assessment of the potential impact of climate change may be adopted where appropriate. Broadscale catchment modelling may be readily available and this is likely to provide suitable outputs for a qualitative assessment by analysing the modelled flood extent against topographic survey data for the site area. This approach is also recommended for development in Flood Zone 1, particularly for understanding the likely future extents of Flood Zone 2 and 3 and, subsequently, the potential need to undertake a more detailed assessment as outlined above. If the Qualitative assessment of flood risk for a development located in Flood Zone 1 indicates that the development may be located in the higher risk Flood Zone 2 or 3 when the potential effects of climate change are considered, then a more detailed assessment of flood risk is likely to be required.

EXCEEDANCE ROUTES

Applicants should submit plans of overland flow exceedance routes showing existing and proposed flow routes and areas where water may be stored in times of flood. These should demonstrate that overland flows will not pose a significant risk to the proposed development and that risk will not be increased elsewhere.

Flood risk associated with overland flow from adjacent land is an important consideration in the Study Area. The EA's Risk of Flooding from Surface Water map does not always show overland sheet flow as it is not channelled into defined surface water flow routes. Topography surrounding the site should be reviewed by Applicants to assess the potential risks to development proposals associated with overland flow. Developers must also demonstrate that overland flow will not overwhelm the capacity of the development's surface water drainage system, and that diversion of this flow will not increase flood risk elsewhere. It is recommended that OS mapping, LiDAR data or topographic survey data is used to assess the flood risk associated with overland flow from adjacent higher land. This is important in considering the design of surface water management arrangements for a site (Section 7.4).

Important Note

There are particular risks associated with existing roads which border the uphill edges of proposed development sites, particularly if the existing road is an overland flow route. Inserting a site access in the vicinity of an overland flow route could result in the flow route being diverted into and through the proposed development site. These risks should be assessed within any FRA as required.

RESIDUAL FLOOD RISK

The assessment of flood risk for a site should consider the residual risk of flooding to the site from relevant sources, for example from the breach or failure of flood defences or from blockage of a culvert.

The EA's Flood Map for Planning illustrates the location of EA flood defences and areas that benefit from flood defence schemes, and other flood risk assets as shown in Appendix B and C. As part of any FRA for a site, consideration should be given to potential features that could present a residual risk of flooding to the site. An assessment of these risks should be completed in relation to the proposed development and appropriate mitigation implemented as appropriate.

An assessment of risk associated with overtopping or a breach in the flood defences should be undertaken in consultation with the EA and / or SCC depending on whether flooding is a result of risk from tidal sources, main rivers or ordinary watercourses. This should be included in the FRA for a development proposed within areas that benefit from flood defences.

The residual risk of flooding as a result of culvert or structure blockage should be assessed, regardless of whether this is associated with major or minor watercourses. To address risks associated with culvert blockage a two-stage process is recommended. Firstly, the Applicant should undertake a qualitative assessment of the potential risk to the development and the consequences of a flooding incident. This should be followed by a more detailed, quantitative assessment if the risks are considered significant.

If the applicant proposes a new culvert crossing of a watercourse, for example a new access road, or amending an existing culvert, then a quantitative analysis is likely to be required to inform the site-specific FRA.

OFFSITE FLOOD RISK

As well as flood risk to the proposed site, all Applicants will need to consider how their proposed development will affect flood risk elsewhere. This section discusses some possible causes of increased risk and how these risks can potentially be mitigated. However, this list is not exhaustive, and all offsite impacts should be considered during the masterplanning of developments, with the relevant details incorporated within a site-specific FRA.

Raising ground levels within areas prone to flooding will reduce the flood storage volume in that area. This could impact parcels of land adjacent to the existing flood storage area as well as other sites both upstream and downstream of the proposed development. Where a proposed development results in loss of floodplain storage, the Applicant will need to demonstrate that there will be no increase in flood risk elsewhere. This is typically achieved using level for level flood plain compensation in an area which is hydraulically connected to the same flood cell. The volume and area of the compensatory flood storage must be equal to or greater than the area being lost.

The same approach should be adopted in areas which are at risk of flooding from small watercourses, not included in the flood map for planning. The Applicant will need to demonstrate that they have considered the risks and that appropriate compensatory storage is provided if required.

Changes to culverts can alter flood risk at locations outside the development by constricting flows from upstream areas or increasing flows to downstream areas. Comparison of the flow capacity of the current and proposed culvert design will help with the assessment of whether there will be increased flood risk to sites elsewhere. Structures upstream and downstream of the proposed culvert should be investigated so that the potential impacts can be understood.

