North Somerset Council

Open, Fairer, Greener

North Somerset Council Strategic Flood Risk Assessment Level 1 - 2025

Document history and status

Revision	Date	Description	By
0	2020	First Issue	Jacobs
A	2024	Updated due to NPPF and PPG change	Wallingford HydroSolutions
B	2025	Updated due to newly published FZs	NSC
C	2026	Minor amendments to SW and GW	NSC

Contents

Glossary and Abbreviations

Term and definition

AEP = Annual Exceedance Probability e.g. 1% AEP is equivalent to 1 in 100 (1%) probability of flooding occurring in any one year (or, on average, once in every 100 years).

AStGWF = Areas Susceptible to Groundwater Flooding

Climate Change = Long term variations in global temperature and weather patterns caused by natural and human actions.

Cumulative Impacts = “Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.” (Hyder, May 1999, Guidelines for the Assessment of Indirect and Cumulative Impacts and Impact Interactions, European Commission)

Development = The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.

Design Flood Event = This is a flood event of a given annual flood probability, which is generally taken as:

- river flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year); or
- tidal flooding with a 0.5% annual probability (1 in 200 chance each year); or
- surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year),

plus an appropriate allowance for climate change (Link to climate change allowances)

Flood & Water Management Act (FWMA) = Part of the UK Government response to Sir Michael Pitt's Review on the Summer 2007 floods, the aim of which (partly) is to clarify the legislative framework for managing surface water flood risk in England.

Flood Map for Planning (Rivers and Sea) = Nationally consistent delineation of ‘high’, ‘medium’ and ‘low’ probability of fluvial and tidal flooding, published on a quarterly basis by the Environment Agency.

Flood Risk Assessment (FRA) = A site-specific assessment of flood risk, undertaken as part of the planning application process for new development or change of use of existing development.

Flood Storage Area = Land which provides a function of flood conveyance and/or storage, either through natural processes, or by design.

Flood Zone 1 Low Probability (FZ1) = PPG Flood Zone, defined as areas outside Zone 2 Medium Probability. This zone comprises land assessed as having a less than 1 in 1,000 annual exceedance probability of river or sea flooding (<0.1%) in any year.

Flood Zone 2 Medium Probability (FZ2) = PPG Flood Zone which comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual exceedance probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1,000 annual exceedance probability of sea flooding (0.5% - 0.1%) in any year.

Flood Zone 3a High Probability (FZ3a) = PPG Flood Zone which comprises land assessed as having a 1 in 100 or greater annual exceedance probability of river flooding (>1%) or a 1 in 200 or greater annual exceedance probability of sea flooding (>0.5%) in any year.

Functional Floodplain (Flood Zone 3b) (FZ3b) = PPG Flood Zone, defined as land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise of land having a 1 in 30 or 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

Formal Flood Management Asset = A feature or structure built and maintained specifically for the purpose of flood risk management.

Groundwater Flooding = Emergence of groundwater at the ground surface or the rising of groundwater into underground infrastructure (such as basements) under conditions where the normal range of groundwater level and flows is exceeded.

Informal Flood Management Asset = A feature or structure that provides a flood defence function, however has not been built and/or maintained for this purpose (e.g. boundary wall).

Level 1 and Level 2 SFRA = There are two levels of Strategic Flood Risk Assessment. All local planning authorities need to carry out a Level 1 assessment at least and it may be necessary to expand the scope of this assessment to a more detailed Level 2 assessment. A Level 1 SFRA should provide sufficient detail to apply the Sequential Test. A Level 2 SFRA should build on the information in the Level 1 assessment and include sufficient information for the Exception Test to be applied. Where a Level 2 SFRA is produced, the Sequential Test should also be applied to identify sites with the lowest risk of flooding within Flood Zones 2 and 3.

Local Plan = A plan for the future development of a local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004. A local plan can consist of either strategic or non-strategic policies, or a combination of the two.

Main River = A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. N.B. Main River designation is not necessarily an indication of size, although it is often the case that they are larger than Ordinary Watercourses.

National Planning Policy Framework (NPPF) = National planning policy published by the Government, most recently in December 2024. It replaces most of the previous Planning Policy Statements, including that regarding flood risk (PPS25).

Planning Practice Guidance (PPG) = Supporting guidance to the NPPF, published by the Government in March 2014 and updated since as an online resource, available at: (http://planningguidance.planningportal.gov.uk/). It replaces previously published Government guidance, including that regarding flood risk.

NSC = North Somerset Council

Ordinary Watercourse = All watercourses that are not designated Main Rivers, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a “small” river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.

Planning Policy Statement (PPS) = A series of statements issued by the Government, setting out policy guidance on different aspects of planning. The majority of PPSs have now been replaced by the National Planning Policy Framework, including PPS25 regarding flood risk.

PPS25 = Planning Policy Statement 25: Development and Flood Risk – previous Government planning policy regarding flood risk, which has now been replaced by the National Planning Policy Framework and PPG.

Residual Risk = A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the design process.

Riparian Owner = Landowner who has any watercourse within or adjacent to any boundary of their property. Responsible for maintaining the river bed and banks within their section of the watercourse. It is their duty to work towards minimising pollution and preventing obstruction to the water flow.

RoFSW = Risk of Flooding from Surface Water: Environment Agency surface water flood maps that give an indication of the areas likely to be at risk of surface water flooding. This includes flooding that takes place from the surface runoff generated by rainwater (including snow and other precipitation) and is on the surface of the ground (whether or not it is moving) and has not yet entered a watercourse, drainage system or public sewer.

Strategic Environmental Assessment (SEA) = A procedure (set out in the Environmental Assessment of Plans and Programmes Regulations 2004) which requires the formal environmental assessment of certain plans and programmes which are likely to have significant effects on the environment. (NPPF definition)

Sustainability Appraisal (SA) = Appraisal of plans, strategies and proposals to test them against broad sustainability objectives. The SEA forms part of the SA. Sustainable Development "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987).

Sustainable Drainage System (SuDS) = Term covering the whole range of sustainable approaches to surface drainage management. These are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible. (Definition based on PPG: Flood risk and coastal change)

Executive Summary

This document presents a Level 1 Strategic Flood Risk Assessment (SFRA) for North Somerset Council (NSC). It provides part of the evidence base for the North Somerset Local Plan and strategic flood risk guidance for consideration when determining planning applications.

Flooding can result in costly damage to property and also pose a risk to life and livelihood. The likelihood and consequences of flooding are predicted to increase with climate change. It is a requirement of the National Planning Policy Framework that future development is planned carefully, steering it away from areas that are most at risk of flooding, taking into account potential cumulative effects of development, ensuring that it does not exacerbate existing flooding problems. This SFRA is an important step in informing choices on where future development should be located and is an essential part of the evidence base for the North Somerset Local Plan.

This Level 1 SFRA provides a minor update to the 2020 published SFRA to incorporate new guidance and legislation. It provides a robust depiction of flood risk across North Somerset by:

- Providing information on the publication of new local and national planning policy that will underpin decision making in North Somerset, particularly within areas that are affected by (and/ or may adversely impact upon) flooding;
- Assisting in the development management process by providing a more informed response to development proposals within North Somerset which may be affected by flooding;
- Mapping areas that have a ‘low’, ‘medium’ and ‘high’ probability of flooding, based on the Environment Agency Flood Map for Planning, surface water flood maps, reservoir flood risk maps, areas susceptible to groundwater flooding and latest modelling data available;
- Supporting NSC in its role as Lead Local Flood Authority; and
- Providing general advice on managing flood risk, including property protection, emergency planning and site-specific Flood Risk Assessments.

As a Level 1 SFRA, this document addresses the requirements of the Sequential Test, which will assist the Council to guide development to areas of lower risk. It also sets out a number of recommendations, in Section 8, for adoption by NSC when considering

development and flood risk. Supporting figures (described in Section 4.3 and included in Appendix A) illustrate the fluvial and tidal Flood Zones, as well as other sources of flood risk, in order to classify the risk of flooding throughout North Somerset. Section 9 includes guidance on how the SFRA should be monitored and reviewed to ensure it remains current.

1.0 Introduction

North Somerset Council (NSC) is preparing a new Local Plan which will provide detailed policies and identify additional housing, employment and other land allocations. This Level 1 Strategic Flood Risk Assessment (SFRA) forms part of the evidence base for the Local Plan and provides information on the probability and likelihood of flooding within North Somerset. Information on flood risk has been used to inform the policies of the Local Plan; in particular the location of development sites. A pre-submission plan was submitted in Autumn 2023 and in due course the plan will be subject to independent examination before final adoption.

This SFRA has been prepared in accordance with the National Planning Policy Framework (Link to National Planning Policy Framework) last updated in December 2023 and associated Planning Practice Guidance.

1.1 Overview

Flooding is an important environmental hazard for communities. The impacts on property and businesses can be devastating and the fear of the repeated risk of flooding can affect wellbeing. Therefore, it is essential that the risk of flooding is considered at all stages of the planning process, to ensure sustainable development. Organisational responsibilities for managing flood risk have changed substantially in the last decade with Local Authorities now taking a greater lead on managing local flood risk through the introduction of the Flood and Water Management Act 2010 (Link to Flood and Water Management Act).

A SFRA is an overview of current and future flood risk to a particular local authority jurisdiction. It provides details of where flooding has occurred, where there is existing risk and where there could be risk in the future. It also provides details of the existing defences and procedures in place to reduce that risk.

The NPPF requires that local planning authorities prepare a SFRA, taking account of advice from the Environment Agency and other stakeholders. The primary purpose of a Level 1 SFRA is to determine the variation in flood risk across an area, based upon data from a variety of sources. Robust information on flood risk is essential to inform and support the flood risk policies in the NSC Local Plan and to inform the decision-making process in the sequential approach to the allocation of sites for development. This SFRA also provides guidance to developers on planning requirements including the sequential approach to development and recommendations for Council planning policy.

This report (and the supporting mapping) should be used by NSC when allocating sites and developers to inform the application of the Sequential Test (see Section 2.6). Following the application of the Sequential Test, it may be necessary to develop a more detailed Level 2 SFRA if any proposed allocations fall within flood affected areas of North Somerset. This would only be necessary if the proposed land use allocations are required to pass the Exception Test (see Section 2.7) in accordance with the NPPF, based on their vulnerability classification and the flood risk of the proposed site. Essentially, the two parts to the Exception Test require proposed development to demonstrate that it will provide wider sustainability benefits to the community that outweigh flood risk and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

The following provides definitions of the principal local sources of flooding that are referred to throughout this SFRA.

1.2 Local Flood Risk

North Somerset Council and its partners have responsibilities for managing local flood risk, i.e. flood risk from sources other than Main Rivers and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses.

Surface runoff – rainwater (including snow and other precipitation) which is on the surface of the ground (whether it is moving or not), and has not entered a watercourse, drainage system or public sewer. Note that the term 'surface water' is used generically to refer to water on the surface and is often associated with periods of intense rainfall.

Groundwater – water which is below the surface of the ground and in direct contact with the ground or subsoil. It is most likely to occur in areas underlain by permeable rocks, called aquifers. These can be extensive, regional aquifers, or may be more local sand or river gravels in valley bottoms underlain by less permeable rocks.

Ordinary watercourse – all watercourses that are not designated Main Rivers, and which are the responsibility of local authorities (outside of an IDB district).

1.3 Aims and Objectives

The primary objective of this SFRA is to inform the review and development of policies related to flood risk management, and also policies for the allocation of land for future development, within the NSC Local Plan. However, the SFRA has a broader purpose of providing a robust depiction of flood risk across North Somerset. It can:

- Inform the development of Council policy that will underpin decision making within North Somerset and particularly within areas that are affected by (and/or may adversely impact upon) flooding;

- Ensure that NSC meets its obligations under the latest flood related planning guidance;

- Update previous guidance to assist developers to mitigate flood risk when submitting planning applications;

- Assist the development management process by providing a more informed response to development proposals which may be affected by flooding, influencing the acceptability and design of future developments within North Somerset and offering a basis for requesting site-specific Flood Risk Assessments (FRAs), if necessary;

- Promote working partnerships between NSC, the Environment Agency and other flood risk management authorities (see Section 7.2) to develop best practice and data sharing regarding flood risk information and its application; and

- Support and inform the NSC emergency planning response to flooding.

1.4 The Need for an Updated SFRA

NSC has been developing a new Local Plan, which includes a review of existing Development Plan Documents and their supporting evidence base. This Level 1 SFRA is an update to the 2020 published SFRA. For this SFRA to successfully support the Local Plan, the 2020 SFRA has been updated to incorporate several changes since its publication, including:

- Updates to the NPPF and supporting Planning Practice Guidance; namely with regards to an updated definition of the functional floodplain;

- Updated guidance from the Met Office and the Environment Agency for the consideration of climate change to reflect the United Kingdom, UKCP18; (Link to Climate Change Allowances for Flood Risk Assessments)

- New tidal and fluvial flood risk data from the Environment Agency;

- Publication of updated reservoir flood risk mapping by the Environment Agency (Link to Reservoir Flood Risk Maps Guidance);

- Details of post-2020 flood events within North Somerset;
- Updates to required procedures outlined by the 2022 PPG update;
- Inclusion of a Coastal Change Management Area (CCMA) study undertaken separately. (Link to Coastal Change Management Areas Report).

1.4 Outputs

The following outputs have been produced as part of this SFRA:

- An assessment of flood risk across a range of sources to enable application of the Sequential Test and Exception Test (see Section 2.6);
- Delineation of Flood Zones 3a and 3b where the modelling outputs are available.
- Flood risk mapping indicating areas currently at risk of flooding as well as at future risk of flooding taking into account climate change;
- Suggested policies and guidance for the local planning authority on the management of flood risk;
- Emergency planning guidance; and
- Guidance for developers and NSC planning officers dealing with applications (see Appendix B).

The SFRA does not seek to replicate nationally available information such as the Government's flood map for planning which shows undefended flood risk from rivers and the sea and Check the long term flood risk for an area in England website which shows surface water flood risk and reservoir flood risk. North Somerset Council's Planning Map represents all the information in one place.

Link to Flood Map for Planning

Link to Check the Long Term Flood Risk website

Link to NSC Planning Map

2.0 Planning Policy Framework and Other Guidance

This section provides a brief overview of the strategy and policy context relevant to flood risk in North Somerset.

The success of the SFRA is heavily dependent upon the ability of the Council to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning policies and development management recommendations. The NPPF provides guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish sound planning policies that will ensure future sustainability with respect to flood risk.

This SFRA is intended to be used by planners and developers to assess the suitability of an area or site to support a particular type of development. This is subject to the level of flood risk, the vulnerability of the proposed development and the extent to which the combination of other factors and mitigation measures might exempt the development from the application of this guidance.

2.1 National Planning Policy

National planning policy is set out in the National Planning Policy Framework (NPPF), which was published by the Government in March 2012 and last updated in December 2024. It forms a more succinct replacement for numerous topic-specific PPSs, including PPS25 on flood risk that has consequently been withdrawn. The NPPF is accompanied by the Planning Practice Guidance (PPG), first published in March 2014, which provides further guidance on specific issues, including flood risk, and replaces all previously published national planning guidance. The NPPF covers a full range of planning issues drawing on the central focus of sustainable development including taking full account of flood risk from all sources. Central themes of the NPPF also include the re-use of previously developed (brownfield) land of low environmental value, promoting economic growth and high-quality design, and transitioning to a low carbon future.

The NPPF underpins the process by which local planning authorities are to account for flood risk as an integral part of the planning process. The overarching aims set out by the NPPF for the management of flood risk at a planning authority level are that all plans should adopt a sequential, risk-based approach that considers all sources of flood risk and accounts for climate change both now and in the future. This approach aims to avoid, where possible, placing people or property at risk and to manage any residual risk by: applying the sequential test (and the exception test if needed); safeguarding land

essential for current or future flood management; using opportunities presented by new development, as well as enhancements to green and other infrastructure, to minimise both the causes and impacts of flooding (with emphasis on natural flood management techniques as part of an integrated strategy); and, where climate change is likely to render existing development unsustainable in the longer term, exploring possibilities for relocating such development, including housing, to more sustainable locations.

The Sequential Test and Exception Test are further explained in Sections 2.6 and 2.7, the NPPF also states that:

“Local plans and spatial development strategies should be informed throughout their preparation by a sustainability appraisal that meets the relevant legal requirements. This should demonstrate how the plan has addressed relevant economic, social and environmental objectives (including opportunities for net gains). Significant adverse impacts on these objectives should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued. Where significant adverse impacts are unavoidable, suitable mitigation measures should be proposed (or, where this is not possible, compensatory measures should be considered).”

The purpose of a Sustainability Appraisal (SA) is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans.

The NPPF also states that local plans should reduce risk from coastal change and identify Coastal Change Management Areas (CCMAs) where physical changes to the coast are expected to affect development. NSC have completed a CCMA methodology, as of May 2023. This document drew from shoreline management plan, coastal defence, erosion risk, flood risk and local plan documents in order to develop a methodology to designate CCMA’s in North Somerset. This methodology was split into three steps:

1. The shoreline management plan and economic case of each part of the coastline was analysed and any areas with a lower than 1:20 cost benefit ratio and a hold the line or advance the line shoreline management policy were discarded from the process.
2. The key risk was identified for each leftover area, whether it be erosion or flood risk.
3. The proposed CCMA boundaries were defined, the method used to define each boundary was unique to the shoreline management plan policy, and the key risk in the area. In total, 11 CCMA’s have been proposed in North Somerset, with the largest spanning from Clevedon to St Thomas’ Head.

The PPG provides specific guidance relating to the implementation of policies contained in the NPPF, including guidance on flood risk policies and the production of SFRAs and

site-specific Flood Risk Assessments (FRAs). It sets out how these should be applied when considering the Sequential Test and Exception Test in preparing development plans and in determining planning applications.

2.2 Local Development Planning Policy

2.2.1 North Somerset Council Local Plan

NSC is currently preparing its new Local Plan which will provide detailed policies and additional housing, employment and other land allocations. This local plan will supersede existing planning policies related to flood risk, e.g. within the North Somerset Core Strategy.

Following changes to national planning policy, including in relation to housing requirements, NSC have carried out additional work to investigate housing land supply options. This work is ongoing, and the local plan is on track to be submitted for examination later in 2025.

2.3 Additional Guidance

2.3.1 Severn River Basin District and South West River Basin District Flood Risk Management Plans.

Flood Risk Management Plans (FRMPs) describe the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. FRMPs set out how risk management authorities will work together and with communities to manage flood and coastal risk. The Severn River Basin District River and the South West River Basin District have Flood Risk Management Plans that cover the North Somerset area. (Link to Flood Risk Management Plans).

Each river basin district also has a river basin management plan, which considers how to protect and improve water quality and use water in a sustainable way. FRMPs and river basin management plans work to a six-year planning cycle and form an important part of a collaborative and integrated approach to catchment planning for water.

The Severn River Basin District River Basin Management Plan (Link to Severn River Basin District Management Plan 2022 and the South West River Basin District (Link to South West River Basin District Management Plan 2022) cover the North Somerset area.

2.3.2 Severn Estuary Shoreline Management Plan

The Shoreline Management Plan (SMP) is a high level non-statutory policy document designed to assist coastal flood and erosion risk management planning. It provides a large-scale assessment of the long-term risks associated with coastal erosion and flooding at the coast and proposes policies to help manage these risks sustainably.

The SMP enables planners and regulators to plan for and manage the way that the coast will change. This could be by maintaining or improving defences, by enabling the natural processes to play a greater role, creating new natural habitat or by helping areas that are at risk of flooding at some point in the future to cope with and limit the impact of flooding events.

The SMP2 for the Severn Estuary received final approval in February 2017 and updated the previous SMP1 (2001). This has been recently refreshed and all the information is now available online. (Link to Shoreline Management Plan Explorer) It has been developed at a high level and at a large scale, taking account of the predicted changes to sea level rise caused by climate change, but is not intended to focus in detail on local differences regarding shoreline position in the future.

The SMP2 has management approaches, including 'Portishead and Clevedon' and 'Kingston Seymour to Sand Bay'.

2.3.3 Creating Sustainable Building and Places in North Somerset, 2021

The Supplementary Planning Document was updated by NSC in 2021 and covers the measures required to achieve sustainable buildings and places in North Somerset. Section 6 of the SPD refers to SuDS and the Core Strategy CS2 policy requirement, as follows:

"Require the application of best practice Sustainable Drainage Systems to reduce the impact of additional surface water run-off from new development, in-line with the requirements of the forthcoming national standards for SuDS. Such environmental infrastructure should be integrated into the design of the scheme and into landscaping features and be easily maintained."

Link to Creating Sustainable Building and Places SPD

2.4 Flood Risk Management Strategies

2.4.1 National Flood and Coastal Erosion Risk Management Strategy

The National Flood and Coastal Erosion Risk Management Strategy for England published in 2020 outlines a comprehensive approach to manage flood and coastal erosion risks. It emphasises the collaborative effort required from various risk management authorities, communities, businesses, and individuals to adapt and prepare for future challenges. The strategy focuses on creating climate-resilient places, ensuring today's growth and infrastructure are resilient to tomorrow's climate, and building a nation ready to respond and adapt to flooding and coastal change. Significant investments and progress have been made since the original 2011 strategy, with a vision toward 2100 for a nation resilient to flooding and coastal changes.

