South-West Hertfordshire Level 1 Strategic Flood Risk Assessment Level 1: Addendum for St Albans

Final Report

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Abbreviations

AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AStGWF	Areas Susceptible to Groundwater Flooding
CC	Climate Change
Defra	Department for Environment, Food and Rural Affairs
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EU	European Union
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FRISM	Flood Risk Metrics
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
GIS	Geographic Information Systems
HELAA	Housing and Economic Land Availability Assessment
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LPU	Local Plan Update
mAOD	metres Above Ordnance Datum
NPPF	National Planning Policy Framework
NVZs	Nitrate Vulnerable Zones
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBD	River Basin District
RBMP	River Basin Management Plan
RMAs	Risk Management Authorities
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SoP	Standard of Protection
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WFD	Water Framework Directive

Definitions

1D model: one-dimensional hydraulic model

2D model: two-dimensional hydraulic model

Annual Exceedance Probability: the probability (expressed as a percentage) of a flood event occurring in any given year.

Brownfield: previously developed parcel of land

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

Catchment Flood Management Plan: a high-level planning strategy through which the EA works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.

Design flood: This is a flood event of a given annual flood probability, which is generally taken as: fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or 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 change each year), plus an appropriate allowance for climate change, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Exception test: Set out in the NPPF, the exception test is a method used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The exception test is applied following the sequential test.

Flood defence: Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).

Flood Map for Planning: The EA Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.

Flood Risk Area: An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).

Flood Risk Regulations: Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

Floods and Water Management Act: Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.

Fluvial Flooding: Flooding resulting from water levels exceeding the bank level of a river (main river or ordinary watercourse).

Flood Risk Assessment: a site-specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.

Green Infrastructure: a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs, and urban fringe.

Greenfield: undeveloped parcel of land

Housing and Economic Land Availability Assessment: An evidence base document that will inform the preparation of the St Albans Local Plan to 2041. The HELAA make a preliminary assessment of the potential suitability and potential of site.

Indicative Flood Risk Area: nationally identified flood risk areas based on the definition of 'significant' flood risk described by Defra and WAG.

Lead Local Flood Authority: the unitary authority for the area or if there is no unitary authority, the county council for the area.

Main river: a watercourse shown as such on the statutory main river map held by the Environment Agency. They are usually the larger rivers and streams. The Environment Agency has permissive powers (not duties) to carry out maintenance and improvement works on main rivers).

Major development: defined in the National Planning Policy Framework (NPPF) as a housing development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more, or as a non-residential development with additional floorspace of 1,000m² or more, or a site of 1 hectare or more, or as otherwise provide in the Town and Country Planning (Development Management Procedure) (England) Order 2015 available here.

Ordinary watercourse: any river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows but which does not form part of a main river. The local authority or internal drainage board has permissive powers (not duties) on ordinary watercourses.

Pitt Review: Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.

Pluvial flooding: see surface water flooding.

Resilience measures: Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.

Resistance measures: Measures designed to keep flood water out of properties and businesses; could include flood guards for example.

Return period: Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.

Riparian owner: A riparian landowner, in a water context, owns land or property, next to a river, stream or ditch.

Risk: In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.

Risk Management Authority: The Environment Agency; a lead local flood authority; a district council in an area where there is no unitary authority; an internal drainage board; a water company and a highway authority.

Sequential test: Set out in the NPPF, the sequential test is a method used to steer new development to areas with the lowest probability of flooding.

Sewer flooding: Flooding caused by a blockage or overflowing in a sewer or urban drainage system.

Strategic Housing Land Availability Assessment: - The Strategic Housing Land Availability Assessment (SHLAA) is a technical piece of evidence to support local plans, policies and Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing land in the authority area which is suitable and deliverable.

Standard of Protection: Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event return period. For example, a flood embankment could be described as providing a 1% AEP (1 in 100 year) standard of protection.

Stakeholder: A person or organisation affected by the problem or solution or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.

Surface water flooding: Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity.

Sustainable Drainage Systems: SuDS are methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques, such as grates, gullies and channels.

Surface Water Management Plan: The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study. There are three key partners who must be involved and engaged in the SWMP study process: the Local Authority, the Environment Agency and the relevant Water and Sewerage Companies.

Water Framework Directive: Under the WFD, all waterbodies have a target to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline. River Basin Management Plans (RBMPs) set out the ecological objectives for each water body and give deadlines by when objectives need to be met.

Windfall site: a site which becomes available for development unexpectedly and therefore not included as allocated land in a planning authority's local plan.