Diversion of Rivers and Surface Water Flow Routes

Diverting a watercourse as part of development can increase fluvial flood risk both upstream and downstream of the site by reducing outflows from upstream areas, increasing inflows to downstream areas and changing the flood storage regime. Prior to planning being granted for a watercourse diversion, the Applicant will need to demonstrate that the diversion will not pose a significant risk to the proposed development and will not increase flood risk elsewhere. These changes would require a Flood Risk Activity Permit or an Ordinary Watercourse consent and therefore early engagement is recommended with the relevant permitting or consenting body. Planning approval does not remove the need to obtain the relevant permit or consent, and therefore early discussions with the relevant body are advised, prior to application, where any watercourse diversions are being considered.

Ground level changes or barriers to surface water flow can lead to flow routes being diverted. This can lead to increased surface water flood risk both onsite and offsite. The Applicant should submit drawings showing existing and proposed overland flow routes, which demonstrate that flood risk to the proposed development is low and that there is no increase in risk elsewhere.

Where development increases the area of impermeable surfaces, it is likely that surface water runoff volumes will increase, due to surface water being unable to infiltrate through permeable surfaces. Impermeable surfaces will increase volumes of surface water runoff and lead to surface runoff

reaching watercourses faster than in the current undeveloped situation, especially where the development is located at a greenfield site. Increased volumes and rates of runoff can both lead to flooding downstream. This is discussed further in Section 7.4 and appropriate mitigation will be required through a surface water drainage strategy.

Consideration should also be given to how any proposed development will impact on the groundwater regime for a site, for example whether foundations of buildings or walls will act as groundwater flow barriers i.e. reduce horizontal groundwater flow and increase groundwater pressures and thus generating groundwater flooding issues. Detailed assessments may be required to demonstrate that there are no adverse impacts.

CONSULTATION WITH STAKEHOLDERS AND CONSULTEES

It is recommended that the LPA is consulted at an early stage to discuss development proposals. Through this process, high level risks will be identified as well as any other organisations which should be consulted such as LLFA, EA, Statutory Water Companies and the IDB.

The roles and responsibilities of the different stakeholders and consultees are provided in Section 3.6.

To assist local planning authorities and developers, the EA has produced Standing Advice to inform on their requirements for developments. Full details of their Flood Risk Standing Advice can be found at www.gov.uk[65].

The EA should be contacted at an early stage to source information relating to the site, for example up to date mapped outputs, historical flooding and hydraulic modelling. The information provided within the SFRA is the best available at the time of writing. More up to date information may be available and contact should always be made with the EA at an early stage to ensure that the detailed site-based FRA is using the most current datasets.

It is strongly recommended that Applicants consult with SCC as LLFA at an early stage of the planning application process to discuss any known flood risk issues at the proposed development site, the need and scope of a site-specific FRA, opportunities to reduce the overall flood risk in the area and sustainable management of surface water runoff including the multiple benefits of SuDS.

Where a development is in close proximity to a SCC or IDB maintained ordinary watercourse (within 8-meters), it is recommended that the Council are consulted to determine if Land Drainage Consents are required. Additionally, Ordinary Watercourse Consent is required for erecting or altering a structure, erecting a culvert, or altering a culvert in a manner that would affect the flow.

In accordance with the Environmental Permitting Regulations, a Flood Risk Activities Permit is likely to be required from the EA for any works within 8m of the top of bank of a main river (or 16m if river is tidal) or 8m from the foot of an EA maintained flood defence structure or culvert (or 16m if river is tidal). More information regarding Flood Risk Activities Permit can be found at www.gov.uk[66].

[65] https://www.gov.uk/flood-risk-assessment-local-planning-authorities
[66] https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

Applicants are reminded to seek permission from any 3rd parties before discharging to their sewers/culverts or proposing work on their land.

7.4 SURFACE WATER MANAGEMENT

To demonstrate that a proposed development does not increase the risk of flooding in the immediate area or the downstream catchment, Applicants will need to identify appropriate arrangements for surface water management onsite. For smaller developments this may be incorporated within the site-specific FRA, but for larger of more complex developments this may be a standalone report.