Link to Local Flood Risk Management Strategy for England 2020

2.4.2 North Somerset Local Flood Risk Management Strategy

The North Somerset Local Flood Risk Management Strategy was published in December 2023 by NSC parts of the strategy also cover broader flood risks, such as flooding from the sea and large rivers.

The objectives of the strategy are:

- A flood resilient North Somerset.
- Today's growth and infrastructure in North Somerset being resilient in tomorrow's climate.
- North Somerset ready to respond and adapt to flooding.

Link to Local Flood Risk Management Strategy

2.5 Flood Zone Classification

Table 2.1 sets out the Flood Zones classification according to the PPG. This classification is used as the basis of the Sequential Test described in Section 2.6 of this SFRA. It identifies the probability of flood risk in each Flood Zone. Flood Zones 1, 2 and 3a are defined by the Environment Agency, ignoring the presence of defences and without taking account of the possible impacts of climate change to the future probability of flooding. Flood Zone 3b should be defined by local planning authorities in agreement with the Environment Agency and should consider the presence of defences.

Table 2.1: Flood Zones Definition

Flood Zone	Definition
Flood Zone 1 - Low Probability of Flooding	Land having a less than 1 in 1,000 Annual Exceedance Probability (AEP) of river or sea flooding.
Flood Zone 2 - Medium Probability of Flooding	Land having between a 1 in 100 and 1 in 1,000 AEP of river flooding; or land having between a 1 in 200 and 1 in 1,000 AEP of sea flooding.
Flood Zone 3a - High Probability of Flooding	Land having a 1 in 100 or greater AEP of river flooding; or land having a 1 in 200 or greater AEP of sea flooding.
Flood Zone 3b – Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs, areas of functional floodplain and their boundaries accordingly, in agreement with the Environment Agency. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

2.6 The Sequential Test

The Sequential Test ensures that a sequential, risk-based approach is followed to direct new development to areas with the lowest probability of flooding from all sources. The aim is to steer new development to areas with the lowest risk of flooding from all sources (Flood Zone 1 or equivalent), taking all sources of flood risk and climate change (future flood risk) into account. Where this is not possible, the sequential test should compare reasonably available sites in medium (Flood Zone 2 or equivalent) risk areas from all sources. If there are no reasonably available sites in low or medium risk, then high risk

areas (Flood zone 3 or equivalent) can be considered, considering the flood risk vulnerability of land uses and applying the Exception Test if required (Section 2.7).

The sequential test is undertaken based on undefended scenarios for flooding from rivers and the sea and must include an appropriate allowance for climate change.

Surface water and groundwater flood risk also triggers the sequential test, and the impact of climate change must be a consideration.

Reservoir flood risk does not trigger the need for a sequential test; however it will need to be demonstrated that the development is safe for its lifetime.

This Level 1 SFRA provides the information for NSC to apply the Sequential Test when considering potential allocation sites in the Local Plan as well as when considering planning applications where the Sequential Test is required. Allocation sites may also have to pass the Exception Test subject to their vulnerability to flood risk.

2.7 The Exception Test

Following application of the Sequential Test, if it is not possible to locate development taking into account its flood risk vulnerability classification it becomes necessary to apply the Exception Test. The Exception Test is set out in the NPPF and is a method to demonstrate that the flood risk to people and property is managed satisfactorily, while allowing necessary development to progress, if suitable sites at lower risk of flooding are not available.

There are two parts to the Exception Test that need to be passed.

For the first part, the assessment of wider sustainability benefits can be informed by the Local Plan's Sustainability Appraisal which identifies key sustainability issues and objectives within North Somerset. The second part of the Exception Test includes a requirement to take account of the future risk from climate change over the lifetime of the development (see Section 5.9).

Table 2 of the 'Flood risk and coastal change' Section of the PPG categorises different types of uses and development according to their vulnerability to flood risk. Table 2.2 maps these vulnerability classes against the flood zones set out in Table 1 of the PPG to indicate where development is 'inappropriate', where it should not be permitted and where the application of the Exception Test is required (refer to Table 3 of the 'Flood risk and coastal change' Section of the PPG).

Table 2.2: Flood Risk Vulnerability and Flood Zone Incompatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	Exception test required	✓	✓	✓
	3a	Exception test required	×	Exception test required	✓	✓
	3b	Exception test required	×	×	×	✓

Although other forms of flooding are not subject to the exception test, through the flood risk assessment applicants must demonstrate that the proposals will be safe for the lifetime of the development.

3.0 Study Area Information

North Somerset is located in the southwest of England and borders the local authority areas of Bristol, Somerset and Bath & North East Somerset. NSC is a unitary authority, approximately 375km^2 in area. More than two thirds of North Somerset is rural. Most residents live in Weston-super-Mare, Portishead, Clevedon and Nailsea. This SFRA covers the entire NSC area.

Refer to Figure 034 for a general location plan of North Somerset which also identifies Main Rivers and ordinary watercourses.

Key habitats within North Somerset include the coastline, inland wetlands (rivers, ponds, the extensive rhynes [waterways that link streams or ditches with Main Rivers] (which provide habitat for water voles and other protected species), floodplain and grazing marsh of the North Somerset Levels and Moors); grazed pastures (notably cattle grazed as an important habitat for greater horseshoe bats); tall hedgerows, tree lines, and semi-natural deciduous woodlands.

Designated city, town and district centres within North Somerset are listed below:

City/ sub-regional centre
Weston-super-Mare

Town centres
Clevedon (Triangle);
Nailsea; and
Portishead

District Centres
Clevedon (Hill Road);
Locking Castle;
Queensway; and
Worle High Street

3.1 Description of Physical Characteristics

3.1.1 Hydrological Catchments

North Somerset can be classified into five Main River hydrological catchments with nine sub-catchments, identified in Table 3.2 and illustrated in Figure 3—1. Additionally, the Oldbridge River catchment is an area of 40.4km2 that discharges into the tidal reach of the Congresbury Yeo.

Most catchments drain westerly into the Severn Estuary with the exception of the Winford Brook and Chew Stoke Stream (i.e. the Chew Valley catchment) that flow easterly down the Chew Valley, eventually joining the River Avon and flowing into the Severn Estuary. The Markham Brook, Ashton Brook and Colliters Brook (i.e. the Bristol Avon catchment) drain towards Bristol and into the River Avon.

Figure 3—1: Hydrological Catchments and Coastline Areas within North Somerset

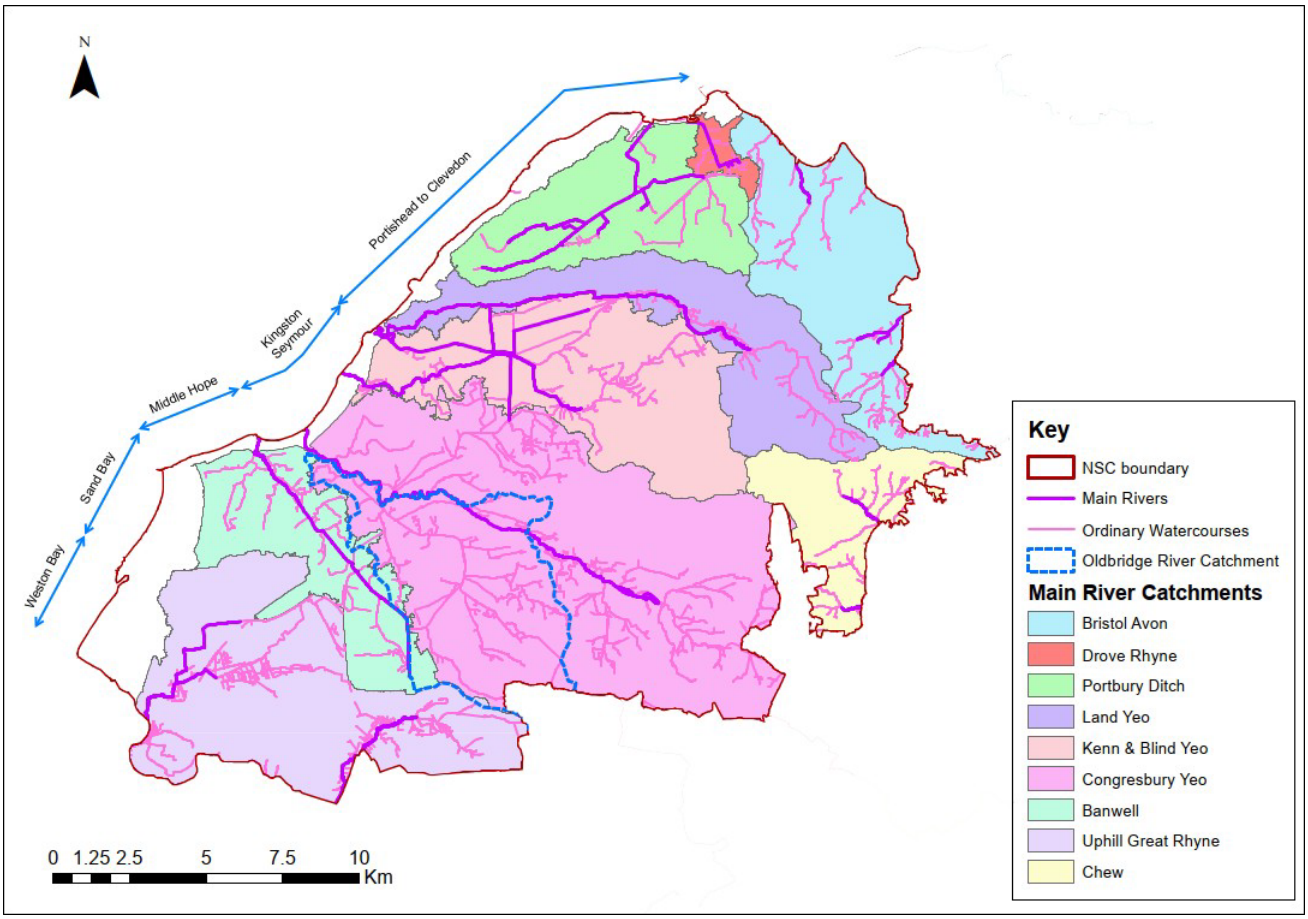

Table 3.2: Catchments in the Study Area

Hydrological catchments	Sub-catchments	Total Area within North Somerset (km^2)	% of study area	Main River length (km)
Bristol Avon	Colliters Brook Ashton Brook Markham Brook	37.4	10	17
Gordano Valley	Portbury Ditch & Sandy Rhyne (30km2)	33.1	8.8	19.1
	Drove Rhyne (3.1km2)			
North Somerset	Land Yeo (33.8km2)	189	50.4	58
	River Kenn Blind Yeo (46.2km2)			
	Congresbury Yeo (109km2)			
	Oldbridge River (40.4km2) (ordinary watercourse)			
River Axe	River Banwell (27.7km2)	84.79	22.6	24
	Uphill Great Rhyne (57.09km2)			
Chew Valley (drains to the Bristol Avon catchment)	Winford Brook Chew Stoke Stream	19.6	5.2	3

Bristol Avon catchment

The Ashton Brook flows for approximately 2km before it reaches the NSC boundary and its confluence with the New Colliters Brook, which eventually flows into the Lower Avon. The Colliters Brook is located south of Ashton Brook and flows for approximately 1km before joining the New Colliters Brook. The Markham Brook flows between Ham Green and Pill for approximately 1.5km before flowing into the Lower Avon at Crockerne Pill.

Permeable uplands in this area consist of a wide range of limestones, sandstones and mudstones. Runoff rates are generally low within the catchment as water easily seeps into the ground via large fissures. Groundwater recharge in this area feeds springs at the base of the hills.

Gordano Valley catchment (Portbury Ditch)

The Gordano Valley catchment area is located in the northwest of the North Somerset study area. The three Main Rivers included in the catchment are the Portbury Ditch, Sandy Rhyne and Drove Rhyne. The Portbury Ditch flows from the Clevedon hills, through Portishead, and outfalls into the Bristol Channel at Portishead Marina. Tributaries including the Walton Brook and Sandy Rhyne join the Portbury Ditch along its 9km length. The Drove Rhyne drains from the west of Easton-in-Gordano and flows northwest for 2.5km where it enters the Bristol Channel approximately 1km east of Portishead Marina.

North Somerset catchment

The catchment is located between the Gordano Levels to the north and North Somerset Levels to the south. The water levels in the Levels and Moors are controlled and drained by a network of channels known as rhynes, and the use of sluices and weirs. The area is mainly used for grazing.

The Land Yeo, Blind Yeo and River Kenn rise from springs in the Mendip Hills. They are maintained by a complex system of penned water management and drainage rhynes (the retained water level varies between summer and winter). These rivers enter the Severn Estuary to the southwest of Clevedon. Historically the Land Yeo flowed through the town centre of Clevedon. It was diverted along the Blind Yeo in the 1970s to reduce fluvial flooding in Clevedon, but a small residual watercourse still flows through Clevedon town centre. At the same time, the capacity within the Blind Yeo was increased to accommodate the extra flow.

The source of the Congresbury Yeo is a spring in the centre of Compton Martin on the western slopes of the Mendip Hills. There are a number of small tributaries which enter the Congresbury Yeo in the upper catchments. The river flows through Ubley and enters Blagdon Lake which was created in the 1890s. Blagdon Lake is the most significant surface water feature in the Congresbury Yeo catchment, with a surface area of approximately 8% of the catchment draining to the spillway.

The Congresbury Yeo flows to the south of Wrington and then through Congresbury where a series of engineered structures control the flow. Up until 1940, when Phipps Sluice was constructed 7km downstream of the village, the river at Congresbury was tidal. In the 1970s the tidal limit was moved further downstream to Tutshill Ear to allow the M5 motorway to be built above high tide level. Following a report by the Wessex Water Authority (January 1981) a flood defence scheme was built to improve the standard of protection against fluvial flooding. The mouth of the river is in Woodspring Bay, west of the village of Kingston Seymour.

The Oldbridge River catchment is an area of some 40.4km2, of which 16.2km2 is a permeable ‘upland’ catchment, with the remaining ‘lowland’ catchment (24.2km2) comprised of inland moors and coastal levels of estuarine alluvial clays. The drainage of the catchment is achieved via a network of minor rhynes and ditches which feed into the arterial watercourse system managed by the North Somerset Levels Internal Drainage Board (IDB). The catchment discharges into the tidal reach of the Congresbury Yeo at Sampson’s Sluice. There are no other outfalls to the Congresbury Yeo catchment and the Congresbury Yeo does not provide any means of drainage within the Oldbridge River catchment.

River Axe catchment

Uphill Great Rhyne and Cross Rhyne are approximately 4.5km in length and drain water from Uphill and the former Weston Airfield. The Uphill Great Rhyne runs from Hans Price Academy through the residential areas of southern Weston-super-Mare and discharges at Uphill Sluice. A 1.6km culvert feeds surface water into the head of Uphill Great Rhyne. A second major channel, Cross Rhyne joins the Uphill Great Rhyne upstream of the hospital site. The tidal sluice at Uphill prevents water entering the Uphill Great Rhyne at high tide and allows the Rhyne to drain at low tide. There are approximately four hours on each tide when Uphill Great Rhyne is tide locked and cannot drain by gravity.

The River Banwell is a largely artificial channel 9km in length and with a very shallow gradient, located to the east of Weston-super-Mare. The river rises as a spring in Banwell village, drains the surrounding agricultural land and part of Weston-super-Mare via the West Wick and St George’s. The outfall is through New Bow Sluice, a tidal defence structure, located 0.8km upstream of the confluence with the Severn Estuary. Due to development within the catchment area it has been necessary to compensate for floodplain loss and additional surface water runoff from these new developments (Parklands) through construction of two storage facilities that counteract the increased flood risk. Phase 1 of construction is now complete and phase 2 is due for completion in the next 3 years.

Chew Valley catchment

On the very south eastern fringe of North Somerset, a relatively small area forms the Chew Valley catchment which eventually drains into the Bristol Avon catchment. Within the study area, the Winford Brook and Chew Stoke Stream are approximately 3km in length and therefore cover a minority of the NSC area.

3.1.2 Coastline

North Somerset includes 60km of coastline. The historical construction of coastal defences goes back at least 1000 years. Previous storm events have damaged the defences which has led to the reconstruction of the structures to provide a higher standard of protection.

The NSC coastline can be classified into five sections as summarised in Table 3.3 and illustrated in Figure 3—1.

Table 3.3: Coastline sections across North Somerset

Coastline section	Description	Estimated Design Standard of Protection at time of consutruction
Portishead to Clevedon	Portishead to Clevedon is a north facing coastline, lined with limestone cliff. Properties along this section of the coastline are generally sparse and located outside areas of predicted tidal inundation. The cliffs are intersected by low lying alluvial areas such as Salthouse Bay. There are embankments and high ground protecting the residential area of Portishead from tidal flooding.	1 in 100 embankments and high ground 1 in 50 for cliffs
Kingston Seymour and Wick St. Lawrence	Kingston Seymour and the southern area of Clevedon are defended by a system of embankments with salt marsh in front of the raised defences. The area is mainly agricultural with associated small residential pockets.	1 in 100
Middle Hope	This section extends from St. Thomas Head to Sand Point. The area has steep cliffs interspersed with narrow intertidal areas. There are no low-lying areas in this section of the coastline.	1 in 100
Sand Bay	The bay faces towards the west and is protected by seawalls and embankments. Residential development is situated behind the seawalls with agricultural land located inland of this development. The north-facing part of the coastline is protected by cliffs.	1 in 100 for seawalls and embankments 1 in 50 for cliffs

Weston Bay	The most southerly section of coastline within the NSC boundary extends from Anchor Head to Brean Down in the south. The bay is western facing with a sandy coastline defined by the hard rock headlands of Birnbeck in the north and Brean Down in the south. There is a wide mud inter-tidal area and sandy foreshore. Weston-super-Mare is the primary developed section of coastline with residential, commercial, recreational and tourist interests. It has a wide sandy beach with a seawall defence. Uphill lies to the south and is defended by an embankment, Uphill sluice and high ground.	1 in 200 for seawall 1 in 50 for embankments

The design standards of protection included in Table 3.3 are based on information provided by the Environment Agency. It should be noted that these were estimated at the time of design and therefore may be subject to change over time due to revisions in the assessment of risk and as a result of the impact of climate change.

4.0 Data and Mapping

4.1 Data Collection

This Section details the data used to develop this SFRA and the methodology used to analyse the flood risk within North Somerset. Data has been collected from a number of sources including NSC, Environment Agency and Wessex Water.

Data collected from the Environment Agency include:

- Environment Agency Flood Zone mapping;
- Risk of Flooding from Surface Water mapping (RoFSW);
- Flood defences;
- Environment Agency Areas Benefiting from Flood Defences;
- Environment Agency Historic Flood Map;
- Environment Agency Reservoir Flood Risk Mapping;
- Environment Agency Main Rivers;
- Environment Agency Detailed River Network;
- LiDAR DTM Data;
- Outputs of hydraulic models;
- Environment Agency Flood Storage Areas
- Environment Agency Flood Alert Areas; and

- Environment Agency Flood Warning Areas.

Data collected from NSC includes:

- Ordnance Survey Background mapping;
- NSC Boundary;
- Parish Boundaries;
- Emergency Management Data; and
- Known flooding problems, observations and events.

Data collected from Wessex Water includes:

- Sewer flooding records 2005-2015.

4.2 Data Quality

Best available data has been used at the time of writing of this SFRA. Where data has not been available for the SFRA, it has been necessary to make assumptions based on professional experience and local knowledge. Where this is the case, the assumptions made are clearly stated.

It should be noted that information on flood risk is continually changing as new flooding events occur and further modelling and analysis is undertaken. Therefore, whilst the datasets used are the best available at the time of publication, the SFRA should be reviewed periodically, with NSC contacted in the meantime for the latest information.

Whilst flood risk information is shown on the produced maps in a relatively precise way, it is not possible to be completely certain from the outputs of this SFRA that any individual property, especially those near the boundaries of Flood Zones, is within a particular Flood Zone. In particular, the locations of flooding provided by Wessex Water are only general and should not be considered as property specific. The Environment Agency Flood Map for Planning should not be used for individual property planning guidance and a site-specific FRA should be completed where appropriate, according to relevant planning guidance.

4.3 Supporting Figures and Maps

The supporting maps and figures can be found on the North Somerset Planning Map

Link to North Somerset Planning Map

5.0 Types of Flooding

5.1 General Information

The flood risk knowledge within North Somerset includes:

- Experience of Council engineers and staff, local councillors and others;
- Records and information on past flooding from all sources (primarily coastal, river, surface water, groundwater and sewers);
- Environment Agency data including the Environment Agency Flood Map for Planning (Rivers and Sea), RoFSW mapping, indicating areas most susceptible to surface water flooding, Areas Susceptible to Groundwater Flooding (AStGWF) and reservoir flood risk data; and
- Previous studies and hydraulic modelling undertaken within North Somerset.