Executive Summary

This report is an addendum to the South-West Hertfordshire Level 1 Strategic Flood Risk Assessment (SFRA) produced by JBA and published in 2018. This addendum will be used to support the review and update of the St Albans City & District Council Local Plan and associated Planning Policy documents using the best available information from key stakeholders. The SFRA assesses additional land promoted to the St Albans City & District Council for potential development, changes to the proposed development sites within the district, and changes in national planning policy and guidance, including the updates to the National Planning Policy Framework in July 2021 and December 2023, the update to the Planning Practice Guidance in August 2022, and revised Climate Change allowances published by the Environment Agency in May 2022.

Introduction

This addendum to the current Level 1 SFRA published in 2024 has been produced to:

- Address any changes required following recent revisions to the National Planning Policy Framework (NPPF).
- Collate and analyse the latest available information and data for current and future (i.e. climate change) flood risk from all sources, and how these may be mitigated, following the updates to the Environment Agency's published allowances in May 2020.
- To highlight changes to site allocations since the Level 1 SFRA was published.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the update to the Local Plan.
- To provide up to date advice for applicants carrying out site-specific Flood Risk Assessments (FRAs) and outline specific measures or objectives that are required to manage flood risk.
- To provide any new evidence to support the application of the sequential test for the allocation of new development sites, to support St Albans City & District Council in the preparation of the Local Plan.

Development and Flood Risk

The sequential and exception test procedures for both Local Plans and FRAs have been documented, along with guidance for planners and developers. Links have been provided for relevant guidance documents and policies published by other Flood Risk Management Authorities (RMAs) such as the Lead Local Flood Authority (LLFA) and the Environment Agency (EA).

The risk of flooding should be reviewed as early as possible in the development process to ensure that opportunities are taken to reduce the risk of flooding on and off the site. Where necessary, development and redevelopment within St Albans will require an FRA appropriate to the scale of the development and to the scope as agreed with Hertfordshire

County Council in its capacity as the LLFA and/or EA. FRAs should consider flood risk from all sources including residual risk, along with promotion of Sustainable Drainage Systems (SuDS) to create a conceptual drainage strategy and safe access/egress at the development in the event of a flood. Opportunities should also be sought to preserve or enhance existing green infrastructure on a development site. Latest climate change guidance (last updated in May 2022) should also be taken into account, for the lifetime of developments. Planners and developers must check that modelling in line with the most up to date EA climate change guidance has been run.

How to use this report

Planners

This addendum provides recommendations regarding all sources of flood risk in St Albans, which can be used to inform policy on flood risk within the emerging Local Plan. This includes the latest flood risk data and guidance to inform the sequential test and provides guidance on how to apply the exception test. The Council can use this information to apply the sequential test to strategic allocations and identify where the exception test will also be needed.

The SFRA provides guidance for developers, which can be used by development management staff to assess whether site-specific FRAs meet the required standard.

Developers

For sites that are not strategic allocations, developers will need to use this SFRA to help apply the sequential test. For both strategic allocations and windfall sites, developers will need to apply the exception test in the following cases:

- Highly vulnerable development in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable development in Flood Zone 3a

A site-specific FRA should be used to inform the exception test at the planning application stage.

This SFRA is a strategic assessment and does not replace the need for site-specific FRAs where a development is either within Flood Zones 2 or 3 or greater than a hectare in Flood Zone 1 or is in an area affected by other sources of flood risk. In addition, a surface water drainage strategy will be required for all major developments in any Flood Zone to satisfy Hertfordshire County Council, the LLFA.

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed FRA. To do this, they should refer to mapping in Appendices E to P and Appendix B (Data sources used in the addendum). At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, last updated in May 2022), inform development design and demonstrate, if required, that the exception test is satisfied. As part of the EA's

updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed assessment of the impact of climate change on flood risk to the site as part of the planning application process when preparing FRAs.

Developers need to check that new development does not increase surface water runoff from a site. Section 8 provides information on the surface water drainage requirements of the LLFA. SuDS should be considered at the earliest stages that a site is developed which will help to minimise costs and overcome any site-specific constraints.

Site-specific FRAs will need to identify how flood risk will be mitigated so development is safe from flooding for its lifetime and does not have an adverse effect on third parties or other areas. In high-risk areas the FRA will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

Any developments located within an area protected by flood defences and where the SoP is not of the required standard (either now or in the future) should be identified and the use of developer contributions considered to fund improvements to the defences.