Sustainable drainage systems, commonly referred to as SuDS, promote an improved approach to the management of surface water runoff that maximises the additional benefits that can be achieved when compared to traditional piped drainage systems. SuDS can comprise a wide range of drainage features that aim to mimic natural drainage systems more closely than traditional drainage systems whilst also improving the quality of our natural and surrounding environment. The overarching principle of SuDS design is that surface water runoff should be managed for maximum benefit, which can be achieved through four broad categories, sometimes known as the 'four pillars' of SuDS:

- Water quantity – Control the quality of runoff to support the management of flood risk and maintain and protect the natural water cycle;
- Water quality – Manage the quality of the runoff to prevent pollution;
- Biodiversity – Create and sustain better places for nature; and
- Amenity – Create and sustain better places for people.

The aims of SuDS are to reduce flood risks and improve the quality of water discharged to rivers and aquifers, as well as enhance open space to provide an improved environment for people and wildlife. On-ground conveyance and storage features are therefore likely to meet these objectives more so than traditional below ground conveyance and storage features. Wherever possible, surface SuDS features should be incorporated into the development layout from the master planning stage to ensure adequate space is allowed for these features.

Below ground tanks may offer some benefit in terms of reduced flood risk but offer little to improve water quality or enhance the landscape. On-ground conveyance and storage features are therefore promoted as far as practical, particularly at the upstream end of drainage systems and for managing smaller rainfall events. This is because they offer the greater potential for improved water quality and reduced maintenance requirements in subsequent sections of the drainage system. Above ground storage features allow for improvements to local biodiversity by creating new habitats and having more variation in vegetation. Other benefits include improved amenity, reduction in carbon emissions, climate change adaptation, improved air quality, groundwater recharge and others.

It is essential that any new development in the Study Area incorporates the principles of SuDS in the development of surface water management strategy for any site. Specific guidance on sustainable surface water management has been prepared for the West of England and Somerset (Section 3.4), with further specific guidance on the application of SuDS in Somerset to be issued by the LLFA later in 2019. This guidance should be used to develop a suitable surface water drainage strategy for a site.

SUDS HIERARCHY

The PPG to NPPF sets out the requirement to consider SuDS within all new development where appropriate and states that developments should aim to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practical:

1. Into the ground (infiltration);
2. To a surface water body;
3. To a surface water sewer, highway drain, or another drainage system; or
4. To a combined sewer.

Applicants will be expected to demonstrate how the above hierarchy has been considered within their proposed development. This hierarchy does not remove the need to ensure that the development is safe from flood risk and does not increase risk elsewhere.

DESIGN STANDARDS

Advice on high level design objectives will be based on the Non-Statutory Technical Standards for Sustainable Drainage Systems (Section 3.4). Advice on calculations and detailed design will be based on the CIRIA SuDS Manual (Document C753). Further guidance will be taken from The West of England SuDS guidance, and the forthcoming Somerset SuDS Design Guide.

For greenfield sites, post development runoff rates should be limited to the existing runoff rate for all events between the 1 in 1 year and the 1 in 100 year events, including an allowance for climate change. For brownfield sites, runoff rates should be limited to the equivalent greenfield runoff rates for all events between the 1 in 1 year and the 1 in 100 year events, including an allowance for climate change. Where this is not practical a minimum of a 30% betterment over the existing situation is expected for all return period events. However, should betterment not be achievable this can be offset by improvements in relation to the other 'pillars of SuDS' described above, as all four pillars should be given equal weighting. It is strongly recommended that Applicants contact the LLFA for preapplication advice to discuss the approach to implementing SuDS on their sites. Methods for calculating runoff must be in accordance with the methods promoted within the CIRIA SuDS Manual.

It is recognised that flow controls designed with very low flow rates can increase flood risks associated with blockages. It is recommended that a minimum flow rate of 2 l/s is used unless it can be demonstrated that this flow rate will lead to an overall increase in flood risk.

Surface water drainage systems should be designed to take account of the future impact of climate change, using the latest guidance on peak rainfall allowances outlined in Section 7.2. The drainage system should be designed for the central estimate of a 20% increase in peak rainfall intensity and application of a relevant freeboard allowance, typically 300mm. Freeboard is an allowance applied to the calculated design level to account for the uncertainty in the parameters used to estimate the design level. The drainage system should be tested with the 40% increase in peak rainfall intensity allowance to ensure that the additional water is contained within the drainage system or areas designed to flood.

Within Somerset, it is expected that drainage systems serving developments must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does

not occur on any part of the site for a 1 in 30 year rainfall event (3.33% AEP) or less, including an allowance for climate change.