5.1 Historic Flooding

Flooding of homes, businesses, agricultural land and roads has occurred in North Somerset from tidal events, Main Rivers and local sources. Local sources include surface water generated by intense rainfall, groundwater and/ or ordinary watercourses. Many areas affected by flooding are situated outside Flood Zones 2 and 3. This is an important reminder that the risk of flooding from all sources must be carefully considered when planning future development, irrespective of the proximity of the site to the coast or a watercourse. Development management decisions must consider all forms of potential flooding to the site, including cumulative impacts. They must also be made with due consideration to the potential impact that future development may have upon known existing flooding problems if not carefully managed.

Information on previous flooding incidents within North Somerset has been collated from a variety of sources. A number of tidal and fluvial flood events have been identified dating back to 1607. Data on previous flood events has been sourced from:

- Previous SFRA for North Somerset (2008) where data was obtained from:
- NSC Engineers and Parish Councillors; and

- North Somerset Levels Internal Drainage Board (IDB), part of the Somerset Drainage Boards Consortium, and prior to that the North Somerset and West Mendip IDBs;
- NSC flood records; and
- Environment Agency flood records.

Historic flood records have been collated along with consultee responses to ensure as many flood events as possible have been included in Figure 035.

A summary of flood history is also included in Table 5.1.

Table 5.1: Significant Recorded Historic Flood Events

Date	Flooding Mechanism	Description	Location
January 1607	Tidal	This was known as the 'Great Flood' which killed approximately 2,000 people across Somerset and has been described as one of the worst natural disasters to hit Britain. There is no accurate record, however, it was estimated that the tide level at Kingston Seymour was 8.9mAOD (metres above ordnance level). It is estimated that water covered 520 km2 of land.	Several flooded areas across North Somerset
1687, 1703, 1794, 1796, 1810	Tidal	There was widespread flooding on both sides of the Severn Estuary.	North Somerset wide

1846	Tidal	The Bristol Mercury newspaper of Saturday 31st January 1846, reported extraordinary high tides, floods and destruction of property as a result of remarkable high tides in the Bristol Channel and Severn Estuary. The coastal lowlands on both sides of the Severn were flooded with livestock and property lost. Portishead suffered one of the greatest floods ever seen.	Portishead
1859	Tidal	Two storms in October and November 1859 resulted in flooding on the Somerset coast. The first of these on 25th /26th October 1859 coincided with a spring tide in the Severn Estuary. This storm, the Royal Charter Storm, is so called because of the loss of the SS Royal Charter, together with the lives of 500 passengers and crew, off the coast of Anglesey (Lamb, 1991). The Western Counties Herald and Bridgwater Mercury of Wednesday October 26th 1859 reported that, in total, more than 600 vessels were lost or damaged in the storm. The tide at Bridgwater rose 5ft higher than the predicted level.	North Somerset wide.
1869	Tidal	A storm-surge of 1m was recorded on the River Avon at Bristol coinciding with a high spring tide, the tide overflowed and flooded many low-lying parts.	North Somerset wide.
1870	Tidal	A severe gale coinciding with a high spring tide caused storm-surge flooding on the Somerset coast.	North Somerset Coast

1883	Tidal	At Avonmouth, the coincident surge of 0.9m took the tide to the highest ever recorded (WWA, 1982). The Port and Pier Railway terminus at Avonmouth was badly damaged and there was severe flooding at Pill, St Georges, Portbury and at Portishead.	North Somerset wide.
1885	Tidal	In Wick St. Lawrence there was a breach at 'Isleton Farm' which caused 2-3 feet of flooding.	Wick St. Lawrence
1896	Tidal	Three consecutive high tides on the Avon from the evening of Wednesday 7th to the evening of Thursday 8th October 1896 caused widespread inundation. At high water there was extensive flooding at Pill and between Avonmouth and Portishead. Fields were flooded to feet deep. Properties were damaged in Pill and Shirehampton.	Pill and Portishead.
1903	Tidal	(Ulysses Storm) Hurricane force storm washed away Knightstone Causeway and The Beach at Clevedon.	North Somerset wide impacts
1914	Tidal	After a series of depressions, on 16th March a gale of unusual severity affected the Bristol Channel on the morning of 16th March	North Somerset wide impacts
1923	Tidal	low pressure system affected the western coasts of Britain on 10th October The westerly gale coincided with a spring high tide, to raise the tide at Severn Beach to its highest in 15 years (The Times, 12th October 1923). Flooding was also experienced on the Somerset coast	North Somerset wide impacts
1924	Tidal	An unusually deep depression with a central pressure of 925mb lay off Iceland at the end of December 1924. A terrific gale swept the whole	North Somerset wide impacts

		of Britain on Friday 26th December and through Saturday, causing widespread damage, shipwrecks and loss of life. The SW gale was accompanied by torrential rain and floods. The gale coincided with high tides on the Somerset coast to cause flooding. The heavy rain and high tides also caused flooding in Gloucestershire.	
1936	Tidal	A very intense depression caused severe gales across Britain. A surge in the outer Severn Estuary of more than 2m coincided with an average spring HW to cause extreme levels and flooding.	North Somerset wide impacts
1957	Tidal and heavy rainfall	Two low pressure events and storms combined with heavy rainfall.	North Somerset wide impacts
1962	Tidal	Strong gale force 9 winds, gusting up to 90mph, were recorded in the Bristol Channel and Severn Estuary on 11th January. The sea wall was breached at Weston-super-Mare (EA, 2009).	North Somerset wide impacts
July 1968	Fluvial / Surface Water and Ordinary Watercourse	A low-pressure event caused severe flooding throughout the South West after 5 inches of rain fell within 24 hours, including a major storm over the Mendip Hills. The flooded areas included Banwell Moor to the north of Banwell Village, part of St. Georges Village and an area between St. Georges and West Wick. It is known that the River Banwell continued to rise for approximately six days after the storm had passed. It is important to note however that the catchment and watercourses themselves were considerably different at that time in	Banwell Moor; St. Georges Village; Wrington; Weston- super-Mare; Clevedon

		both alignment and cross-section to the current situation. Furthermore, St. Georges had experienced very little development prior to 1968 and the M5 Motorway had yet to be built. In Wrington there were several reports of flooding in the 1968 event. Silver Street was flooded, caused by surface water from Clements Field and Riding Farm. The Congresbury Yeo flooded 125 properties in Main Street, with flood depths of up to 2 metres and extensive damage to the A370 road bridge recorded. Parts of Weston-super- Mare were cut off due to flooding and landslides and areas of Clevedon were under 0.6m of water.	
1974	Tidal	In early February, storms crossed the region at the time of high spring tides. A surge coinciding with HW on 9th February, caused tidal inundation in the Severn Estuary.	Pill
1981	Tidal	The failure of the old Uphill tidal sluice during a storm led to tidal inundation and extensive flooding in Uphill village. At the same time, sea defences were also breached in Uphill. However, the inner flood banks prevented further flooding. In Clevedon, large waves broke over the sea wall and parts of the crest slabs and grouted stone rear facing were ripped off resulting in flooding to 12 properties. At Wick St. Lawrence there was a breach in the defences on the seaward side at Woodspring Bay with other sections of the defences affected and water levels reaching the top of the inner embankment. Properties were	Uphill; Clevedon; Wick St. Lawrence; Kingston Seymour

		evacuated and at Kingston Seymour water collected in Middle Lane with flooding extended to Laurel Farm.	
1989-1990	Tidal	Tidal inundation on a lesser scale to 1981 occurred in Weston-super-Mare, Kingston Seymour, Wick St. Lawrence and Clevedon following a storm event.	Weston- super-Mare; Wick St. Lawrence; Kingston Seymour; Clevedon
Summer 2007	Surface Water and Ordinary Watercourse	Evidence suggests surface water runoff from surrounding fields was the cause of garage and gardens flooding in South Meadow, Wrington. The Glebe and Garstons Close also flooded in 2007 and anecdotal evidence suggests properties experienced internal flooding for two hours before waters receded. Apart from fluvial flooding, Wrington was affected by the local springs which exacerbated the surface water problem.	Wrington
January 2008	Surface Water and Ordinary Watercourse	The Avon Fire and Rescue service recorded more than 200 flooding incidents in one afternoon. Within the NSC boundary there were two call outs. In Winford they rescued three people from a car trapped in flood water. At St. Georges Hill two pumps were used to remove flood water in properties. In Wrington roads were flooded and cars had to be abandoned.	Winford; St. George's Hill; Wrington

February 2008	Surface Water and Ordinary Watercourse	Station Road (A370) at Flax Bourton became impassable and the railway line was temporarily closed with trains cancelled.	Flax Bourton
2012	Surface Water and Ordinary Watercourse	Significant flooding across North Somerset in August, September and November 2012. Summer Lane ponds at Weston Village caused flooding to residential streets, properties narrowly avoided internal flooding.	Several flooded areas across North Somerset
Winter 2013-2014 and Summer 2014	Surface Water and Ordinary Watercourse	Rainfall totals were significantly higher than average during winter 2013-2014 and August 2014, however these events did not result in the same level of property flooding reports as 2012.	Several flooded areas across North Somerset
2016	Surface Water and Ordinary Watercourse	During Storm Angus in November 2016, 22 properties were reported to have flooded internally and 143 flooded externally across North Somerset. Additional flooding was prevented by the deployment of temporary defences in Summer Lane, Weston-Super-Mare	Several flooded areas across North Somerset

January 2023	Surface Water Flooding	Around 12 properties flooded internally.	Several flooded areas across North Somerset

As indicated in Table 5.1, in 2012, a combination of high rainfall totals and saturated ground brought widespread flooding to many parts of the UK; North Somerset experienced higher rainfall than the long-term national average. A total of 25 communities were affected by these events; 474 properties were reported to have flooded internally and 428 flooded externally across North Somerset. A summary of flooded locations within North Somerset where more than ten properties suffered internal flooding, according to the North Somerset Local Flood Risk Management Strategy (2013), is provided in Table 5.2.

Table 5.2: Key Flooded Locations in 2012

Location	**Estimated no. internal flooding incidents**	**Estimated no. external flooding incidents**
Backwell	20-30	40-50
Clevedon	20-30	5-10
Congresbury	10-20	10-20
Langford	10-20	10-20
Locking	10-20	5-10
Nailsea	20-30	40-50
Weston-super-Mare	20-30	20-30
Winscombe	20-30	10-20
Wrington	80-90	140-150

5.3 Fluvial Flood Risk

Fluvial Flood Zones have been defined in accordance with PPG requirements. The delineation of Flood Zones (refer to Figures 001-033) is based on the Environment

Agency Flood Map for Planning (from Rivers and the Sea) which defines the Flood Zones as follows:

5.3.1 Flood Zone 1 – Low Probability

Flood Zone 1 – Low Probability comprises land assessed as having a less than 1 in 1,000 AEP of river and sea flooding (<0.1%). For SFRA purposes, this incorporates all land that is outside Flood Zones 2 and 3. It is important to note that land within Flood Zone 1 may still be vulnerable to flooding from sources other than fluvial and/or tidal sources.

5.3.2 Flood Zone 2 – Medium Probability

Flood Zone 2 - Medium Probability comprises land assessed as having between a 1 in 100 and 1 in 1,000 AEP of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1,000 AEP of sea flooding (0.5%-0.1%) in any year. In other words, land situated between Flood Zones 1 and 3a. Flood Zone 2 (Medium Probability of Flooding) is based on the most recent Environment Agency Flood Map for Planning (Rivers and Sea).

5.3.3 Fluvial Flood Zone 3a – High Probability

Fluvial Flood Zone 3a - High Probability comprises land assessed as having a 1 in 100 or greater AEP of river flooding (>1%) in any year. Fluvial Flood Zone 3a (High Probability of Flooding) is based on the most recent Environment Agency Flood Map for Planning (Rivers and Sea). Tidal Flood Zone 3a is delineated separately (see Section 5.4.1).

5.3.4 Fluvial Flood Zone 3b – Functional Floodplain

The PPG defines Flood Zone 3b – Functional Floodplain as:

“land where water has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would flood with an annual probability of 1 in 30 (3.3%) or greater in any year or is designed to flood (such as a flood alleviation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point for consideration and discussion to identify the functional floodplain” (PPG, SFRA guidance).

Flood Zone 3b is therefore identified by local planning authorities. National Guidance further clarifies that:

"The area identified as functional floodplain should take into account the effects of defences and other flood risk management infrastructure. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain".

In addition, the guidance states that areas intended to flood, such as upstream Flood Storage Areas (FSAs) should also be identified as functional floodplain.

The Environment Agency knowledge of the floodplain is continually being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. The Environment Agency has an ongoing programme of improvement and updates to the published Flood Maps are made on a quarterly basis.

For the purposes of this Level 1 SFRA, functional floodplain is identified in a number of key areas within North Somerset to allow for Flood Zone 3 to be further classified into Zones 3a and 3b. Flood Zone 3b is delineated where the risk of flooding is predicted to be 1 in 30 (3.3%) AEP or greater, taking into account the presence of defences. As a conservative approach, where modelling results were not available for the 1 in 30 (3.3%) AEP event, FZ3a (1 in a 100 AEP) will be considered as the functional floodplain and will be used to delineate Flood Zone 3b.

If a defended scenario was not available and/ or there are no formal flood defences within the modelled area, undefended scenarios have been used instead.

Where detailed modelling was not available, for spatial planning purposes and in agreement with NSC, all land in FZ3a is considered as a proxy for FZ3b until it can be demonstrated to the satisfaction of the Environment Agency and NSC that it can be considered otherwise.

The approach stated above is suitable for the purposes of a level 1 SFRA. Where detailed modelled outlines for 3.3% AEP event are unavailable for sites at risk of fluvial flooding, further detailed modelling is required to refine the assessment and to comply to the EA's latest climate change allowances. This should be carried out as part of a site-specific FRA.

Table 5.3 includes an overview of the sources and information used to delineate Flood Zone 3b along Environment Agency Main Rivers. In addition to the information in Table 5.3, the published Environment Agency flood storage areas (FSAs) have also been included as mapped Flood Zone 3b. Tidal Flood Zone 3b is delineated separately (see Section 5.4.2).

Table 5.3: Flood Zone 3b Delineation Data

Watercourse	Catchment	Source of Data	Available Scenario Used to Delineate Flood Zone 3b
Markham Brook	Bristol Avon	Detailed modelling completed by the Environment Agency	1 in 25 (4%) annual chance event extent - defended scenario
Portbury Ditch	Gordano Valley	Detailed modelling completed by the EA	1 in 30 (3.3%) annual chance event extent – baseline scenario (undefended); no defended scenario outlines available.
Congresbury Yeo	North Somerset Levels	Detailed modelling completed by the EA	1 in 30 (3.33%) annual chance event extent – undefended scenario
Land Yeo, Kenn, Blind Yeo	North Somerset Levels (Clevedon area)	Detailed modelling completed by the Environment Agency	1 in 20 (5%) annual chance event extent – baseline scenario (undefended); no defended scenario outlines available
Woodspring Bay	Coastal/Tidal	Detailed modelling completed by the EA/NSC	1 in 200 (0.5%) annual chance, defended and

			undefended (tidal 3b)
North Coast Tidal Model	Coastal/Tidal	Detailed Modelling completed by the EA	1 in 200 (0.5%) annual chance defended and undefended (tidal 3b)
Uphill Great Rhyne	Axe	Detailed modelling completed by the Environment Agency	1 in 20 (5%) annual chance event extent – baseline scenario - undefended (no formal defences present)
River Banwell	Axe	Detailed modelling by Royal Haskoning DHV and Wallingford Hydrolsolutions	1 in 30 (3.33%)

Any development within Flood Zone 3b is likely to measurably impact upon the existing flooding regime, increasing the severity and frequency of flooding elsewhere. It is important to recognise that all areas within Flood Zone 3b are subject to relatively frequent flooding and there is a 3.33% chance of flooding each year. There are clear safety, sustainability and insurance implications associated with future development within these areas and informed planning decisions must be taken with care. Development in such areas is only likely to be appropriate for 'Water Compatible' developments and 'Essential Infrastructure' and would need to pass the Exception Test in accordance with the NPPF (see Table 2.2).

For this Level 1 SFRA, Fluvial Flood Zone 3b has been illustrated in Figures 001-033. However, the absence of Flood Zone 3b extent does not necessarily correspond to no risk of flooding for the 1 in 30 (3.3%) AEP event (e.g. informal flood storage areas may be located outside of the delineated functional floodplain) and it is the responsibility of the developer to demonstrate that a proposed area is suitable for development.

5.4 Tidal Flood Risk

The study area is within the Severn Estuary and as such it is exposed to significant tidal conditions. The Severn Estuary has the second largest tidal range in the world and the

northwest facing coastline exposes many of the local communities to combinations of extreme tides, surges, swell and wind waves.

Flooding to low-lying land from the sea and tidal estuaries is a principal flood risk source within North Somerset. Without defences in place approximately a quarter of the area of North Somerset is at risk of flooding. However, the tidal flood defence network across the study area is well developed and extensive; therefore, flooding rarely occurs due to high tidal levels alone (although a residual risk of flooding remains due to the age and condition of the defences). The dominant source of tidal flood risk is related to the coincidental occurrence of a high astronomical tide, the passage of a storm surge and the effects of wind related waves. Overall, the likelihood and severity of coastal flooding depends on a number of parameters including weather systems, wind and wave conditions, underlying topography, effectiveness of drainage systems, the condition of flood defences, in addition to the Standard of Protection they afford (which could change in future due to climate change). The rapid onset of tidal flooding often results in more significant impacts of flooding compared to flooding from rivers.

The delineated Tidal Flood Zones are listed below and are illustrated in Figures 001-033. Flood Zones 1 and 2 as described above (see Sections 5.3.1 and 5.3.2) are both fluvial and tidal in nature, therefore Tidal Flood Zones 1 and 2 have not been delineated.

5.4.1 Tidal Flood Zone 3a – High Probability

Tidal Flood Zone 3a - High Probability comprises land assessed as having a 1 in 200 or greater AEP of tidal flooding (>0.5%) in any year. Tidal Flood Zone 3a (High Probability of Flooding) is based on the most recent Environment Agency Flood Map for Planning.

5.4.2 Tidal Flood Zone 3b – Functional Floodplain

This Level 1 SFRA also delineates Tidal Flood Zone 3b, as tidal flood risk is the major source of flood risk within North Somerset. Tidal Flood Zone 3b functional floodplain should not occur inland of present coastal defences as the coastline is defended with a greater standard of protection than the 1 in 30 (3.3%) AEP event. Therefore, Tidal Flood Zone 3b has been indicated where tidal flooding (i.e. Tidal Flood Zone 3a) is predicted to occur on the seaward side of the raised coastal defences.

However, as flood risk increases the standard of protection the sea defences provide declines with time. Refer to section 7.8 on residual flood risk for more information.

Flood defences within North Somerset are described in more detail in Section 7.3 and are illustrated in Figures 040 and 041.

5.5 Surface Water Flood Risk

Significant flooding from surface water runoff, and from blockages within drains and culverts, has been experienced in recent years at a number of locations within North Somerset. Communities with multiple reported incidents of surface water flooding include Hutton, Wrington, Blagdon, Backwell, Langford, Iwood, Yatton and Bleadon, with property damage recorded in several areas. Many incidents also occur in more rural locations, where the frequency of flooding can be relatively high.

In some locations, however, the interaction between surface water runoff, groundwater flooding and spring emergence can materially increase flood depths and extents. Where these combined mechanisms occur, reliance on surface water mapping alone can underestimate the level of risk. Site-specific catchment modelling is therefore required to characterise the true sources, pathways and severity of flooding in these locations, notably Langford, Churchill and Backwell.

Surface water flow paths are indicated by the Environment Agency RoFSW mapping indicating the extent of flooding from surface water that could result from a flood with a 1 in 1000 (0.1%), 1 in 100 (1%) and 1 in 30 (3.3%) annual exceedance probability. Please refer to the EA flood maps for RoFSW extents, which can be viewed on the Government's long term flood risk website. (Link to Check The Long Term Flood Risk site).

5.5.1 Critical Drainage Areas

Environment Agency guidance states that a Flood Risk Assessment (FRA) would be required to support a planning application if the development is located in Flood Zone 1 and in an area with critical drainage problems as notified by the Environment Agency. However, the Environment Agency has yet to identify any Critical Drainage Areas (CDAs) in North Somerset.

The IDB areas include a network of rhynes that contribute significantly to the drainage of that land. Development within the IDB areas has the potential to impact the function of rhynes and, as a result, increase local flood risk. Therefore, drainage issues within these areas should be given particular prominence. The Somerset Drainage Boards Consortium is a non-statutory consultee in the planning process.

The design of proposed developments should also carefully consider the impact that local flooding and raised groundwater levels may have upon the operation of SuDS, also considering potential cumulative effects. SuDS should be designed in accordance with guidance included within the SuDS Manual (see Section 7.5).

5.6 Reservoir Flood Risk

In 2021 the EA published updated maps showing the flood risk associated with dams and reservoirs. The maps illustrate two flooding scenarios: a 'wet-day' and a 'dry-day'. The 'wet-day' scenario is the modelled flood extents if the dam or reservoir fails whilst the river is already experiencing an extreme natural flood. The 'dry-day' scenario predicts the flooding that would occur if the river was at its normal levels. These scenarios were produced using dam breach and flood modelling techniques.