Neighbourhood plans

Neighbourhood planning groups can use the information in this SFRA to assess the risk of flooding to sites within their community, using Section 5 of this addendum and the flood mapping in the appendices. This report will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events for St Albans are listed in Section 5.1. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned by St Albans are outlined in 6.5 and Section 7.3 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Mapping

The SFRA mapping highlights on a strategic scale the flood risk from fluvial, surface water and reservoirs sources, and where groundwater emergence may occur; as well as where the effects of climate change are most likely to occur. The maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or depict small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this mapping. The Environment Agency regularly reviews its flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

Use of SFRA data

It is important to recognise that the SFRA Addendum has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from all sources of flooding, and the potential impacts of future climate change. Information on flood risk is being updated continuously. SFRAs should be periodically updated as appropriate when new information on flood risk, flood warning or new planning

guidance or legislation becomes available. New information on flood risk can be obtained from Hertfordshire County Council, Thames Water, the Environment Agency, and neighbouring authorities.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

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

(National Planning Policy Framework, paragraph 166)

JBA Consulting was commissioned by the Three Rivers District Council, Dacorum Borough Council, St. Albans District Council and Watford Borough Council to undertake a Level 1 Strategic Flood Risk Assessment (SFRA) in 2018, which replaced the 2007 SFRA for South-West Hertfordshire. The study was intended for use in informing decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk, and to also provide a comprehensive and robust evidence base to support the preparation of new local plans for South-West Hertfordshire. As part of the Level 1 SFRA, a total of 492 potential development sites in St Albans were screened for all sources of flood risk including fluvial, surface water, groundwater, sewers, and reservoir, to inform the site selection criteria and process.

This document provides an addendum statement on how elements of the Level 1 SFRA were conducted in 2018, in accordance with previous version of the Planning Practice Guidance (PPG), and the implications of the latest version of the 'Flood risk and coastal change' section of the PPG, released in August 2022. The document includes a review of the proposed allocation sites for the currently Emerging Draft Local Plan 2041, ahead of the publication of the Regulation 19 document. The review has been undertaken against the latest requirements of the NPPF and PPG, to identify where a Level 2 SFRA may be required to support application of the Exception Test, and the allocation of sites. This document also provides a review of Thames Water Drainage Water Management Plans (DWMPs), as published in June 2023 and the potential implications of these plans on the SFRA.

1.2 SFRA Addendum outputs

- Identification of policy and technical updates since the original SFRA was published in 2018.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change, using all available models within the study area.

1.3 Use of SFRA data

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

Developers will still be required to undertake site-specific Flood Risk Assessments to support Planning Applications. At the time of publication, this SFRA contains the latest available flood risk information. Over time, new information pertinent to planning decisions will become available, such as updated hydraulic models (which are then integrated into the Flood Map for Planning), updated information on other sources of flood risk or evidence showing future flood risks, new flood event information, new defence schemes and updates to policy, legislation, and guidance. The Upper Colne and Upper Lee models are currently being updated by the EA and are due for delivery in 2024. The EA are also currently undertaking new national-scale modelling (NaFRA2) which is due to go live in August 2024, although these timescales are subject to change due to the complexities of this project. Developers should check the online Flood Map for Planning in the first instance to identify any major changes to the Flood Zones and the long-term flood risk mapping portal for any changes to flood risk from surface water or inundation from reservoirs.

1.4 Relevant updates in guidance, policy, strategies, and plans

Following publication of the South-West Hertfordshire Level 1 SFRA in 2018, there have been some notable changes in flood risk policy, guidance, strategies and plans. The most significant of which are revisions to the NPPF and its accompanying guidance (the PPG), most recently issued in December 2023 and August 2022 respectively., The Environment Agency (EA) climate change allowances were updated for peak river flow in October 2021 and for surface water flood risk (peak rainfall) in May 2022. Additionally, Water Company draft DWMPs were issued in June 2023 which outlines plans for future investments in sewerage infrastructure.

1.5 How to use this report

The table below outlines the contents of this report and details which supersede the information in comparable sections of the South Hertfordshire Level 1 SFRA and where pertinent information on the St Albans district in the Level 1 SFRA should still be used alongside this report.

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of this Level 1 SFRA Addendum.	For general information and context.