EXCEEDANCE FLOWS

Temporary exceedance of flood management infrastructure (including drainage systems) is often not adequately assessed within new development. This could occur as a result of an intense rainfall event that temporarily overwhelms inlet structures such as gullies, or it could be caused by a system blockage. Developers must be able to demonstrate how exceedance flows will be retained within the site boundary without increasing flood risk elsewhere.

Temporary ponding of water is likely to occur where these structures have insufficient capacity to receive rainfall during intense rainfall events. On sloping sites, this water will follow the ground's topography and could pose flood risk elsewhere. It is therefore extremely important that Applicants consider this temporary exceedance of drainage systems and demonstrate how this water can be managed, retained and allowed to discharge to the drainage system once the intensity of the storm has reduced. On-ground conveyance and storage features are generally much better at managing these types of events than underground piped systems.

LONG-TERM MAINTENANCE

The long-term maintenance of surface water drainage systems is integral to their ability to manage flood risk and protect the natural water environment for the lifetime of the development. Applicants should ensure they secure robust maintenance arrangements for the lifetime of the development. Where possible, the Applicant should seek to have their surface water drainage systems adopted by a public body or statutory water company.

The surface water drainage systems should be built to adoptable standards. Surface water drainage systems designed to serve roads should be to a standard which would allow them to be adopted by the local Highway Authority. Surface water drainage systems designed to serve roofs and private accesses should be to a standard which would allow them to be adopted by a Statutory Water Company.

Information regarding the proposed adoption and maintenance of surface water drainage systems must be submitted as part of the planning application, including a proposed maintenance plan.

7.5 MITIGATING RESIDUAL FLOOD RISK

RESISTANCE AND RESILIENCE MEASURES

For development within areas identified to be at risk of flooding, the Applicant will need to demonstrate that appropriate resistance and resilience measures have been adopted to adequately protect the development from flooding. This section discusses a range of possible resistance and resilience measures.

The need for site-specific resistance and resilience measures for all developments will need to be agreed in consultation with the relevant authorities and tailored to site-specific conditions. For proposed development within areas that benefit from flood defences, resistance and resilience measures should be incorporated to adequately protect the development from the residual risk of flooding due to overtopping, breach or failure of the flood defences.

Raised Floor Levels

Risk to life and damage to property can be minimised by raising floor levels within areas identified to be at risk of flooding from any source, including surface water and other local sources.

EA standing advice for Somerset states that finished floor level should be 0.3m above surrounding ground level, although this can potentially be relaxed in Flood Zone 1. The EA standing advice also states floor levels within new development should be at least 0.6m above the predicted 1 in 100 (1%) year fluvial flood level with an allowance for climate change as calculated for the 'design' scenario. The height that the floor level is raised above the flood level is referred to as the 'freeboard' and is determined by assessing the residual risks, confidence in flood data and vulnerability of development. If detailed modelling has been completed, it may be acceptable to lower this freeboard to 0.3m in response to the increased accuracy of the predicted flood depths (assuming there is confidence in the modelling for the local area). Similarly, a lower freeboard of 0.3m may be acceptable for Less Vulnerable development. Any relaxations are agreed on a case by case basis. Floor levels may need to be raised to mitigate the risk from other sources of flooding, i.e. surface water or ground water flood risk as well as fluvial flood risk.

If it is not possible to locate ground floor levels above the estimated flood level, resistance and resilience measures should be considered. If floor levels cannot be raised to an appropriate height, ground floor sleeping accommodation may not be considered appropriate. An appropriate Flood Warning and Evacuation plan would also be required.

For Water-Compatible Development and Essential Infrastructure, the freeboard that is considered appropriate will be dependent on the operational requirements of the development and subsequent risks in the event of flooding. For new highways classified as Essential Infrastructure it is expected that the road level is situated a minimum of 0.6m above the predicted 1 in 100 (1%) year fluvial flood level and including an allowance for climate change as calculated for the 'design' scenario.

Flood Resilience

Where development is located in an area of flood risk, the Applicant should look to include flood resistant and flood resilient design measures as set out within 'Improving the Flood Performance of New Buildings (Flood Resilient Construction), CLG (2007)' and BSI 85500:2015 Flood Resistance and Resilient Construction - Guide to Improving the Flood Performance of Buildings, November 2015. Further guidance is also provided by the National Flood Forum, www.nationalfloodforum.org.uk.