The main dams or reservoirs that could impact North Somerset include the following:

- Barrow Gurney reservoirs (grid reference: ST539674)
- Blagdon Lake (grid reference: ST513596)

The modelled extents tend to lie along the Congresbury Yeo and the Land Yeo. The Barrow Gurney reservoirs impacts the Land Yeo and Blagdon Lake impacts the Congresbury Yeo. The Severn estuary is the watercourse that both of these rivers drain into.

Areas shown to be at risk from reservoir failure include but are not limited to: Congresbury, Cox's Green, Wrington and Kingston Seymour, all of these areas are associated with the Congresbury Yeo watercourse.

There are many areas shown to be at risk to reservoir failure, however, reservoir failure is a rare event with a low probability of occurrence. Current reservoir regulation, which has been further enhanced by the FWMA, aims to ensure that all reservoirs are properly maintained and monitored to detect and repair any problem.

Maps showing the 'wet-day' and 'dry-day' modelled scenario extents can be found on the data.gov website. (Link to Check the Long-Term Flood Risk site).

When considering reservoir flood risk, the likelihood of flooding is low, but the impact may be high. Suitable physical mitigation measures should be in place to mitigate the risk, flood warning and evacuation plans cannot be relied upon as the sole mitigation measure.

5.7 Groundwater Flood Risk

Groundwater flooding can occur when groundwater levels rise and reach the ground surface, or when groundwater discharges from springs (including ephemeral or “winterbourne” springs). This typically follows prolonged periods of sustained rainfall, when recharge exceeds drainage and groundwater levels respond over weeks to months. The areas most susceptible are often low-lying locations where the water table is naturally shallow, and where local geological conditions allow groundwater to emerge at the surface. Groundwater flooding is therefore most commonly associated with areas underlain by major aquifers, but it can also arise from perched groundwater conditions where less permeable strata restrict downward drainage.

Within North Somerset, the British Geological Survey (BGS) Areas Susceptible to Groundwater Flooding (AStGWF) dataset (Link to Groundwater Flood Risk dataset) has been used as a high-level screening tool to indicate potential susceptibility to groundwater emergence. The dataset is provided on a 1 km grid and identifies, at a broad scale, areas where groundwater flooding could occur based on geological and hydrogeological conditions. It does not indicate the probability of flooding, frequency, depth, or pathways, and should therefore be treated as a hazard (susceptibility) dataset rather than a risk-based assessment.

The dataset does not explicitly consider where groundwater may pond, move laterally, or be retained within shallow soils; it primarily indicates where groundwater might emerge at the ground surface. Susceptibility is represented by one of four categories showing the proportion of each 1 km grid square that is susceptible to groundwater flood emergence:

≤ 25%

> 25% to ≤ 50%

> 50% to ≤ 75%

≥ 75%

Absence of a value indicates that groundwater emergence is not anticipated at this screening scale.

It is important to note that large areas of North Somerset are underlain by the Mercia Mudstone Group (MMG), which is highly variable across the area. While the MMG is often characterised as relatively low permeability, local weathering, fracturing, sandier horizons, and desiccation cracking can create conditions where relatively high infiltration rates may be recorded during the summer months. In contrast, during the winter months

the ground can become rapidly saturated, with reduced effective infiltration and prolonged high soil moisture deficits being removed, leading to seasonal waterlogging.

In some locations (though not universally), lateral flow can occur within the weathered and/or fractured zones of the Mercia Mudstone, allowing water to move downslope or concentrate along permeability contrasts. This is not typically aquifer-driven groundwater flooding, but it can lead to the development of a perched water table above less permeable horizons and result in waterlogged fields, seepage zones and locally persistent wet ground conditions during wetter periods. These mechanisms can be highly localised and may not be well represented by national, coarse-resolution susceptibility mapping.

The river floodplains to the south and east of Nailsea and to the east of Banwell exhibit stoneless, mostly reddish clayey soils formed from river alluvium which can be affected by groundwater and seasonal saturation. Much of the river valley floors and lower slopes comprise brown earths and reddish fine loams over clayey subsoils; where subsoils are more permeable these may be subject to slight seasonal waterlogging, with conditions influenced by local topography, soil structure, and the underlying geology. The Gordano Valley is similarly bounded by reddish fine loamy soils overlying clayey subsoils, which also show a tendency for seasonal waterlogging.

Given the variability of the Mercia Mudstone and the potential for perched groundwater and localised lateral flow, site-specific hydrogeological assessment is recommended in areas where development is proposed and/or where there is evidence of seasonal saturation, seepage or prolonged wet ground. This is particularly relevant in parts of Churchill, Langford and Backwell, where local ground conditions can vary significantly over short distances and where targeted investigations are needed to confirm groundwater mechanisms, seasonal behaviour, and appropriate mitigation measures.

5.8 Sewer Flooding

In urban areas, rainwater frequently drains into surface water sewers or combined sewers (sewers containing both surface and wastewater). These sewers can be surcharged due to heavy rainfall, inadequate capacity or blockages, resulting in flooding of the surrounding area until the water can drain away.

Wessex Water has provided information on the number of properties that have experienced sewer flooding in North Somerset for this updated SFRA. Sewer flooding may be internal or external (to property curtilages or highways); internal flooding is generally considered more disruptive than external or curtilage flooding. The information provided includes flooding incidents during a ten year period (May 2005 – January

2015). This information needs to be regularly updated to reflect assessments and works completed by Wessex Water and any subsequent flooding incidents. The majority of sewer flooding is caused by blockages and it is important to only dispose of flushable items into the sewer network.

The total number of properties flooded from sewers in North Somerset are summarised by postcode in Table 5.4. The highest risk areas are in postcode areas BS40 (Wrington), BS24 (Bleadon, Hutton, Locking, Lympsham and Weston-super-Mare), BS22 (Kewstoke, Weston-super-Mare and Wick St Lawrence) and BS49 (Congresbury and Yatton).

Any new development must address the impact on the existing capacity of the sewer system and any associated sewage treatment works. Increases in discharge may lead to the overloading of receiving sewers and consequently an increase in flood risk and pollution. There must be no surface water connections to foul sewers. Developers must consult sewerage undertakers prior to discharging into existing systems.

Bristol Water was also consulted for potential flooding incidents due to water supply system failures. There were no formal records to be provided; however, their response indicates there is an area that is considered to be at risk of flooding between Banwell and Winscombe, which lies within Flood Zone 2.

Table 5.4: Wessex Water Property Sewer Flooding Records

Postcode	Internal Flooding	External Flooding	Total
BS20 0	-	11	11
BS20 6	2	4	6
BS20 7	1	-	1
BS20 8	-	4	4
BS21 6	1	6	7
BS21 7	1	1	2
BS22 6	3	8	11
BS22 7	-	1	1
BS22 8	4	15	19
BS22 9	-	11	11
BS23 2	-	3	3

BS23 4	1	-	1
BS24 0	5	5	10
BS24 6	9	-	9
BS24 7	-	17	17
BS24 8	5	14	19
BS24 9	4	1	5
BS25 1	3	9	12
BS25 5	-	3	3
BS29 6	-	2	2
BS40 5	15	44	59
BS40 8	-	1	1
BS41 8	2	-	2
BS41 9	1	1	2
BS48 1	-	2	2
BS48 2	3	9	12
BS48 3	1	4	5
BS48 4	-	2	2
BS49 4	1	15	16
BS49 5	5	5	10
Total	**67**	**198**	**265**

5.9 Climate Change

EA guidance Link to Climate Change Allowances for Flood Risk Assessments instructs local planning authorities, developers and their agents on how climate change allowances should be applied in flood risk assessments. There is clear scientific evidence that global climate change is happening now and cannot be ignored. Increases in flood risk due to climate change means that a site currently located within a lower risk zone (Flood Zone 1 or 2) could in the future be re-classified as lying within a high-risk zone (Flood Zone 3a or 3b). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding (see Section 2.6). Climate change allowances are predictions of anticipated change. Making allowances for climate change minimises vulnerability and provides resilience to flooding and coastal change.

The EA provides climate change allowances for:

- Peak river flow

- Peak rainfall intensity
- Sea level rise
- Offshore wind speed and extreme wave height

Allowances are provided by the EA for a variety of climate scenarios over different epochs. For North Somerset council all four climate change allowances stated above are relevant and are covered in more detail below.

5.9.1 Peak river flow

Peak river flow allowances show the anticipated changes to peak flow by management catchment, where management catchments are sub-catchments of river basin districts. The range of allowances is based on percentiles, as shown below.

- Central allowance is based on the 50th percentile.
- Higher Central allowance is based on the 70th percentile
- Upper End allowance is based on the 95th percentile.

The NSC administrative boundary crosses two management catchments. Most of the area of NSC is within the Avon Bristol and Somerset North Streams management catchment. However, the Somerset South and West management catchment is located to the south of the NSC administrative boundary, this management catchment contains Weston-Super-Mare within its boundary – the largest population centre of the county. The climate change allowances are summarised in Table 5.5.

Table 5.5: Increases in peak river flows for North Somerset Management Catchments.

Allowance	Total Potential Change (2020s)	Total Potential Change (2050s)	Total Potential Change (2080s)
Avon Bristol and Somerset North Streams			
Central	10%	12%	26%
Higher	15%	19%	39%
Upper	27%	38%	71%
Somerset South and West			
Central	12%	17%	37%
Higher	18%	26%	50%
Upper	29%	45%	82%

The guidance states that both central and higher allowances should be assessed as part of an SFRA. The flood risk vulnerability classification as defined in the NPPF should be used to classify the vulnerability of the development in order to determine the applied climate change allowance during a site-specific FRA. After the flood risk vulnerability of the development is established, the recommended allowances are applied, which are summarised below:

In Flood Zones 2 or 3a for:

- essential infrastructure – use the higher central allowance.
- highly vulnerable – use central allowance (development should not be permitted in Flood Zone 3a)
- more vulnerable, less vulnerable & water compatible – use the central allowance.

In Flood Zone 3b for:

- essential infrastructure – use the higher central allowance
- highly vulnerable, more vulnerable & less vulnerable – development should not be permitted
- water compatible – use the central allowance

Peak river flow allowances should also be applied to development that is currently located in Flood Zone 1 but might be re-classified to Flood Zone 2 or 3 in future.

5.9.2 Peak rainfall

Increased peak rainfall affects surface water flood risk and the design of drainage systems. Peak rainfall allowances are provided for the central and upper percentile across two epochs (2050s and 2070s). Like the peak river flows, allowances are specified per management catchment. The two management catchments within NSC and their peak rainfall allowances are summarised in Table 5.6.

Table 5.6: Peak rainfall allowances for North Somerset Management Catchments.

Allowance	Total Potential Change (2050s)	Total Potential Change (2070s)
Avon Bristol and Somerset North Streams		
Central 3.3%	20%	25%
Upper 3.3%	35%	40%
Central 1.0%	25%	25%
Upper 1.0%	40%	45%
Somerset South and West		
Central 3.3%	20%	25%
Upper 3.3%	35%	40%
Central 1.0%	25%	25%
Upper 1.0%	40%	45%

The recommended allowances are based on the proposed lifetime of the development. For developments with a lifetime beyond 2100, the upper allowance should be assessed for both the 1% and the 3.3% AEP for the 2070s epoch (2061 to 2125).

For a development with a lifetime between 2061 and 2100, an FRA should be assessed using the central allowances for both the 1% and 3.3% AEP, for the 2070s epoch (2061 to 2125).

For a development with a lifetime up to 2060, an FRA should be assessed using the central allowances for both the 1% and 3.3% AEP, for the 2050s epoch (2022 to 2060).

5.9.3 Sea level rise

Sea level rise allowances for the predicted impact of climate change were updated in May 2022 to reflect the latest climate change projections (UKCP18). A range of allowances have been published to allow assessment for a range of sea level rise scenarios. Table 5.7 includes the sea level rise allowances for the south west region for a range of epochs until 2125, using epoch from 1981 to 2000 as a baseline.

Table 5.7: Sea level rise allowances for the south west region

Allowance	2000 to 2035 (mm)		2036 to 2065 (mm)		2066 to 2095 (mm)		2096 to 2125 (mm)		Cumulative rise 2000 to 2125 (m)
	/year	total	/year	total	/year	total	/year	total	
Higher Central	5.8	203	8.8	264	11.7	351	13.1	393	1.21
Upper End	7	245	11.4	342	16	480	18.4	552	1.62

Although any development should be assessed against both the Higher Central and Upper End and the residual risk managed for the worse case. Climate change projections to use in North Somerset to determine design flood levels should be:

- In urban areas where protected by hard defences use the Higher Central. This is where the chance of future new flood defences is higher but not guaranteed and the defences are less likely to breach in an extreme event.
- In rural areas outside of settlement boundaries where protected by grass embankments, use the Upper End. This is where future new flood defences are less likely and the chance of breach in an extreme event is higher.

North Somerset Planning Map shows the expected extents for Tidal Flood Zone 3a with an increase due to sea level rise predicted between 2125 and 2139. Mapping is based on the cumulative rise from 2000 to 2125 and 2139, for the Upper End allowance estimate. This has been combined with the outputs of the Woodspring Bay model for both 2125 and 2139 undefended scenarios.

LiDAR data (Digital Terrain Model (DTM) at 1m resolution) have been used to identify existing tide levels and predicted tidal flood extents outside of the extents of the Woodspring Bay Model. Table 5.8 summarises the current and future average tide levels for the five North Somerset coastline sections.

For this SFRA, detailed hydraulic modelling has only been undertaken for the Woodspring Bay model area, in other areas a GIS exercise has been used to assess the impact of climate change on sea level rise, therefore, predicted flood extents shown in North Somerset Planning Map are intended as a guide for areas outside of the Woodspring Bay model extents. Developers should undertake site-specific FRAs to demonstrate that the proposed development is appropriate.

Table 5.8: Current and future (with climate change) average tide levels for the five North Somerset coastline sections taken from The Environment Agency's Coastal Flood Boundary Conditions 2018 dataset (Link to EA Coastal Flood Boundary Conditions Report)

Coastline Section	Current level (m AOD)	Sea level rise increase to 2125 (m)	Future level (with climate change) (m AOD)
Portishead to Clevedon	8.36	1.62	9.98
Kingston Seymour and Wick St. Lawrence	7.61	1.62	9.23
Middle Hope	8.19	1.62	9.81
Sand Bay	8.22	1.62	9.84
Weston Bay	8.36	1.62	9.98

5.9.4 Offshore wind speed and extreme wave height

Increases in water depths and alterations in storm patterns across the UK may cause changes in wave height along the coast. Offshore wind speed and extreme wave height allowances have been stipulated for coastlines across England, for two epochs. In addition to the allowance, EA guidance suggests that a sensitivity test allowance is also planned for in developments where it is appropriate to apply a credible maximum scenario. Table 5.9 shows the offshore wind speed and wave height allowances.

Table 5.9: Offshore wind and Extreme wave height allowances for England

Applies throughout the English coast	2000 to 2055	2056 to 2125
Offshore wind speed allowance	5%	10%
Offshore wind speed sensitivity test	10%	10%
Extreme wave height allowance	5%	10%
Extreme wave height sensitivity test	10%	10%

Similar to surface water flood risk guidance, these allowances are based on the predicted lifetime of the development.

It is essential that developers consider the possible change in flood risk over the lifetime of the development because of climate change. According to the PPG, residential development should be considered to have a minimum lifetime of 100 years, unless there is specific justification for considering a shorter period. The lifetime of a non-residential development should depend on the characteristics of that development and developers would be expected to justify why they have adopted a given lifetime for the development, but a period of 75 years is likely to form a starting point for assessment.

In the absence of detailed hydraulic modelling or if the hydraulic modelling does not contain the relevant climate change return periods specified by the EA, the anticipated extent for Fluvial Flood Zone 3a (i.e. 1 in 100 (1%) AEP event) after the next 100 years can be expected to be approximated by the current Flood Zone 2 (i.e. 1 in 1000 (0.1%) AEP event) extent due to the predicted impacts of climate change. Similarly, those areas (and properties) that are currently at risk of fluvial flooding for the 1 in 100 (1%) AEP event (i.e. situated within Flood Zone 3a), may be susceptible to more frequent flooding in future years, corresponding to Fluvial Flood Zone 3b. Furthermore, there could be an increase in localised surface water flooding incidents due to the predicted impact of climate change on rainfall. Therefore in lieu of there currently being no climate change modelling available for surface water flooding, the low risk 1 in 1000 year outlines should be used as an approximation of the 1 in 100 year risk plus climate change. The above approach is appropriate for the purposes of a level 1 SFRA, however when performing a site-specific FRA, further detailed modelling outputs will need to be provided which comply to the EA's most recent climate change guidance.

Finally, the design standards of protection for coastal flood defences in North Somerset were estimated at the time of design and therefore, may be subject to change over time due to climate change.

6.0 Flood Risk in North Somerset

6.1 Current Levels of Flood Risk

The low-lying land of the Somerset Levels and potential threat of tidal inundation make flood risk a key issue within North Somerset. Approximately one third of the properties across North Somerset are located in areas at risk of flooding from rivers and the sea. The rapid onset of tidal flooding often results in more significant impacts of flooding compared to flooding from rivers.

A summary of key flood risk sources across several populated areas of North Somerset is included below. Flood Zone delineation across North Somerset can be found in, and North Somerset Planning Map surface water flood maps can be found on the EA's website.

6.1.1 Weston-super-Mare

Much of the existing urban area is located in Flood Zones 2 and 3, mostly on account of tidal flood risk. Exceptions are the Worlebury Hill area and the banks of higher ground behind the seafront. Surface water flood risk is particularly associated with the area surrounding Worlebury and Bleadon Hills.

Parts of the Weston-super-Mare area, mainly along the coastline, are indicated as being susceptible to groundwater flooding. Also, several events of sewer flooding have been recorded in Weston-super-Mare between 2005 and 2015 (see Section 5.8).

6.1.2 Banwell

The village and most of its immediate surroundings lie within Flood Zone 1. However, there is an extensive area of Flood Zone 3 to the north, related to the River Banwell, as well as the Severn Estuary and Somerset Levels. There are areas of surface water flood risk to the north of the village associated with local watercourses and rhynes.

6.1.3 Clevedon

The southern area of Clevedon falls entirely within Flood Zone 3, with tidal flooding from the Severn Estuary being the dominant flood risk to the town. Hydraulic modelling for fluvial watercourses is not available for the Land Yeo and Blind Yeo, because of this, fluvial Flood Zone 3a is considered as a proxy for Flood Zone 3b in this location. Surface water flooding within the town often occurs around large impermeable areas or

topographic depressions. Parts of Clevedon, mainly along the coastline, have also been indicated as being susceptible to groundwater flooding.

6.1.4 Nailsea and Backwell

The town and village are located in Flood Zone 1, however it is surrounded by land within Flood Zones 2 and 3. Much of the hydraulic model results for the area (The Land Yeo and River Kenn) contain 1 in 30 AEP results, derived from national scale modelling. There are also sections of the urban areas with surface water flood risk, these occur in flow routes which run from the east to the west of Nailsea and from the extensive catchment above Backwell. Additionally extensive areas of surface water flood risk lie within the town boundary. Groundwater emergency and ephemeral springs are also a hydrological feature of Backwell and can pose a risk of flooding to properties.

Areas around Nailsea are at risk of flooding should the Barrow Gurney reservoirs fail. However, the town itself, including all residential areas, is not within the zone predicted to flood.

6.1.5 Yatton and Congresbury

The area partly falls within Flood Zones 2 and 3, however most of the residential areas lie within Flood Zone 1. There is a section of fluvial Flood Zone 3b present within Congresbury, this is associated with the Congresbury Yeo and has limited extent. The Congresbury Yeo benefits from an informal flood storage area (‘Gang Wall’) which captures over-spilling from the watercourse.

There are also large areas at risk from surface water flooding at Yatton, Congresbury and Claverham. Large portions of surface water flood risk exist in the fields south of the railway, in the Stowey Rhyne catchment. To the south of Yatton in the valley of the Congresbury Yeo there are large areas of predicted surface water flooding in nearby fields. In Claverham, surface water flood risk occurs primarily in the impermeable areas of the town. The area mostly falls within 1km grid squares with 25% of their area susceptible to groundwater flooding.

Part of Congresbury and a small area of Yatton are at risk of flooding if Blagdon Lake failed. Also, there have been 16 sewer flooding events recorded within Yatton between 2005 and 2015, almost all of them being cases of external flooding. More than 50 sewer flooding events have been recorded in Wrington during the same period.

6.1.6 Portishead

A large area of the town, including the marina and much of the area south to it, lies within Flood Zones 2 and 3. The area of flood risk extends northeast to Portbury Wharf, where some areas around the seafront and the Royal Portbury Dock Flood Storage Area (FSA) are included in Tidal Flood Zone 3b. Also, Flood Zone 3 extends southwest through the Gordano Valley as far as Walton, parts of which are also fluvial in nature. The tidal flood zone 3b encapsulates the areas surrounding the Portbury Wharf Nature reserve. The only watercourse in the area containing a modelled flood zone 3b is the Portbury Ditch, which indicates that the functional floodplain closely follows this ditch. Areas of surface water flood risk exist mainly around the Portbury Ditch. Portishead is considered to be susceptible to groundwater flooding (<25% of 1km grid squares around Portishead and 25 to >75% of 1km grid squares around Portbury are susceptible to groundwater flooding).