Section	Contents	How to use
2. Flood risk policy and strategy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.	Section 2, Section 3.1 and 3.2 of this report supersede the following sections of the Level 1 SFRA: • Section 2.2 • Section 2.3.2 • Section 2.4.1 • Section 2.4.2 • Section 2.5.2 • Section 2.9
3. Planning policy for flood risk management	Sets out the pertinent revisions to the NPPF since the publication of the Level 1 SFRA and provides guidance on how the sequential test should be applied.	Section 3 and Section 6.6 of this report supersedes Section 3 of the Level 1 SFRA.
4. Impact of Climate Change	Outlines the latest climate change guidance published by the EA. The latest data available is interpreted to provide an overview of the impact of climate change on flood risk in St Albans.	Section 4 of this report supersedes Section 4 of the Level 1 SFRA.
5.Understanding of flood risk in St Albans	Provides a high-level assessment of flood risk across the district.	Section 5 and Appendix B of this report supersede Section 5 and Section 6 of the Level 1 SFRA. Reference to **Appendix C (Understanding flood risk in St. Albans City and District)** of the Level 1 SFRA is recommended for general information on the topography, geology and geography of the district.
6. Flood defences and flood risk assets	Provides assessment of residual risk from flood defences, including current condition and standard of protection.	Section 6 of this report supersedes Section 7 of the Level 1 SFRA
7. Flood risk management requirements for developers	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Provides	Section 7 of this report supersedes Section 9 of the Level 1 SFRA.

Section	Contents	How to use
	guidance for developers and outlines conditions set by the Lead Local Flood Authority (LLFA) that should be followed.	
8. Surface water management and SuDS	Advice on SuDS and surface water management. This section also provides an overview of SuDS suitability across the study area.	Section 8 of this report supersedes Section 11 of the Level 1 SFRA.
9. Strategic flood risk measures	The range of potential strategic flood risk solutions to be considered by the LPA and developers.	Section 9 of this report supersedes Section 10 of the Level 1 SFRA.
10. Assessment of flood risk in potential development areas	Summary of flood risk to promoted HELAA sites and other strategic sites.	Section 10 of this report supersedes Section 12 of the Level 1 SFRA.
11. Summary and recommendations	Summarises the results and conclusions of this study and provides recommendations for both planning policy and developments.	Developers and planners should use this section in conjunction with Section 13 of the Level 1 SFRA.
Appendix A: DWMP review	Provides a detailed summary of the Thames Water DWMP and its potential implications for St Albans.	Planners should use this section to evaluate the suitability of the use DWMP data for the application of the sequential and exception tests.
Appendix B: Data sources used in the SFRA	Provides details of the layers used within the supplemental PDF mapping and any limitations associated with the use of the datasets.	Appendix B supersedes information contained in Section 5 of the Level 1 report.
Appendices E - P	Provides static PDF mapping for all part of the district for all sources of flood risk.	This mapping supersedes the GeoPDF mapping of St Albans provided in Appendix A of the Level 1 SFRA.
Appendix O	Provides a detailed summary of flood risk for each site screened against the criteria set out in Section 10.1.1.	This section supersedes the information contained in Appendix B of the Level 1 SFRA.

Note: Hyperlinks (highlighted in green) are provided in the text to external documents.

2 Flood risk policy and strategy

This section sets out any updates to key national, regional, and local policy documents and strategies since the publication of the South-West Hertfordshire Level 1 SFRA in 2018.

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

The National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England provides the central framework for future action by all RMAs to tackle flooding and coastal erosion in England. The Strategy looks ahead to 2100 and sets out the actions needed to address the challenges associated with climate change.

The Strategy is defined by three high level ambitions:

- Climate resilient places
- Today's growth and infrastructure resilient in tomorrow's climate
- A nation ready to respond and adapt to flooding and coastal change

Measures within the Strategy include:

- Updating the national river, coastal, and surface water flood risk mapping and producing a new set of long-term investment scenarios to improve understanding of future risk and investment needs.
- Trialling new and innovative funding models to contribute to the investment needs for flood and coastal resilience.
- Flood resilience pilot studies.
- Developing an adaptive approach to the impacts of climate change by seeking nature-based solutions towards flooding and erosion issues, integrating Natural Flood Management (NFM) into the new Environmental Land Management scheme, and considering long term adaptive approaches in Local Plans.
- Maximising the opportunities for flood and coastal resilience as part of contributing to environmental net gain for development proposals, investing in flood risk infrastructure that supports sustainable growth, and developing world leading ways of reducing the carbon and environmental impact from the construction and operation of flood and coastal defences.
- Aligning long term strategic planning cycles for flood and coastal work between stakeholders.
- Consistent approaches to asset management and record keeping.
- Updating guidance on managing high risk reservoirs considering climate change.
- Development of digital tools to communicate flood risk, transforming the flood warning service, supporting communities to plan for flood events, increasing flood response and recovery support, and mainstreaming property flood resilience measures and 'building back better' after flooding.