If it is not possible to raise ground floor levels above the estimated flood level for the site (derived from appropriate modelling), the following recommendations are included within EA Standing Advice:

- Water depth up to 0.3m - Design the proposed building or development to keep water out as much as possible. Do this by using materials that have low permeability (i.e. materials that water cannot pass through such as impermeable concrete).
- Water depth from 0.3m to 0.6m - Design the proposed building or development to keep water out (unless there are structural concerns) by using materials with low permeability to at least 0.3m; using flood resilient materials (e.g. lime plaster) and design (raised electrical sockets); and making sure there's access to all spaces to enable drying and cleaning.
- Water depth above 0.6m - Design the proposed building or development to allow water to pass through the property to avoid structural damage by using materials with low permeability to at

least 0.3m; making it easy for water to drain away after flooding; and making sure there's access to all spaces to enable drying and cleaning.

Development located within the defended Flood Zone 3a may be at risk from sudden inundation following a breach of the flood defences. If it is not possible to locate the ground floor level of the development above the predicted flood level, it is recommended that the Applicant strives to reduce the rate of inundation, i.e. through raising ground levels as high as practicable without increasing flood risk elsewhere, to provide sufficient time to facilitate evacuation of the site. Access and evacuation is discussed in greater detail below.

ACCESS AND EGRESS

For developments located within Flood Zone 3 or areas at significant risk of flooding from other sources, Applicants will need to provide Flood Warning and Evacuation Plans for any parts of a development that are below the estimated flood level during the 1 in 100 (1%) year event allowing for climate change. This requirement also applies to any development located within a lower Flood Zone where vehicular access (particularly to enable access to emergency services and other key infrastructure) requires passage through an area at higher risk.

The definition of 'safe' access and egress is influenced by the vulnerability of the proposed development and the ability of the users of that development to escape the identified risks. The assessment should be made in relation to 'Flood hazard', as described in the DEFRA and EA guidance on flood risk to people[67].

For More Vulnerable development located in the defended or undefended Flood Zone 3, or in an area at high risk of surface water flooding, it is recommended that dry vehicular access is provided. This should be above the 1 in 100 (1%) year flood level, with allowance for the potential effects of climate change. Where this is not possible, it may be acceptable to demonstrate that a suitable access and egress route subject to 'very low' flood hazard is available.

For Less Vulnerable development located in the Flood Zone 3, or in an area at high risk of surface water flooding, it is also recommended that dry vehicular access is provided where practical. However, where this is not possible, a viable access and egress route that is subject to 'moderate' flood hazard may be considered acceptable.

Requirements for safe access and egress at the development should be agreed with the EA and the Somerset Civil Contingencies Partnership at the pre-application stage.

If safe access and egress cannot be achieved, a safe refuge within a building can be considered. A safe refuge should be adequately sized to comfortably accommodate the total number of occupants expected within the development/dwelling for potentially a number of hours. The refuge should be powered to allow lighting and electrical points and must be accessible safely for the occupants.

[67] DEFRA / EA Flood and Coastal Defence R&D Programme, Flood Risks to People – Phase 2, FD2321/TR2.

EMERGENCY PLANNING

Developing in areas known to flood can pose risk to the users of those developments as well as to the emergency services who are tasked with evacuation during floods. Most proposed developments in areas identified to be at fluvial flood risk, and in some cases from other sources of flooding, will need to consider emergency planning.

Planning applications for developments located within the defended and undefended Flood Zone 3a and Flood Zone 3b are likely to require a site-specific Flood Warning and Evacuation Plan or flood response plan. The nature of this plan should correspond with the vulnerability and size of the proposed development. It is also required that a site-specific Flood Warning and Evacuation Plan is prepared for Highly Vulnerable development in Flood Zone 2.

Consultation with the EA and the Somerset Civil Contingencies partnership should be undertaken for all developments in Flood Zone 3a and 3b, during which time their requirements for resilience measures and their requirements for a site-specific flood evacuation plan or flood response plan should be established.

The EA advises that people and key infrastructure may be vulnerable at different stages of flooding and that a different set of actions will be required as summarised below:

- before – lack of preparedness – ensure people are aware (sign up to Flood Warnings Direct) infrastructure is protected or resilient;
- during – property and infrastructure is flood-resistant, escape and access is appropriate, refuge areas are provided;
- after – recovery is maximised - ensure emergency services can reach those most at risk/affected, no basement-only properties in areas of high flood risk, ensuring properties are properly flood-resilient.

For larger developments, vulnerable developments and/or developments in areas at high risk, the flood evacuation plan or flood response plan should include, but is not limited to, the following:

- Evacuation procedures or procedures for safe refuge;
- People responsible for evacuation and/or safe refuge;
- Evacuation and emergency refuge routes;
- Flood warning codes; and
- Local emergency services contact details.