6.1.7 Long Ashton

There are areas in Flood Zones 2 and 3, locally around the Ashton Brook, southeast of Long Ashton. Those areas in Flood Zone 3 are also considered to be the functional floodplain, as detailed hydraulic modelling results for the catchment were not available at the time of publication of this SFRA. Additional corridors of Fluvial Flood Zone 3 follow the Land Yeo to the west.

There are also areas of surface water flood risk within Long Ashton, as it contains several pluvial flow routes, in addition to surface water flood risk associated with the Ashton Brook and Land Yeo. The area is considered to be susceptible to groundwater flooding. Finally, areas around the urban area of Long Ashton and up to the edge of the residential area boundary, would be at risk of flooding in the event of the failure of Barrow Gurney reservoir.

6.1.8 Pill

Large parts of the area lie within Flood Zone 1. Areas adjoining the River Avon fall within Flood Zone 3 and also form part of the functional floodplain. A narrow corridor of Fluvial Flood Zone 3a, which for a small area along the NSC boundary forms part of the functional floodplain, extends south from the River Avon along the Markham Brook. There are areas of surface water flood risk in the centre of Pill, which are associated with local watercourses. The area mostly falls within 1km grid squares with 25% of their area susceptible to groundwater flooding.

6.1.9 Current Flood Risk in Steep Holm Island

The island of Steep Holm lies 9km off Weston-super-Mare and 5km from the tip of Brean Down within the Bristol Channel. It is owned and managed by the Kenneth Allsop

Memorial Trust. According to available mapping and aerial imagery, the island consists of steep, hard rock cliffs around its perimeter providing a level of protection against tidal flooding; freely available Light Detection and Ranging (LiDAR) data also indicates this. However, erosion around the seafront and cliffs is expected to affect the island, with climate change potentially increasing the rate of such phenomena.

Hydraulic modelling data for Steep Holm island was not available, at the time of publication of this Level 1 SFRA.

7.0 Flood Risk Management

7.1 Flood Risk Resilience

This section highlights the role of various bodies in relation to flood risk management and offers recommendations for each to ensure that flood risk is managed in a sustainable and resilient manner in the future.

The risk of flooding can never be fully eliminated, but the likelihood and consequences of flooding can be reduced through good management. One of the key aims of the Environment Agency National Flood and Coastal Erosion Risk Management Strategy is:

- Today's growth and infrastructure resilient in tomorrow's climate: Making the right investment and planning decisions to secure sustainable growth and environmental improvements, as well as resilient infrastructure.

The primary purpose of this SFRA is to inform decision making as part of planning policy and development management processes, taking due consideration of the scale and nature of flood risk affecting North Somerset. Responsibility for flood risk management resides with all tiers of Government, as well as individual landowners and developers, as outlined in Section 7.2.

7.2 Responsibilities for Flood Risk Management

There is no statutory requirement for the Government to protect property against the risk of flooding. Nevertheless, the Government recognises the importance of safeguarding the wider community and, in doing so, the economic and social wellbeing of the nation. Following the Pitt Review into the flooding of summer 2007 and subsequent Flood Risk Regulations 2009 and FWMA 2010, new responsibilities for managing flood risk have been assigned to local authorities, the Environment Agency and others.

Several partners manage flood risk within North Somerset and the key responsibilities of the primary groups relevant to this SFRA are:

7.2.1 Environment Agency

Provides a strategic overview of all sources of flooding. Under its permissive powers, it oversees flood risk management activities on Main Rivers, regulating reservoir safety, and working in partnership with the Met Office to provide flood forecasts and warnings. The Environment Agency is a statutory consultee for planning applications and assists the spatial planning and development management process through the provision of information and advice regarding flood risk and related issues.
A Flood Risk Activity Permitting (FRAP) is required for development close to Main River or coastal defences.
Link to FRAP guidance: Flood risk activities: environmental permits - GOV.UK (www.gov.uk)

7.2.2 North Somerset Council:

As the **Lead Local Flood Authority (LLFA),** NSC is responsible for the coordination of local flood risk management across its administrative area. This coordination covers development, asset maintenance, application and monitoring of a strategy for local flood risk management, a duty to maintain a register of flood risk assets and a duty to contribute towards the achievement of sustainable development.
It also grants land drainage consents outside of the IDB District.
https://n-somerset.gov.uk/business/licences-permits/other-licences-permits/land-drainage-consent

NSC is also the **local planning authority** and is responsible for developing an SFRA which should consider the risk of flooding from all sources throughout North Somerset and inform the allocation of land for future development, development management policies and SAs. NSC is responsible for determining local planning applications and must consult with the Environment Agency, where appropriate, when making planning decisions.

As a **Highway Authority**, NSC is responsible for providing and managing highway drainage and roadside ditches and must ensure that road projects do not increase flood risk.

As an **Emergency Management Unit**, NSC duties fall under the Civil Contingencies Act 2004. Responsibilities include developing and maintaining emergency plans, making

sure public information is available and conducting emergency exercises to ensure NSC's and partner organisations' emergency response.

7.2.3 Internal Drainage Boards

Somerset Drainage Boards Consortium: The SDBC manages the operations of three drainage boards in Somerset:

- Axe Brue Internal Drainage Board;
- Parrett Internal Drainage Board; and
- North Somerset Levels Internal Drainage Board.

Of these the North Somerset Levels Internal Drainage Board (IDB) and Axe Brue IDB fall within North Somerset.

Under the land Drainage Act 1991 the SDBC manages water levels to protect people, property and the environment. It undertakes maintenance and improvement works and grants land drainage consents. Planning applications are made available to the Board for comments; as a non-statutory consultee in the process the Board does not have the power to grant or reject a planning application but will advise that any proposed development will not increase flood risk, adversely affect water level management or restrict the Board's ability to maintain any watercourse.

7.2.4 Water companies

Wessex Water and Bristol Water are sewerage and water undertakers and are responsible for managing the risks of flooding from surface water, foul or combined sewer systems and water supply systems respectively.

7.2.5 Landowners and Developers

Landowners and developers have the initial responsibility for protecting their land against the risk of flooding. They are also responsible for managing the drainage of their land such that they do not adversely impact upon adjoining properties. The section below also explains riparian responsibilities for flood defences.

7.3 Flood Defences

The Environment Agency Flood Map for Planning (Rivers and Sea) does not take account of the presence of raised defences. However, when determining the suitability of a development proposal, the NPPF requires that a planning application demonstrates that any residual risk (e.g. resulting from the failure, overtopping or abandonment of a

flood defence) can be safely managed. This consideration will be included when the Level 2 SFRA is developed for allocation sites, if appropriate. This aspect should also be considered when developing site-specific FRAs.

This Level 1 SFRA has considered the presence of flood defences in delineating Flood Zone 3b (functional floodplain). Fluvial Flood Zone 3b has been mapped based on the defended scenarios of hydraulic models, where these were available (see Table 5.3). Tidal Flood Zone 3b has been mapped where tidal flooding (i.e. Tidal Flood Zone 3a) is predicted to occur on the seaward side of the raised coastal defences.

In the complex urban and rural environments in which we live, both natural and manmade features can affect the routing of flood waters. Some may have been specifically constructed (i.e. known as 'formal') for the purpose of managing water flow and reducing flooding (e.g. flood embankments, culverts and sluices). Formal flood defences within North Somerset are indicated on North Somerset Planning Map. The figure additionally indicates the Areas Benefiting from Defences (ABDs), as published by the Environment Agency. This dataset shows those areas that benefit from the presence of defences in a 1 in 100 (1%) chance of flooding each year from rivers; or 1 in 200 (0.5 %) chance of flooding each year from the sea. Also shown is the standard of protection of defences within North Somerset estimated at the time of construction and does not taken into account the impact of climate change.

Other structures may have been built for a different purpose (i.e. known as 'informal') but still affect overland flowpaths (e.g. buildings, garden walls, railway embankments) despite not being maintained for this specific purpose. These structures and features have not necessarily been included in the defended and undefended hydraulic modelling. However, the impact of their failure would need to be considered by new development.

The Environment Agency (or any other risk management authority) has no statutory responsibility to maintain Main Rivers (and/or flood management assets) within the UK. This remains the responsibility of the riparian landowner. The Environment Agency retains 'permissive powers' however and using these powers may carry out a programme of monitoring and maintenance.

Other flood management assets (e.g. culverts) have also been identified across North Somerset. It is important to recognise the function of these assets and to ensure that their functionality is maintained. Assets should be carefully reviewed in a local context as part of detailed site-specific FRAs.

Within protected areas there will always be a residual risk of flooding. This may be due to an extreme event that exceeds the standard of protection of the asset, changing

climatic conditions that increase the frequency and severity of flooding, a structural failure, or flooding behind the asset (e.g. due to elevated groundwater levels). It is incumbent on both NSC and developers to ensure that the standard of protection and good condition of flood risk management assets provided within new development can be assured for the lifetime of the developments.

7.4 Flood and Coastal Erosion Risk Management (FCERM) Capital Schemes

The current 6-year flood and coastal erosion risk management (FCERM) investment programme runs from 1 April 2021 to 31 March 2027 and aims to reduce the risk of flooding and coastal erosion to at least 3360,000 homes. This includes risk of flooding from rivers, the sea, groundwater and surface water. The Environment Agency regularly reviews the programme to take into account changes such as serious flooding, local partnership funding contributions and new flood risk information.

The asset management information online dataset (Link to Asset Management Dataset) published by the Environment Agency, lists the schemes that form part of the 6-year FCERM capital investment programme, including information on their expected completion timeline and number of homes to be protected, and identifies the capital schemes that have already been completed.

7.5 Surface Water and Sustainable Drainage Systems (SuDS)

SuDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment, thereby providing multiple benefits. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings.

The CIRIA SuDS Manual (C753) (Link to the CIRIA SuDS Manual) should be the starting point for the design of any surface water drainage scheme in North Somerset and the LLFA will assess applications against the requirements within the manual.

Local SuDS Standards Exceeding National Requirements

In addition to the minimum requirements set out in the *National Standards for Sustainable Drainage Systems (SuDS)* (DEFRA, June 2025), the following enhanced local standards apply within North Somerset to reflect the specific hydrological sensitivities, regulatory context, and long-term maintenance challenges of the area:

1. Control of Runoff in the Cross Rhyne and Banwell Catchment

For developments within the Cross Rhyne and Banwell catchment, surface water runoff must be restricted to the **1 in 1 year greenfield runoff rate** for all rainfall events up to and including the 1 in 100 year event plus climate change.

Justification: This approach reflects the known downstream flood risk, conveyance limitations and tidal boundary constraints within the River Banwell and Cross Rhyne system. It goes beyond the national standard (which allows greenfield-equivalent discharge) by ensuring a highly conservative runoff rate is applied across all storm return periods to protect existing drainage infrastructure and reduce cumulative risk.

2. Restriction of Discharge Volumes

The volume of runoff discharged from new development should be controlled using long-term storage techniques or attenuated to the greater of 2 litres per second per hectare (2 l/s/ha) or Qbar (mean annual peak flow) in IDB catchments.

Justification: While the national standard permits greenfield rates or long-term storage, this local standard imposes a maximum threshold that accounts for receiving network constraints.

3. Prohibition of Underground Storage for Greenfield Sites

Underground storage systems are not appropriate for greenfield developments in North Somerset and will not be supported.

Justification: The national standards support a surface-based SuDS approach but do not prohibit underground structures. Locally, the prohibition of underground storage ensures that SuDS deliver multiple benefits in line with planning policy objectives, including biodiversity, water quality enhancement, and integration into public amenity spaces. It also minimises long-term maintenance risks associated with inaccessible buried infrastructure. The biodiversity requirements in North Somerset are such that open water habitat is required in all new developments.

4. Site Flooding Criteria for Design Events

Drainage systems must be designed to ensure that:

- No part of the development site floods in a 1 in 30 year rainfall event plus climate change, and

- No property or primary access route floods in a 1 in 100 year event plus climate change.

Justification: The national standards require no internal property flooding for the 1 in 30 year event and safe exceedance for rarer events. The North Somerset standard strengthens this by requiring no surface flooding for lower-order areas and full protection of key infrastructure during more extreme events. This reflects the importance of maintaining emergency access and public safety, particularly in locations susceptible to overland flow and constrained drainage outlets.

5. Buffer Zones Around SuDS and Watercourses

All ponds, attenuation basins, and other surface water features must be set within a minimum 5 metre development-free buffer, with access provided for inspection and maintenance. For watercourses within Internal Drainage Board (IDB) areas, a 9 metre buffer applies to viewed rhynes and 6 metres for all other watercourses, unless otherwise agreed.

Justification: While national standards promote accessibility and maintenance, they do not define buffer widths. The locally defined buffers align with biodiversity and access requirements in the North Somerset *Biodiversity and Trees SPD* and are essential to facilitate routine maintenance, reduce ecological disturbance, and ensure compliance with IDB access policies.

6. Outfall Design Criteria

Outfalls from SuDS must be:

- Positioned above normal summer water levels for ordinary rainfall events, and
- Designed to surcharge only during a 1 in 1 year return period event or greater.

Justification: This goes beyond national expectations by requiring a higher operational resilience for discharge structures, avoiding backwater effects during frequent rainfall and ensuring outfalls function under normal operating conditions without dependence on surcharge behaviour. This is particularly important in IDB-managed catchments where base water levels may already be elevated due to penning water levels higher in the summer.

7. Maintenance Plan Requirements

A site-specific management and maintenance plan must be provided for all SuDS features. The submission of generic maintenance schedules copied from CIRIA C753 will not be accepted.

Justification: National standards require maintenance planning but allow significant flexibility. In North Somerset, all drainage submissions must include a plan that clearly sets out who is responsible for each SuDS element, how access will be maintained, and how ongoing performance will be assured. This ensures clarity for future owners, avoids post-construction ambiguity, and supports long-term adoption, inspection and maintenance that will support the biodiversity requirements of the development.

These enhanced standards are necessary to secure the long-term resilience, biodiversity gain, and functionality of sustainable drainage systems across North Somerset. They respond to locally observed risks and align with the principles of planning policy, including the NPPF and associated Planning Practice Guidance

8. Integrated Surface Water and Groundwater Modelling Requirements

Where there is significant surface water flood risk, and either (i) an interaction with groundwater flooding is anticipated or (ii) local known issues are present, the drainage strategy and flood risk mitigation must be supported by:

• Pre-construction 2D hydraulic modelling (baseline and proposed), demonstrating flood risk to the site and surrounding area for relevant design events (including climate change), and
• Post-construction 2D hydraulic verification modelling (as-built), demonstrating that the constructed scheme performs as modelled and does not increase flood risk on- or off-site.

The LLFA will provide details of where these areas apply. Applicants should seek the LLFA's view at pre-application stage to agree the modelling scope, extent and assumptions (including any off-site contributing catchments and flow pathways that materially influence the site).

Justification: This goes beyond national expectations by requiring a proportionate, catchment-aware demonstration of residual and exceedance risk where complex interactions (notably high groundwater, limited infiltration capacity, or known local flow routes) can materially change surface water behaviour. It ensures that layout, levels and SuDS are evidenced to be effective for the lifetime of the development, and that the development will be safe without increasing flood risk elsewhere, aligning with the NPPF and associated Planning Practice Guidance approach to managing flood risk from all

sources and with the principles of early, integrated surface water design set out in the national SuDS standards.

9. Hydrogeological Study Requirements (Groundwater, Springs and Mercia Mudstone)

In areas of groundwater flood risk where springs are present and Mercia Mudstone is present, a hydrogeological study must be submitted to inform the drainage strategy and flood risk assessment. The study must:

• Characterise groundwater levels and seasonal variability (including monitoring where necessary),
• Identify spring sources, pathways and potential re-emergence locations (on and off site),
• Demonstrate the suitability (or otherwise) of infiltration and below-ground storage (including interaction with maximum likely groundwater levels), and
• Set out mitigation measures to avoid increased groundwater flooding, instability, seepage-related impacts, or adverse effects on water quality and receiving waters.

Justification: This goes beyond national expectations by requiring site-specific evidence where low-permeability strata, spring lines and shallow/perched groundwater can create complex and sensitive conditions, and where development earthworks, drainage features and landscaping can alter pathways and trigger new or worsened flooding mechanisms. A hydrogeological study provides the necessary basis to determine appropriate runoff destinations and constraints on infiltration, and supports compliant design and long-term performance in accordance with the NPPF, associated Planning Practice Guidance, the national SuDS standards, and good practice guidance in CIRIA C753.

7.6 Emergency Planning

NSC, as a local authority, is designated as a Category 1 Responder under the Civil Contingencies Act 2004 and as such has a legal duty to:

- assess the risk of emergencies occurring and use this to inform contingency planning;
- put in place emergency plans;
- put in place business continuity management arrangements;
- put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency;

- share information with other local responders to enhance co-ordination;
- co-operate with other local responders to enhance co-ordination and efficiency; and provide advice and assistance to businesses and voluntary organisations about business continuity management.

The Environment Agency monitors river levels within the Main Rivers affecting North Somerset. Based upon an in-house forecasting computer model, the Environment Agency assesses the maximum water level that is likely to be reached during an anticipated flood event, which can extend from a few hours to several days. Where these predicted water levels are expected to result in the inundation of populated areas, the Environment Agency will issue a series of Flood Warnings (see Section 7.7) within defined Flood Warning areas, encouraging residents to act to avoid damage to property in the first instance.

In addition to the Environment Agency Flood Warning service, the Flood Forecasting Centre (a partnership between the Environment Agency and the Met Office) forecasts for natural forms of flooding – river, surface water, tidal and groundwater. A daily Flood Guidance Statement provides information for Category 1 and 2 responders to help with emergency planning and resourcing decisions. It presents an overview of the flood risk across five days and identifies possible severe weather, which could cause flooding and significant disruption to normal life. These forecasts, combined with understanding of the areas at highest risk provided by the level 2 SFRA can inform emergency planning for all sources of flooding.

In the context of emergency planning, a major emergency is any event (happening with or without warning) causing or threatening death or injury, damage to property or the environment or disruption to the community which, because of the scale of its effects, cannot be dealt with by the emergency services and local authority as part of their day-to-day activities. This may include severe flooding.

In the event of a severe flood emergency, the local authority will endeavour to keep its services operating normally whilst responding to requests for assistance from the emergency services. Requests may include the provision of:

- rest centres (temporary accommodation, usually a school, leisure centre or other community facility) for use by anyone affected by the incident;
- emergency transport;
- emergency feeding;
- public information;
- temporary mortuaries (in a mass fatalities incident);

- specialist advice, for example engineers, planners, surveyors, trauma and after care; and
- support for the police in terms of evacuating people, site clearance, road closures.

North Somerset Council will activate its Major Incident Response Plan and core response plans such as the NSC Evacuation & Transport Plan and NSC's Welfare & Shelter Plan to mitigate the impacts of an emergency occurring and are the lead organisation in respect of the recovery effort.

7.6.1 Evacuation key considerations

In areas of tidal and fluvial flood risk a Flood Warning and Evacuation Plan may be required.

Dry access (i.e. above both defended and undefended design flood level plus climate change) should be sought wherever possible to ensure that all residents can be safely evacuated in times of flood. A Flood Warning and Evacuation Plan must be in place, suitable to the type of development, where there is no safe dry access to/from the site (i.e. access through Flood Zone 1). The PPG states that the ability of residents and users to evacuate before the design flood with allowance for climate change must be assessed.

Emergency Planners have a role through the planning approval process to assess the adequacy of safe access plans for new developments.

The emergency planners will have to take this into account to ensure the developer has considered this carefully in their proposals and that the plans are appropriate for future users.

In a district wide extreme event, residents may be asked to stay in place if they have a first floor safe refuge and evacuation will be focused on the most vulnerable.

7.6.2 Safe refuge

If development floor levels cannot be raised above the undefended design flood event plus an allowance for climate change, then a residual risk of flooding will remain and a safe refuge must be design into the fabric of any buildings that form part of the development proposals. The safe refuge is a place where the occupants of the building can go to in the event of a flood and wait for either the flood event to pass or to be rescued.

The safe refuge must:

- Be large enough for all the occupants to be able to lie down.
- Have light and power.
- Where possible have access to a clean water supply.
- Have access externally at the same level as the refuge.

7.7 Flood Warning

The Environment Agency Flood Warning Service operates in areas at risk of flooding from rivers and the sea. In select locations, the Environment Agency provides a groundwater Flood Warning and alert service, targeted on communities that are known to be at risk or have previously experienced groundwater flooding. The areas within North Somerset where Flood Warnings and Flood Alerts operate are indicated on North Somerset Planning Map.

The Environment Agency issues three Flood Warning codes referring to three different warning stages of flood risk. These are categorised in Table 7.3.

Table 7.3: Environment Agency Flood Warning Stages

Flood Warning Stage	Symbol	Description	What it means	What to do
Flood Alert		Flooding is possible. Be prepared.	Possibility of flooding to low lying land and floodplain areas.	Be alert, stay vigilant and make early preparations for flooding.
Flood Warning		Flooding is expected. Immediate action required.	Expected flooding to homes and/ or businesses.	Individuals and organisations should take immediate action to protect themselves and/ or their property.
Severe Flood Warning		Severe Flooding. Danger to life.	Expected severe flooding with extreme danger to life and property.	Act on your flood plan. Listen to emergency services. Follow evacuation procedures where applicable.

'Flood Alert' is used to pre-warn for different levels of impending flooding. Flood Warning' is used when flooding is expected within the flood warning area. 'Severe Flood Warning' is used when there is a significant risk to life or significant disruption to communities. There is also a 'Flood Warning No Longer in Force' message available for areas where 'Flood Warning' and 'Flood Alerts' have been removed during the last 24 hours.

The Flood Alert and Flood Warning Area datasets are published by the Environment Agency and available to download from data.gov.uk. Flood Alert Areas are geographical areas where it is possible for flooding to occur from rivers, the sea and in some locations, groundwater. Flood Warning Areas are geographical areas where flooding is expected to occur and where a Flood Warning Service is provided; they generally contain properties that are expected to flood should a flood event occur.

7.8 Breach Modelling

Limited breach modelling has been undertaken to understand the residual risk of flood and the potential impact of a breach.

Breach set up

Breach modelling was completed to assess the flood risk from a defence failure or removal. In some cases, the flooding from a defence failure can be more extensive than the full defence removal (undefended) scenario, due to the presence of the flood defences alongside the channel preventing the floodwater from entering the floodplain, thereby increasing levels in the channel. When the defence fails, the higher water levels in the channel pour through the breach at high velocity and this can cause extensive flooding.

Breach modelling was completed for two locations following EA breach modelling guidance (2021). For reference, all breach model parameters are summarised in Table 7-5 and the breach locations are shown on Figure 7-3.

The assessment included climate change higher central (HC) and upper end (UE) allowances.

Table 7-1: Breach model parameters

Location	Defence Type	Breach width (m)	Time to closure (Hours)	Defence crest/ ground level (mAOD)	Trigger level (mAOD)
WSB Breach 01	Open Coast Embankment	200	44	8.83/ 6.33	7.58*
WSB Breach 02	Samson Sluice Gate	N/A	Open for duration	N/A	Open all
*Trigger level determined by half the height of the defence.					

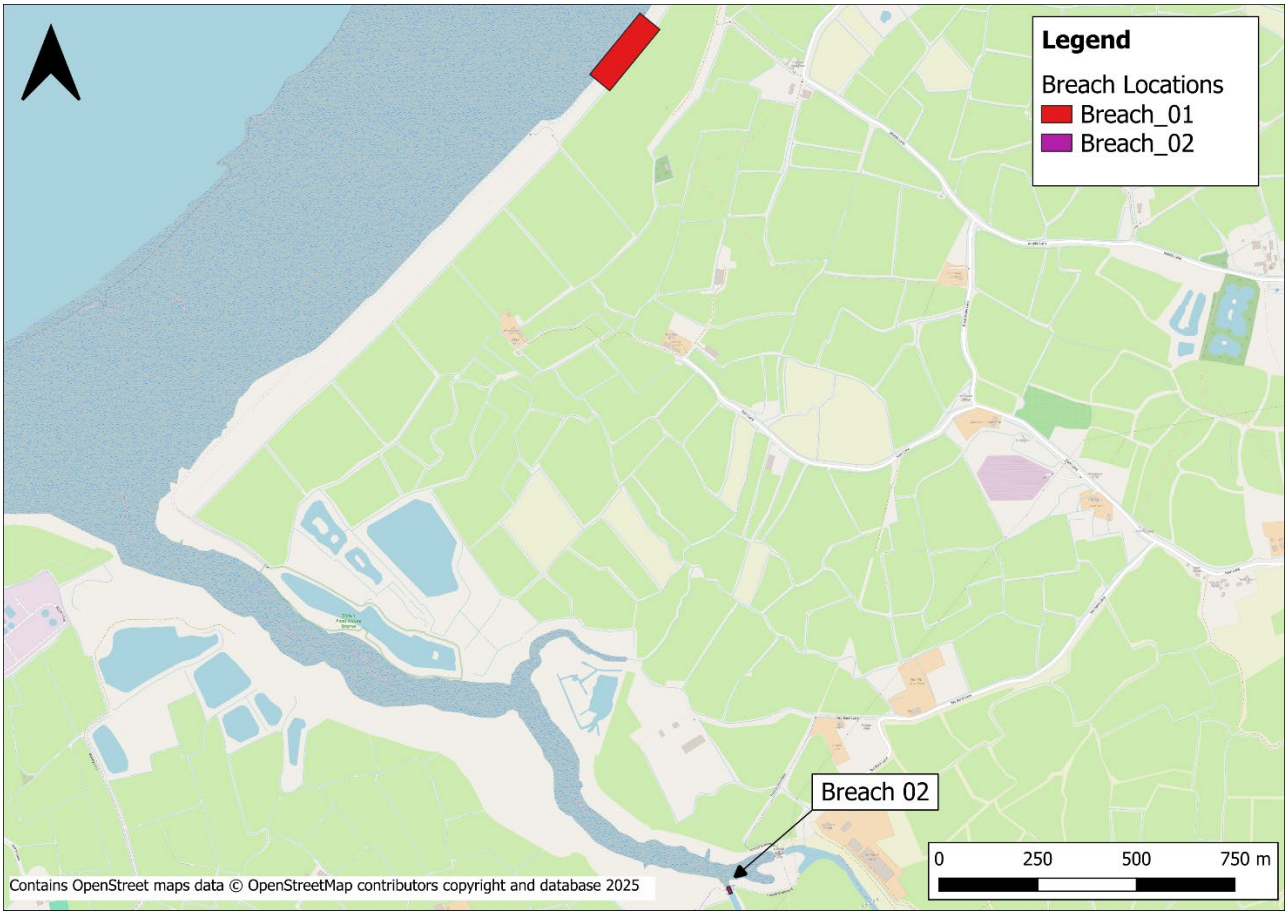

Figure 7-1: Woodspring Bay Breach locations

Breach 1 - 0.5% AEP with Wave Overtopping

The defended model results show widespread flooding impact for the present-day and all climate change events with the breach on the open coast (Figure 7-6). The modelling shows the flood risk from still water flooding and wave overtopping. Still water flooding is when the combined water level from the tide plus the surge is higher than the defence crest heights and water flows over the embankments. As sea level rises with increasing climate change epochs, and as most of the defences are lower than 9.5mAOD, there is widespread still water flood risk regardless of the breach. Figure 7-7 compares the flood extents from the lowest (present-day 0.5% AEP) with the highest (0.5% AEP 2125 UE) model event simulations.

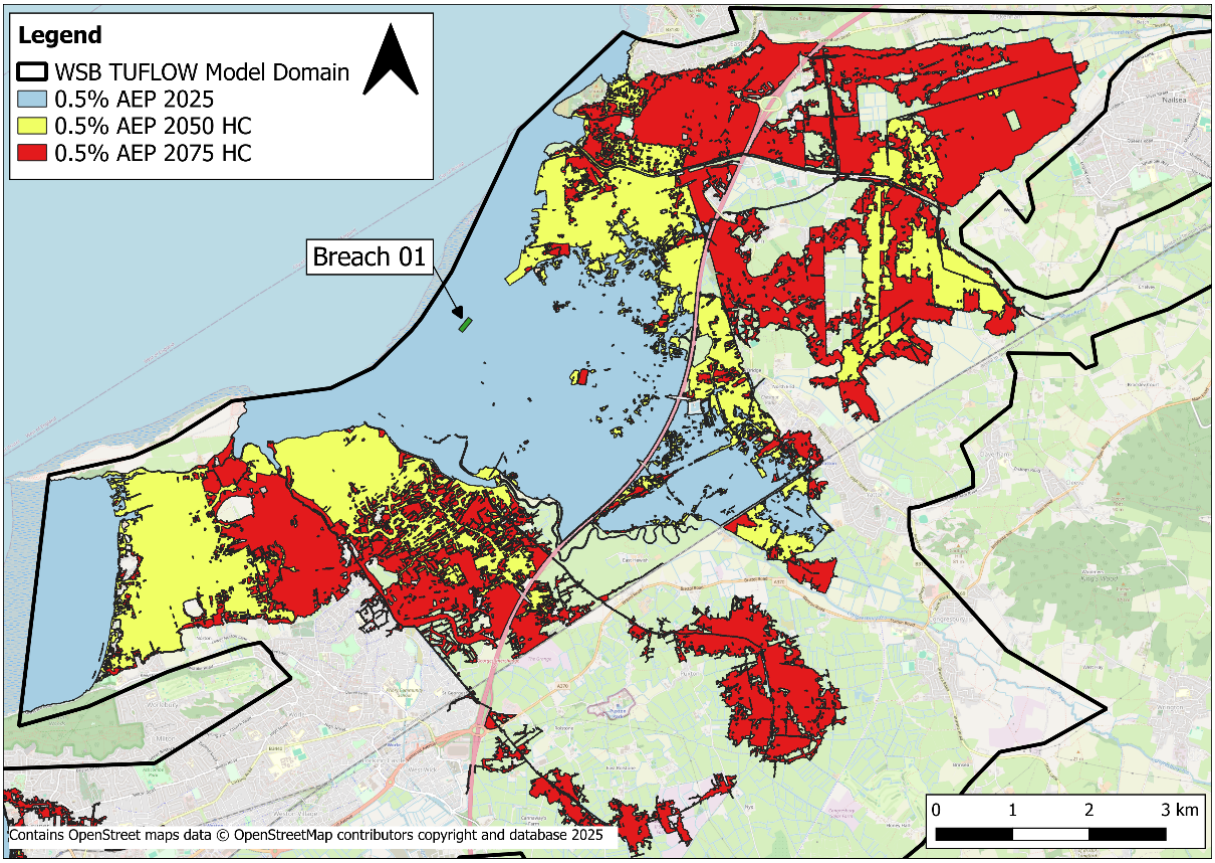

Figure 7-2: Breach 1 - 0.5% AEP event for present-day, 2050 HC and 2075 HC epochs.

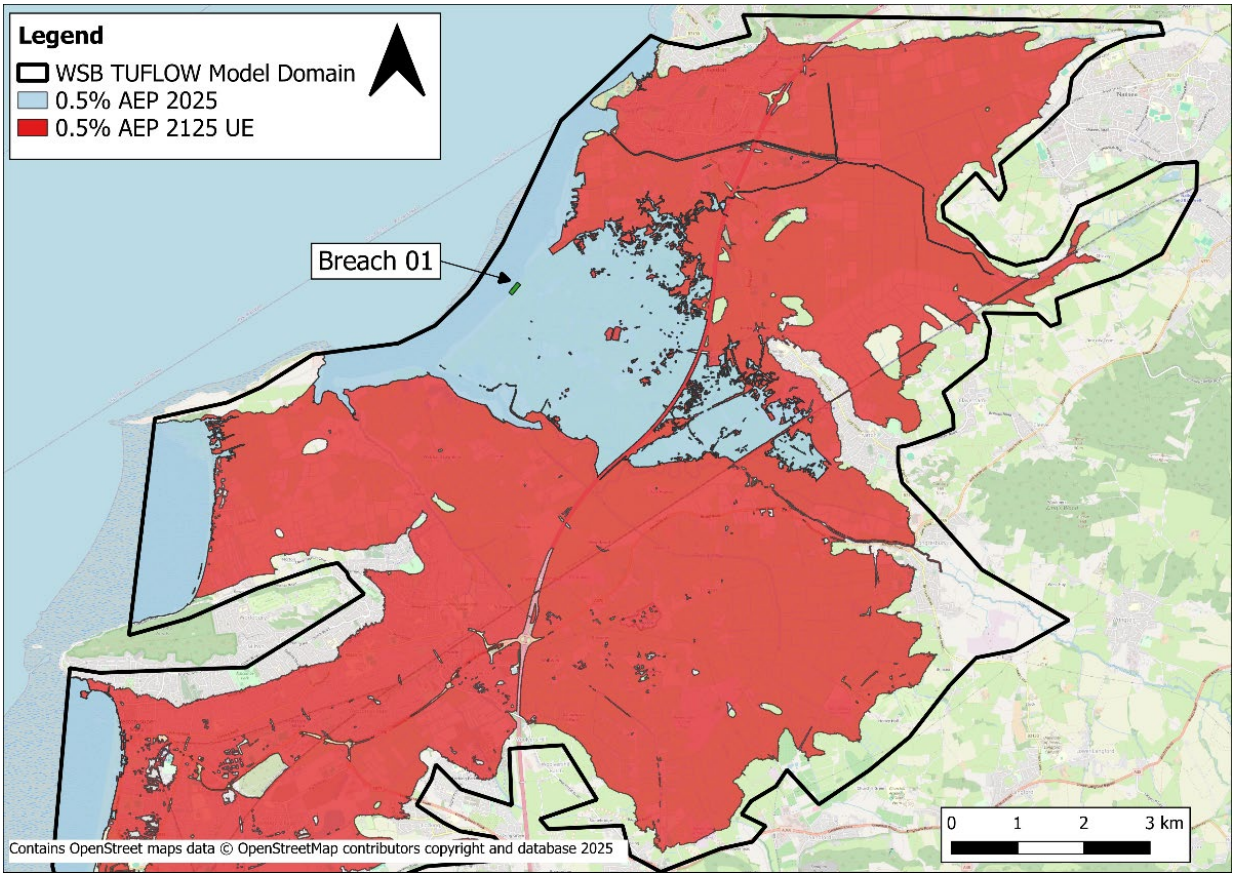

Figure 7-3: Breach 1 - 0.5% AEP event for present-day and the highest epoch simulated (2125 UE).

Time to inundation, Breach 1 - 0.5% AEP 2025 with Wave Overtopping

The model results also include time to inundation plots which show the amount of time into the simulation when the flood water depth first exceeds 0.01m in each model grid cell. For the 0.5% AEP Figure 7-8 shows the time to inundation from the initiation of the Breach. The results show the flood water takes 13 hours to reach the Kingston Seymour Sewage Treatment Works, 14 hours to reach Middle Lane Farm, 15 hours to reach Kingston Seymour and 37 hours to reach Yatton.

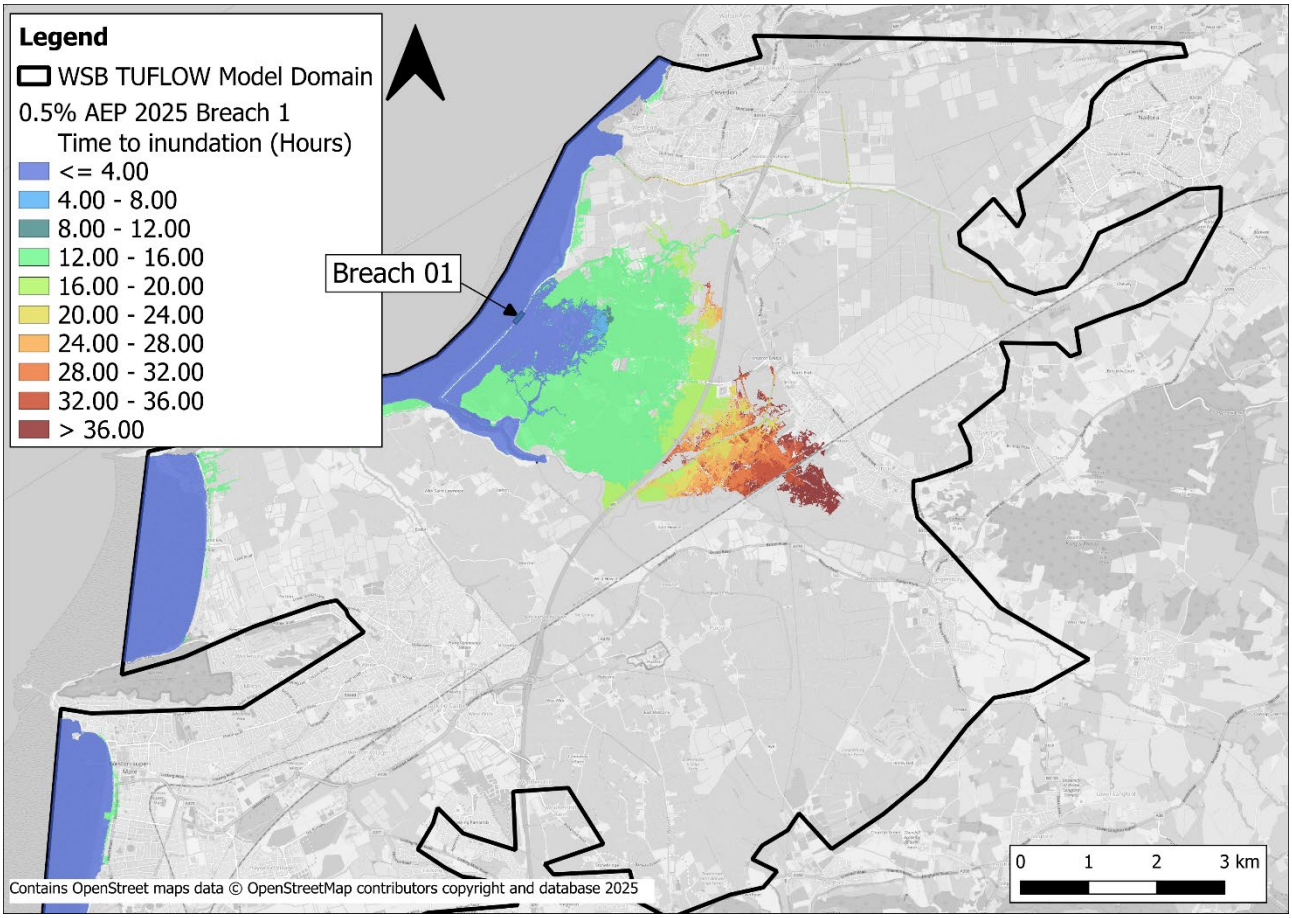

Figure 7-4: 0.5% AEP event in 2025 showing the time to inundation for Breach 1

Time to inundation, Breach 1 - 0.5% AEP 2125 UE with Wave Overtopping

In the 0.5% AEP event in 2125 with the UE uplifts, shown in Figure 7-9, the results show the flood water takes 13 hours to reach the Kingston Seymour Sewage Treatment Works and Middle Lane Farm, 13.5 hours to reach Kingston Seymour, 21 hours to reach Yatton and 27 hours to reach Congresbury.

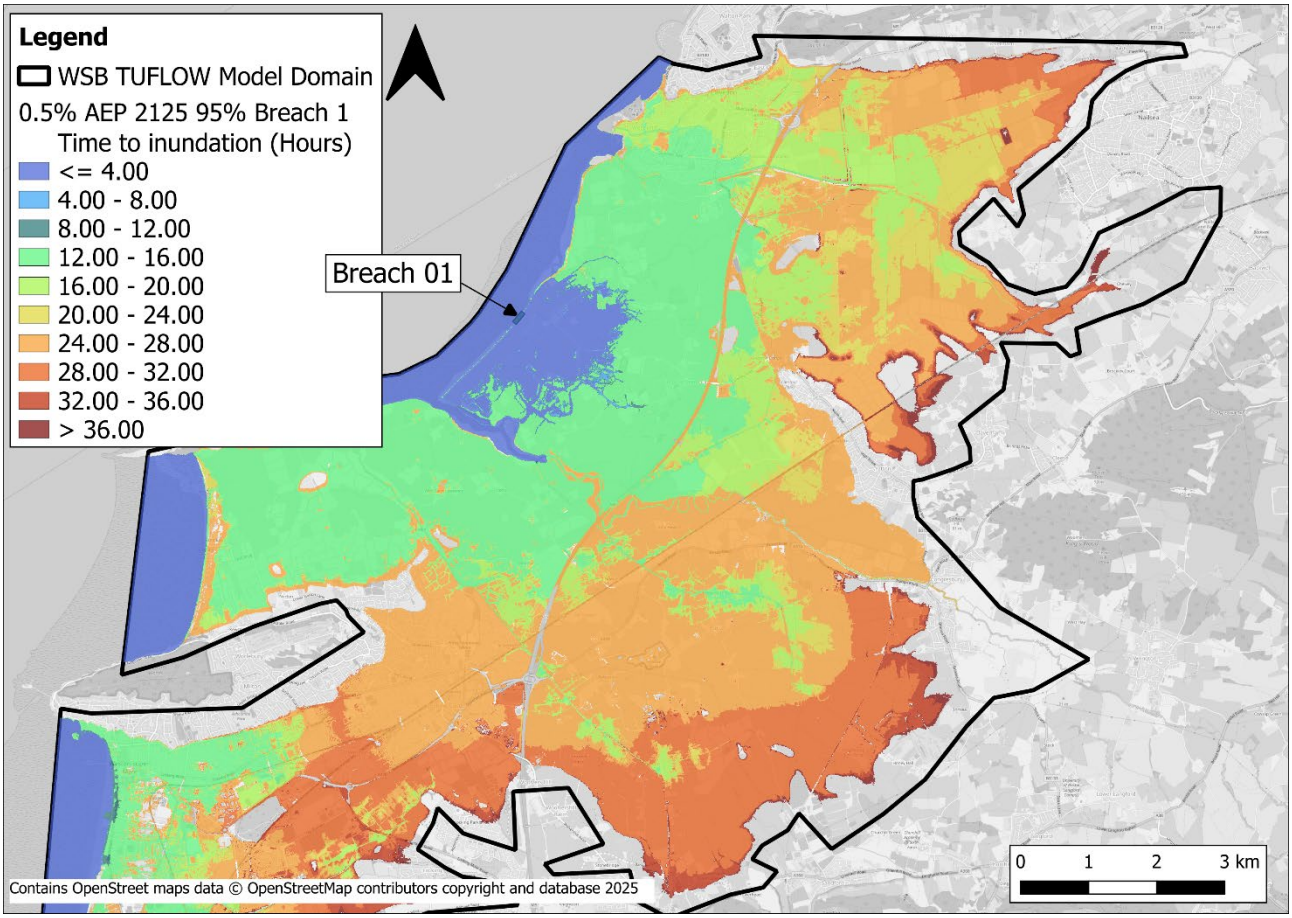

Figure 7-5: 0.5% UE AEP event in 2125 showing the time to inundation for Breach 1

Breach 2 - 0.5% AEP with Wave Overtopping

The defended model results for the present-day 0.5% event with the open culvert shows similar flooding to the present-day MHWS event (Figure 1-5). However, with increasing sea level rise and climate change epochs the flood extents increase, as shown in Figure 7-10. The flood risk is from both still water flooding and wave overtopping. As sea level rises with increasing climate change epochs, and as most of the defences are lower than 9.5mAOD, there is widespread still water flood risk regardless of the open culvert in the higher climate change epochs. Figure 7-11 compares the flood extents from the lowest (present-day 0.5% AEP) with the highest (0.5% AEP 2125 UE) model event simulations.