8 SUMMARY

8.1 OVERVIEW OF THIS SFRA

This Level 1 SFRA has been prepared on behalf of SWT and SSDC as an update to previous SFRAs published for these Local Authorities.

This Level 1 SFRA has been developed in accordance with NPPF and in consultation with the EA. It assesses the risk of flooding from all sources, now and in the future, taking into account the impacts of climate change, and assesses the impact that land use changes and development within the Study Area could have on future flood risk.

Specifically, this Level 1 SFRA report has:

- Determined the variations in risk from all sources of flooding, and also the risks to and from surrounding areas in the same flood catchment;
- Enabled the application of the Sequential Test and, where applicable, the Exception Test for determining land use allocations;
- Identified the requirements for site-specific FRAs in particular flood risk areas;
- Determined the acceptability of flood risk in relation to emergency planning capability; and
- Considered opportunities to manage flood risk to existing communities and developments through better management of surface water, provision for conveyance and of storage for floodwater.

Of key importance within this SFRA is the recommended development policies that all developments in the Study Area are expected to consider, which are detailed in Section 7.

8.2 UPDATING THE SFRA

This Level 1 SFRA has been developed using the latest guidance and information available in relation to the assessment of flood risk. The EA regularly update their flood mapping and these updates, along with other studies carried out within the Study Area such as flood risk studies and flood investigations, will improve the current level of knowledge of local flood risk in the Study Area.

A periodic review of this SFRA should be undertaken following the publication of any emerging policy directives, significant hydraulic modelling updates or flooding events to ensure that the SFRA remains a live and up-to-date document.

8.3 RECOMMENDATIONS

In light of the findings of this report, the following recommendations are made in relation to flood risk in the Study Area. Some of these recommendations should be taken forward as part of a Level 2 SFRA.

WEST SOMERSET

- As part of a future Level 2 SFRA, detailed hydraulic modelling, to include climate change and/or Flood Zone 3b (Functional Floodplain) mapping where Flood Zone 3b is currently based on the Flood Zone 3a outline, is recommended for the following areas, including the potential for interaction between flood sources where appropriate (Section 5.2). The areas identified are generally main settlements or areas where development is proposed.

- Minehead – fluvial only required. Fluvial Flood Zone 3b mapping is currently based on the Flood Zone 3a extent. The tidal Flood Zone 3b has been defined based on detailed modelling;
- Watchet – no climate change modelling currently available. Detailed modelling of Flood Zone 3b has been completed; and
- Williton – no climate change modelling currently available. Detailed modelling of Flood Zone 3b has been completed.

- Investigate the future risk of tidal flooding in the West Somerset subarea, especially Minehead, in relation to climate change and the future performance of the defences. This will require modelling of climate change in relation to tidal flooding along the coastline; and
- Investigate surface water flooding in Minehead, Williton, Washford, Doniford and Carhampton:
  - This could include surface water modelling in proposed development areas as part of the Level 2 SFRA.

TAUNTON DEANE

- As part of a future Level 2 SFRA, detailed hydraulic modelling, to include climate change and Flood Zone 3b (Functional Floodplain) mapping where Flood Zone 3b is currently based on the Flood Zone 3a outline (Section 5.2), is recommended for the following areas. The areas identified are generally main settlements or areas where development is proposed.
  - Wellington – no detailed modelling currently available; and
  - Taunton – detailed modelling defended scenarios and climate change scenarios under development. Flood Zone 3b mapping is currently based on Flood Zone 3a (see below).
- Update this SFRA with the model outputs from the Taunton Northern Tributaries modelling and the Taunton Flood Alleviation Scheme modelling.
- Investigate surface water flooding in Taunton, Wellington and Wiveliscombe;
  - This could include surface water modelling in proposed development areas as part of the Level 2 SFRA.

SOUTH SOMERSET

- As part of a future Level 2 SFRA, detailed hydraulic modelling, to include climate change and Flood Zone 3b (Functional Floodplain) mapping where Flood Zone 3b is currently based on the Flood Zone 3a outline (Section 5.2), is recommended for the following areas. The areas identified are generally main settlements or areas where development is proposed.
  - Ilminster – no detailed modelling currently available; and
  - South of Yeovil – no detailed modelling currently available for the tributary of the River Yeo in the south of Yeovil (believed to be known as the Dodham Brook).
- Surface water modelling in proposed development areas as part of the Level 2 SFRA.

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