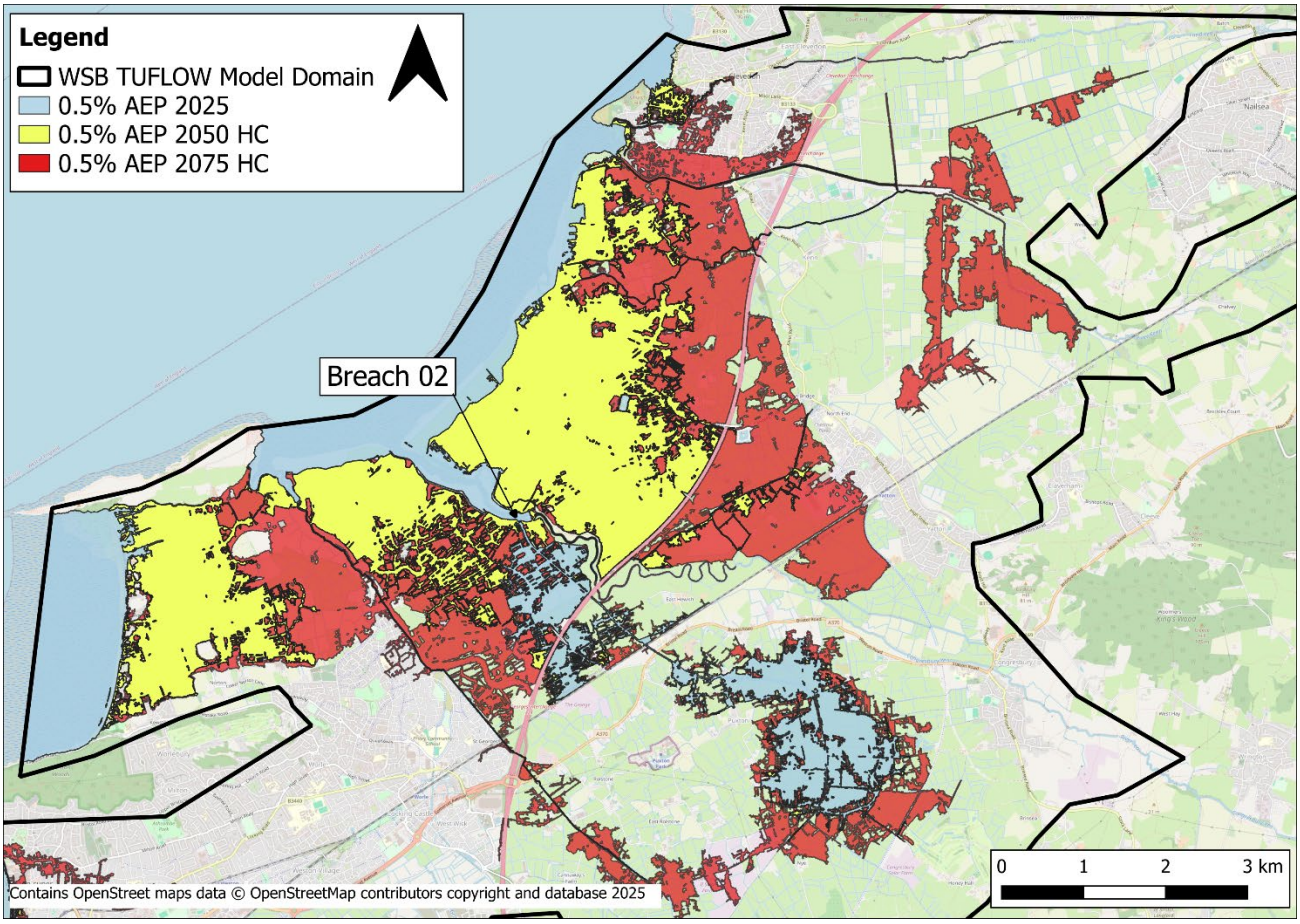

Figure 7-6: Breach 2 - 0.5% AEP event for present-day, 2050 HC and 2075 HC epochs.

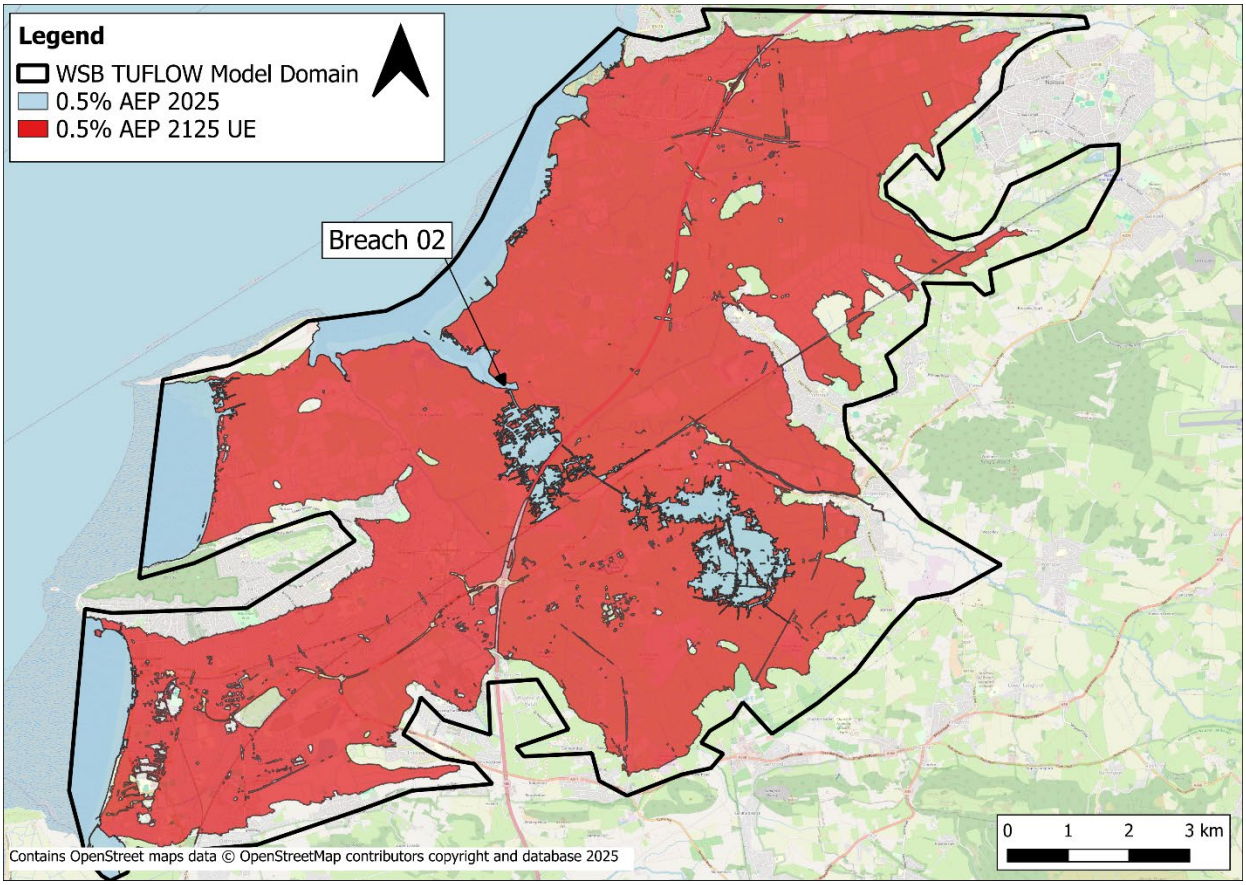

Figure 7-7: Breach 2 - 0.5% AEP event for present-day and the highest epoch simulated (2125 UE).

Time to inundation, Breach 2 - 0.5% AEP 2025 with Wave Overtopping

Figure 7-12 shows the results for the time to inundation in the 0.5% AEP event for Breach 2. With the flapped outfall removed the floodwater travels up the Oldbridge River channel and floods Sluice Farm after 2 hours. The floodwaters reach Willow Farm after 14 hours, the outskirts of Puxton after 27 hours and West Hewish after 28 hours.

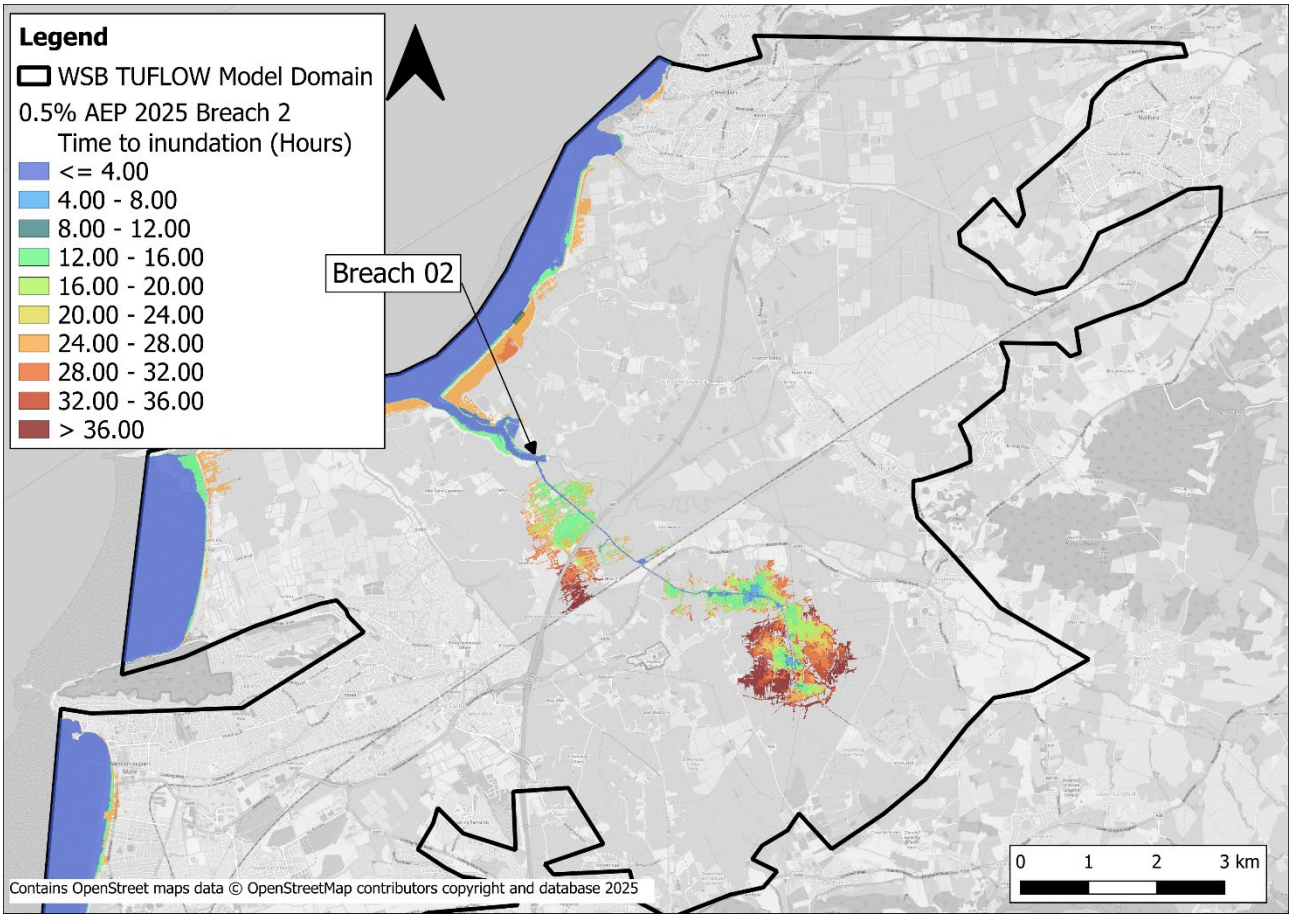

Figure 7-8: 0.5% AEP event in 2025 showing the time to inundation grid for Breach 2

Time to inundation, Breach 2 - 0.5% AEP 2125 UE with Wave Overtopping

Figure 7-13 shows the results for the time to inundation in the 0.5% AEP event in 2125 for Breach 2. With the flapped outfall removed the floodwater travels up the Oldbridge River channel and floods Sluice Farm after 2 hours. The floodwaters reach Willow Farm after 5 hours, the outskirts of Puxton after 27 hours and West Hewish after 19 hours. In this climate change event additional communities are impacted, with the floodwater reaching the outskirts of Weston-super-Mare after 18 hours, East Hewish after 26 hours, Yatton 27 hours and Congresbury 29 hours.

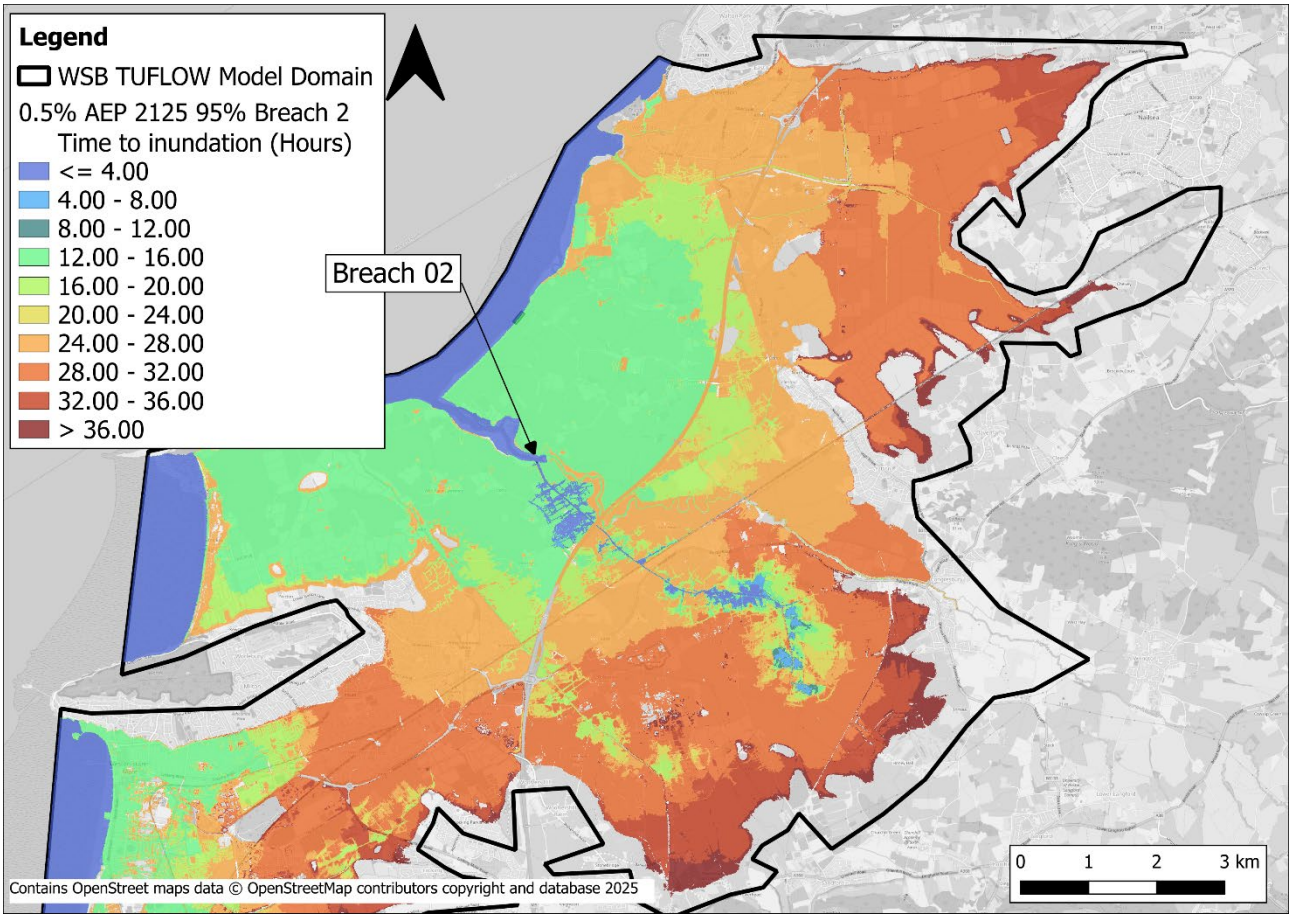

Figure 7-9: 0.5% UE AEP event in 2125 showing the time to inundation grid for Breach 2

7.9 Residual Risk of Flooding

It is essential that the risk of flooding is minimised over the lifetime of a development in all instances. However, it is important to recognise that flood risk can never be fully eliminated and there will always be residual risk of flooding. This residual risk is associated with several potential risk factors including (but not limited to):

- a flood event that exceeds the standard of protection for which the flood risk management measures have been designed;
- failure of flood risk management infrastructure due to poor maintenance or neglect or future abandonment/retreat, such as the breach in the defences discussed in the previous section; and
- general uncertainties inherent in the predictions of flooding, including climate change projections.

The SFRA has completed a review of all sources of flood risk within North Somerset to apply the Sequential Test, identifying several areas that are associated with a high probability of flooding. However, there are limitations in the methodologies used for flood prediction and the models developed are reliant upon observed flow data and calibration. It is incumbent that developers carry out a detailed site-specific FRA as part of the design process, including site specific breach modelling, where appropriate. A review of uncertainty should be undertaken as an integral outcome of this detailed investigation.

Under national planning policy (particularly paragraphs 159–169 of the NPPF and its accompanying Planning Practice Guidance), proposals in flood-prone locations must include a **residual risk assessment** that considers a breach or overtopping of any defences. In North Somerset, this residual risk is especially significant because large areas lie below current spring high tide levels. Where modelling also indicates velocities over a grass embankment exceed the acceptable threshold for plain grass cover, a breach becomes far more likely under climate change scenarios. Consequently, an "undefended" or breach-depth approach becomes essential in the Flood Risk Assessment (FRA), as summarised below:

7.9.1 Higher Residual Risk in North Somerset

Much of North Somerset's land lies below existing spring high tide levels. As a result, if a defence fails or is overtopped, floodwaters can reach dangerous depths. This is compounded by climate change, which projects even higher tide levels over time.

7.9.2 Defence Breach Likelihood

Modelling has shown velocities flowing over grass embankment defences may exceed what grass cover can sustainably resist. Consequently, the embankment could fail in a severe event, making a breach virtually inevitable at high flows.

7.9.3 Why Use Undefended (Breach) Depth?

Given these projected velocities and the land's low elevation, the FRA must treat the site as if the defence fails, this is especially true in areas benefitting from grassed embankments, where the risk of breach is higher, especially under climate change scenarios. This "worst-case" scenario (with a breach) identifies the actual depth and extent of flooding that could occur behind defences.

7.9.4 Implications for Site Specific Flood Risk Assessment

Applicants should model breach flood depths, velocities, and overland flow routes, accounting for climate change or use the undefended scenario if resources do not allow for site specific breach modelling.

The FRA must then propose mitigation: raising finished floor levels, designing flood-resistant construction, and establishing safe refuge or evacuation routes.

7.9.5 Planning Decision Consequences

Because of the region's below-spring-tide ground levels and the known weaknesses at high velocity, the local planning authority expects a thorough FRA that demonstrates safety even under extreme breach conditions.

Failure to adequately address these points can lead to refusal on flood risk grounds in accordance with NPPF policies.

In short, where significant portions of North Somerset lie below current spring tide levels and embankment modelling indicates breaching is likely, adopting an undefended flood risk depth in the FRA is essential. This ensures the development proposal fully considers and mitigates the genuine worst-case scenario in line with national policy. How that understanding of risk is translated into ground levels and design proposals is discussed elsewhere and is dependent on the level of residual risk and the location of the development.

7.10 Procedure for Considering Existing Flood Defences in North Somerset

North Somerset relies on a network of coastal and river flood defences of varying design, construction, and condition. Absent these defences, nearly a quarter of North Somerset's area would be under threat from tidal flooding. In line with Planning Practice Guidance (PPG), site-specific FRAs must account for both the defended scenario and residual risk (the 'undefended' scenario, or failure/overtopping of defences).

7.10.1 Planning Practice Guidance Overview

When assessing flood risk for development, FRAs should identify:

- **Operation, Funding & Maintenance** of flood defences over the development's lifetime.
- **Space for Future Maintenance or Upgrades** to accommodate climate change.

- **Consequence of Overtopping or Breach**, as well as the design standard of defences.
- **Adequacy of Flood Warnings**, ensuring occupants can respond effectively.
- **Presence & Upgrades of Flood Defences in the Future**, where feasible and funded.

Where flood defences are likely to be improved, the main driver for mitigation will be the risk of breach or failure of the improved defence. Otherwise, overtopping or breach must be modelled (or the undefended scenario used) to estimate potential flood depths and velocities.

7.10.2 Principles for Flood Risk in North Somerset

Fluvial Flood Risk:

- No residential development should be at risk of fluvial or surface water flooding (when including climate change allowances) following appropriate mitigation.

Tidal Flood Risk:

- Approach Varies by Location: In Weston-super-Mare, Clevedon, and Portishead, where regeneration is needed, external areas and access routes should reflect the wider area's flood risk.
- Ground Floor Sleeping: Where tidal flood depth exceeds 150 mm (in the defended scenario), ground floor sleeping accommodation is not permitted.

Data-Gathering Process for FRAs

When preparing an FRA, the following data sources and steps must be used to evaluate flood defences and residual risk.

Data Source 1: Defence Asset Type & Condition

- Access the Environment Agency Asset Management Database to determine the type and condition grade of nearby flood defences.
- Condition Grades range from 1 (very good) to 5 (very poor**):**

Grade 1 Very Good	Cosmetic defects that will have no effect on performance
Grade 2 Good	Minor defects that will not reduce the overall performance of the asset

Grade 3 Fair	Defects that could reduce performance of the asset
Grade 4 Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed
Grade 5 Very Poor	Severe defects resulting in complete performance failure

Data Source 2: Planned Defence Upgrades

- Contact the Environment Agency (WessexEnquiries@environment-agency.gov.uk) to see whether there are plans to upgrade local flood defences, including certainty of delivery.

Data Source 3: Deterioration Rate

- Use *Defra/EA Practical Guidance on Determining Asset Deterioration and the Use of Condition Grade Deterioration Curves (2014)*.
- Assume a medium maintenance regime (annual inspection/repair, target Grade 3).
- Model a medium rate of deterioration that accounts for progressive asset degradation over time.
- Present that information within the FRA.

Data Source 4: Undefended Scenario Depth & Hazard

- Identify flood depths and hazard ratings if the defences do not protect (breach, overtopping, or no maintenance).
- Where defences are unlikely to be upgraded to keep pace with climate change—particularly those in poor condition—the 'undefended' scenario effectively becomes the design scenario rather than just a residual risk.
- Climate change projections to use:
    - In urban areas where protected by hard defences use the Higher Central.
    - In rural areas outside of settlement boundaries where protected by grass embankments, use the Upper End.

Breach Modelling (If Proposed)

- For tidal flood risk in the North Somerset Levels and Moors, any breach model must assume a 5-day repair time over a spring tide cycle.

- If breach modelling is not performed, the undefended scenario should be used to assess and mitigate residual risk.

7.11 Practical Steps for Determining Floor Levels (Tidal Flood Risk Only)

In areas of tidal flood risk, particularly Weston-super-Mare, Clevedon, and Portishead (where the defences are hard defences and less likely to breach and the benefit cost ratio is such that future flood defence upgrades are more likely), follow these steps (*Note: Seek EA/LLFA advice for fluvial or other flood sources*):

In areas that are protected by grass embankments and dunes, particularly the coast between Kewstoke and Clevedon. The condition of the defences are poor and there are stretches that are no longer maintained by the Environment Agency, then the undefended rood risk with climate change should be used to determine the design flood event, in the absence of detailed breach modelling.

Step 1: Raise Ground Levels

- Raise ground levels above the defended design flood event (including climate change) plus 600 mm freeboard.
- This is expected in all locations unless site constraints make it impracticable.

Step 2: If Step 1 Is Not Possible

- Raise ground level as high as feasible under the site circumstances.

Step 3: Apply Design Criteria Based on Flood Depth Above Finished Floor Level (FFL)

Defended – highest flood depth including climate change (future flood risk):

Flood depth above finished floor level	**Flood resilient construction**	**Safe refuge**	**Ground floor sleeping accommodation**
0-150mm	Required	Possibly required see below	Acceptable
150-600mm	Required	Possibly required see below	Unacceptable
600mm plus	Discuss proposals with EA and LPA		

Undefended – highest flood depth including climate change (future flood risk):

Flood depth above finished floor level	Flood resilient construction	Safe refuge	Ground floor sleeping accommodation
0mm	Use defended criteria above only		
0-150mm	Not required	Not required	Acceptable
150-600mm	Required	Not required	Unacceptable
600mm - 2500mm	Required	Required	Unacceptable
2500mm plus	Discuss proposals with EA and LPA		

Step 4 - Flood Resilient Construction

FRAs must demonstrate:

- ***Water Exclusion Measures*** (e.g., barriers, sealed air bricks).
- ***Fabric Resilience*** (e.g., water-resistant materials, raised electrical sockets).
- Refer to the *CIRIA Code of Practice for Property Level Flood Resilience* for additional guidance.

Step 5 - Safe Refuge

When ***safe refuge*** is required:

- ***Size & Location:*** Must accommodate all occupants lying down, have light and power, and, if possible, a clean water supply.
- ***External Access:*** A window or door at the refuge level for rescue if the area is flooded.
- ***Blocks of Flats***: Ground floor dwellings cannot rely on upper flats for refuge; a dedicated refuge area is essential.

Step 6 - Safe Access

- ***Access Routes***: Position above design flood levels if possible.

  Depth & Velocity Constraints:
  - Private vehicles: max 150 mm depth, <1 m/s velocity.
  - Ambulance: max 300 mm depth, <1 m/s velocity.
  - Fire tender: max 600 mm depth, <1 m/s velocity.

Step 7 - Emergency Planning & Warning Systems

- Ensure adequate flood warning systems are in place (EA Flood Warnings or local equivalents).
- Develop an emergency plan detailing evacuation routes, roles, and places of safety in accordance with the Adept/Environment Agency publication **Flood risk emergency plans for new development.**
- In certain areas, safe refuge may be the sole viable approach rather than evacuation.

Step 8 - Structural Resilience

- Address how flood depth and velocity could affect structural integrity.
- Consider material-resilient designs (e.g., reinforced foundations, waterproof membranes).

Step 9 - Consideration of Vulnerable Populations

- FRAs must outline measures for people with mobility impairments, the elderly, and other vulnerable groups.
- Demonstrate safe evacuation or refuge options that account for these needs.

This North Somerset–specific procedure outlines how to account for existing flood defences and their potential deterioration over time, ensuring that both defended and undefended flood risk scenarios are adequately assessed. In particular:

- ***Defended Scenario:*** Evaluate climate change impacts and potential defence upgrades.
- ***Undefended/Breach Scenario***: Where defence upgrades are uncertain or assets are in poor condition, model the site as effectively undefended.
- ***Design & Mitigation***: Implement progressive steps to raise ground/floor levels, incorporate flood resilient construction, ensure safe refuge, safe access/egress, and plan emergency responses.

8.0 Recommendations and Policy for the Planning Authority

8.1 Revisions to Local Planning Policy Regarding Flooding

Local planning policy detailed in Section 2 of this SFRA, including the new NSC Local Plan, is currently being developed.

RECOMMENDATION: NSC should review their planning policy in relation to flooding to ensure it is consistent with the NPPF and current Environment Agency Guidance,

including in relation to FRAs, sustainable drainage, green infrastructure and flood resilience. New or revised policy should reflect findings and recommendations of this SFRA, including requiring applicants to consider the SFRA and its mapping taking into account the impacts of climate change, as a starting point for the assessment of flood risk in relation to development or redevelopment proposals. Later in this report, Section 8.8 focuses on the need to seek opportunities to reduce flood risk where possible.

8.2 Site Allocations

The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. where possible steer development towards the areas of lowest flood risk. The NPPF stipulates the application of a sequential approach to site allocation, utilising the Sequential Test. A flow diagram demonstrating the application of the Sequential Test for a local plan site allocation is provided in the PPG. Development sites should be allocated within areas of lowest flood risk in the first instance – in Flood Zone 1 (which relates to flooding from river and sea), but the PPG stipulates that other sources of flooding must be considered. Only if it can be demonstrated that there are no suitable sites within areas with the lowest flood risk (taking into account all sources of flooding) should alternative sites be contemplated, taking account of the vulnerability of the proposed land use. Tables 2 and 3 in the PPG stipulate 'appropriate' land uses for each Flood Zone. The Exception Test should be applied where necessary.

RECOMMENDATION: Any future site allocations must be determined via the application of the Sequential Test, and the Exception Test if required, in line with Government guidance. The evaluation of potential sites should be guided by the mapping and the findings presented within this Level 1 SFRA and, if necessary, supplemented by a more detailed Level 2 SFRA which covers all potential sources of flooding. Full account should be taken of all sources of flooding including from rivers, groundwater, sewerage, surface water and reservoir together with the potential effects of climate change on flood risk. The PPG highlights that a Level 2 SFRA may be required to provide the information necessary for the application of the Exception Test, but a Level 2 SFRA may also be required to assess flood risk from non-fluvial sources on some sites where the information in this Level 1 SFRA provides insufficient detail to enable the allocation to be determined.

8.3 Relocation of Unsuitable Existing Development

The NPPF recommends that plans should take a proactive approach to mitigating and adapting to climate change where climate change is expected to increase flood risk, some existing development may not be sustainable in the long-term. Local authorities should support appropriate measures to ensure the future resilience of communities and

infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

RECOMMENDATION: NSC, working in partnership with the Environment Agency and others, should seek to identify existing development which is potentially at risk from future impacts of climate change and, if necessary, potential sites for relocating that development, taking into account the Sequential Test. More suitable alternative uses for such sites should be sought, taking account of Table 3 in the PPG. The information contained in the SFRA can be used to assist this process.

8.4 Safeguarding

The NPPF states that local authorities should safeguard land from development that is required for current and future flood management. Such land may take the form of multi-function green infrastructure.

RECOMMENDATION: In partnership with the Environment Agency, NSC should seek to identify land required for current and future flood management and, if justified, safeguard it through planning policy. This can include areas within or adjoining allocated development sites which are particularly suitable for flood management purposes. The information contained in the SFRA can be used to assist this process.

8.5 Securing New Infrastructure

The NPPF requires local authorities to work with other policy-making authorities and relevant bodies to assess infrastructure needs in their area. After identifying infrastructure needs, the NPPF states that non- strategic policies should then be included within the Local Plan to deliver the infrastructure required. Section 106 agreements and Community Infrastructure Levy charges (under Section 106 of the Town & Country Planning Act 1990) provide potential sources of funding for new flood risk reduction infrastructure or contributions towards it. A further potential source of funding would be Partnership Funding from businesses. Should a business at risk of flooding benefit from future mitigation works as a result of new development they may be able to contribute to the cost of delivery.

RECOMMENDATION: In collaboration with other Risk Management Authorities, NSC should identify existing communities and businesses at risk of flooding that may benefit from the provision of new flood mitigation works and whether these could be delivered in collaboration with future allocations. NSC should also identify potential sources of Partnership Funding to contribute to the cost of new flood defence measures, including a

fixed Community Infrastructure Levy contribution to reduce the residual risk of flooding. The mapping of flood risk in the SFRA would assist the identification of areas at risk.

8.6 Naturalisation of Watercourses

The re-naturalisation of watercourses by introducing meanders can assist in the mitigation of flood risk by increasing capacity and decreasing velocities. In addition to flood risk benefits it can restore biodiversity, benefiting wildlife and people. The provision of culverts in new developments may increase the risk of flooding through a reduction in watercourse capacity and an increased risk of blockage, and adversely affect wildlife habitat.

RECOMMENDATION: NSC should adopt a policy of opposition to the culverting of watercourses as part of a new development. In addition, they should work with developers to seek opportunities to remove existing culverts when within, or on, a development boundary. NSC should collaborate with developers to seek opportunities to re-naturalise modified watercourses.

8.7 Opportunities to Reduce Flooding

The NPPF recommends that local plans should use opportunities provided by new development to reduce the causes and impacts of flooding, where appropriate through the use of natural flood management techniques. The NPPF also requires local authorities to work with other local authorities and providers to assess infrastructure needs in their area, including with regard to flood risk.

The NPPF also states that local plans should reduce risk from coastal change and identify Coastal Change Management Areas (CCMAs) where physical changes to the coast are expected to affect development.

RECOMMENDATION: NSC should:

Work with other authorities and bodies, as appropriate, to identify specific flood risk infrastructure required within North Somerset. The Local Plan and information contained within this SFRA can be used to assist this process, although more detailed studies are likely to be required. One possible framework for assessing flood risk and prioritising partnership working will be through the Drainage and Wastewater Management Plan framework co-ordinated by water companies;

Work with other risk management authorities and landowners to identify opportunities for the implementation of upstream attenuation storage, natural flood management

measures and changes to land management practices within a catchment-wide framework to reduce flood risk. This SFRA provides information for the Council and LLFA to take a catchment-based approach to flood risk mitigation and encourage the inclusion of such measures within new development that may also benefit other parties. NSC should encourage developers through a site-specific Flood Risk Assessment to include flood risk mitigation measures that benefit the wider community;

- In identifying and allocating potential development sites seek reasonable opportunities for flood risk reduction measures, taking into account a Level 2 SFRA if needed;

- Consider the need to identify CCMAs, define what type of development will be appropriate in such areas and make provision for their planned lifetime, or identify development that needs to be relocated away from CCMAs; and

- Give consideration to a suitable generic policy to be contained within the emerging Local Plan in respect of non-allocated sites where flood risk reduction measures should be sought.

RECOMMENDATION FOR PROPOSED DEVELOPMENT:

Proposed development should not result in a net loss of floodplain storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

Proposed development should not result in an increase in surface water runoff and, where possible, should demonstrate betterment in terms of rate of surface water runoff by a minimum of 50% against the existing greenfield situation, both in rate and volume.

Previously developed sites must reduce post development flow to the greenfield run-off equivalent in terms of both flow and volume.

SuDS should be implemented to reduce and manage surface water, fully in accordance with the requirements of the national standards for sustainable drainage systems (SuDS). National standards for sustainable drainage systems (SuDS) - GOV.UK

8.9 Planning Applications – NSC and Applicants

Planning applications can be submitted both for sites allocated within development plans and other sites, known as windfall sites. Flood risk at windfall sites may not have been previously considered in detail by the local planning authority.

Footnote 59 of the NPPF summarises when a site specific flood risk assessment is required. It states:

“A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.”

A Site-Specific Flood Risk Assessment Checklist is provided by the Government as part of the Planning Practice Guidance and should be used as the starting point for all site-specific FRAs. Developers should also be aware that the Environment Agency is continually refining and updating the flood zone mapping. They should therefore consult with the Environment Agency to ensure that the latest extents are used when assessing the risk of flooding.

Link to FRA Checklist

RECOMMENDATION: Applicants should use the Government’s FRA checklist as the starting point for any flood risk assessment to be submitted with their planning application, utilising the information contained within this SFRA in both their FRA and design proposals; this will provide the evidence required to enable NSC to undertake the Sequential Test if necessary. Full account should be taken of all sources of flooding including from rivers, groundwater, sewerage, surface water and reservoirs, together with the potential effects of climate change on flood risk and impacts on and from existing flood management infrastructure. The SFRA mapping will be of particular use in identifying key information for the FRA, including Flood Zones and flood management assets, but must be read in conjunction with the SFRA text. However, it is important to note that the SFRA provides the most up-to- date information at the time of writing, but the data could change with time.

Compliance with current planning policy in relation to flooding requirements contained in the NPPF and local planning policy documents produced by NSC should be demonstrated by applicants in their planning applications and considered by planning officers in their determination of applications, including with regard to FRAs, sustainable drainage and flood resilience.

8.10 Restriction of Permitted Development Rights

Permitted Development (PD) rights allow for some minor development, such as certain sizes of building extension, without planning permission. The PPG states that minor developments, some of which are covered by PD rights such as small extensions, are "unlikely to raise significant flood risk issues unless:

- they would have an adverse effect on a watercourse, floodplain or its flood defences;
- they would impede access to flood defences and management facilities; or
- where the cumulative impact of such developments would have a significant effect on local flood storage capacity or flood flows".

Minor developments subject to PD rights, such as some extensions or paving over of gardens, therefore have the ability to raise flood risk and increase surface water runoff. Article 4 of the Town and Country Planning General Permitted Development Order provides a possible vehicle for the removal of PD rights in exceptional circumstances, which the NPPF notes to be "limited to situations where this is necessary to protect local amenity or the well-being of the area". This could include situations where minor permitted development has the potential to add to localised flood risk as highlighted above, such as from the cumulative impact of extensions within an area.

RECOMMENDATION: If there are areas within North Somerset where Permitted Development could lead to an increase in flooding, an Article 4 Direction could be explored. An Article 4 direction would need to be strongly justified and therefore subject to further detailed investigation.

8.11 Development Management Recommendations

Appendix B summarises the recommendations made throughout this SFRA regarding spatial planning and development management. It is important to note that the document is designed as a summary of issues covered elsewhere in the SFRA, NPPF and other guidance documents. It should not be relied upon in isolation when writing or evaluating a FRA, but should be considered being part of the SFRA.

9.0 Reviewing and Updating this SFRA

This SFRA provides a strategic overview of the spatial variation of flood risk throughout North Somerset at a particular point in time, based on the best available information at that time.

The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within North Somerset; with data continually changing as new flooding events occur and further modelling is undertaken, this knowledge is continually evolving. In addition, Government policy on flood risk continues to change, with significant changes to national and local policy evident between the publication of the previous SFRA update in 2020 and this update in 2025. Given that this is the case, a periodic review of this SFRA is imperative and it must be treated as a living document.

Appendix A. Supporting Figures

The following figures below are replicated on the NSC Planning Map, EA Mapping is also replicated for ease of use.

NSC Planning Map: Link to North Somerset Planning Map

- SFRA L1 2025 Tidal Flood Zone 3a including climate change at 2125
- SFRA L1 2025 Tidal Flood Zone 3a including climate change at 2139
- SFRA L1 2025 Fluvial Flood Zone 3a without climate change (defended)
- SFRA L1 2025 Fluvial Flood Zone 3b without climate change (5% AEP) (defended)
- SFRA L1 2025 Tidal Flood Zone 3b (5% AEP) (defended)
- SFRA L1 2025 Groundwater flood zones
- SFRA L1 2025 Flood Defence Type
- SFRA L1 2025 Standard of Protection
- SFRA L1 2025 EA Areas Benefitting From Defences

Environment Agency Flood Map for Planning: Link to EA Flood Map for Planning

- Environment Agency - Flood Zone 2 (fluvial and tidal)
- Environment Agency - Flood Zone 3 (fluvial and tidal)
- Surface Water Flood Risk
- Environment Agency Main Rivers

Long term flood risk for an area in England: Link to Check long term flood risk website

- Reservoir flood zone (dry day)
- Reservoir flood zone (wet day)
- Surface Water Flood Risk

Breach Modelling: Link to North Somerset Planning Map

- SFRA L1 2025 Tidal Defence Breach 1 2025
- SFRA L1 2025 Tidal Defence Breach 1 2050 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 1 2050 (Upper End)
- SFRA L1 2025 Tidal Defence Breach 1 2075 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 1 2075 (Upper End)
- SFRA L1 2025 Tidal Defence Breach 1 2100 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 1 2100 (Upper End)
- SFRA L1 2025 Tidal Defence Breach 1 2125 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 1 2125 (Upper End)
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- SFRA L1 2025 Tidal Defence Breach 2 2025
- SFRA L1 2025 Tidal Defence Breach 2 2050 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 2 2050 (Upper End)
- SFRA L1 2025 Tidal Defence Breach 2 2075 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 2 2075 (Upper End)
- SFRA L1 2025 Tidal Defence Breach 2 2100 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 2 2100 (Upper End)
- SFRA L1 2025 Tidal Defence Breach 2 2125 (Higher Central)
- SFRA L1 2025 Tidal Defence Breach 2 2125 (Upper End)