The Strategy was formally adopted and published in July 2020 alongside a New National Policy Statement for Flood and Coastal Erosion Risk Management, which can be accessed from the Government website. The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

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

It can be expected that the implementation of the National Strategy will lead to the publication of new guidance and practice that is focused on resilience and adaptation over the coming years. It will be important that the content of the SFRA is sensitive to these changes in national approach, so these ambitions are captured in the delivery of the local plan.

For further information, the Government has published the full National Flood and Coastal Erosion Risk Management Strategy (FCERM).

2.2 Flood Risk Management Plans

The Flood Risk Regulations (2009) translate the European Union (EU) Floods Directive into UK law. They were retained in UK law post-Brexit, but were revoked on 01/01/2024, under the Retained EU Law (Revocation and Reform) Act 2023. The EU requires Member States to complete an assessment of flood risk (known as a PFRA) and then use this information to identify areas where there is a significant risk of flooding. The Hertfordshire PFRA was initially published in 2011, and subsequently updated with an addendum to the report published in 2017. This was reviewed in the South-West Hertfordshire Level 1 SFRA. No further updates are available at the time of this report being published.

The six-year cycle of assessment, mapping, and planning required under the Flood Risk Regulations also requires the development of FRMPs. The EA led the development of the FRMPs. The first FRMPs were published in 2016 and the second cycle plans which describe actions to manage flood risk across England between 2021 and 2027 were published in December 2022. No further cycles will be carried out in the UK since the Flood Risk Regulations (2009) were revoked.

St Albans lies within the Thames FRMP area but does not fall into any Flood Risk Areas (as identified under the Flood Risk Regulations 2009). While the second cycle FRMP is intended to manage significant flood risk in the Flood Risk Areas identified within the Thames RBD it is also recognised that there are areas at flood risk outside of these Flood Risk Areas. The plan has therefore been expanded to show what is happening across the RBD and in locally important areas referred to as 'Strategic Areas' which were put forward by the EA providing they were not already designated Flood Risk Areas. St Albans is in the Colne Valley Strategic Area, some strategic measures identified for this area are:

- Collaborate with key partners and stakeholders in the Colne Management Catchment.
- Work with local partners and risk management authorities to commission asset modelling studies.
- Seek and support early engagement on large third-party infrastructure projects that may impact flood risk in the lower Colne Management Catchments in the lower reaches and tributaries of the Colne Management Catchment.
- Seek and support early engagement on large third-party infrastructure projects that may impact flood risk in the lower Colne Management Catchment.

The Thames RBD FRMP is available on the government website here. More information on district and national scale measures is available on the EA's online interactive mapping.

2.3 The Water Framework Directive and Water Environment Regulations and River Basin Management Plans

The purpose of the WFD, which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called RBMPs.

The WFD requires the production of RBMPs for each River Basin District. RBMPs support the government's framework for the 25-year environment plan and allow local communities to find more cost-effective ways to further improve our water environments. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques.

The EA manages the RBMPs and must review and update them every six years. The first cycle of RBMPs were published in 2009 and were most recently updated in 2022.

The St Albans lies within the Thames RBD. The updated Thames RBD RBMP for 2022 can be accessed on the Government website.

2.4 Updated guidance on Strategic Flood Risk Assessments

There was an update to the 'How to prepare a Strategic Flood Risk Assessment guidance' in May 2024, which requires further adjustment to the approaches to both Level 1 and Level 2 assessments. Where possible, assessment carried out for the Level 1 addendum has been undertaken in accordance with the latest guidance. The latest guidance can be accessed on the Government website.

2.5 Local policy and guidance for SuDS

The 2023 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 175). When considering planning applications, local planning authorities (LPAs) should consult the relevant LLFA on the management of surface water to satisfy that:

- The proposed minimum standards of operation are appropriate.

- Using planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime.
- Should seek to provide multiple benefits.

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

- Hertfordshire guidance for developers on Surface water drainage
- Hertfordshire Local Flood Risk Management Strategy outlines local SuDS policies, adopted in 2019
- SuDS Manual (C753), published in 2007 and updated in 2015
- Defra non-statutory technical standards for sustainable drainage systems, 2015
- Defra National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011
- Building Regulations Part H (MHCLG), 2010

The 2023 NPPF states that flood risk should be managed "using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding". Hertfordshire County Council set out in their Local Flood Risk Management Strategy 2019 that they expect SuDS to be incorporated when planning all major developments, from the Strategic Development Location scale through to a ten-dwelling development.

2.6 Water Cycle Studies

Water Cycle Studies assist local authorities to select and develop growth proposals that minimise impacts on the environment, water quality, water resources, infrastructure, and flood risk and help to identify ways of mitigating such impacts. These documents intended to be a holistic assessment of regional and strategic water infrastructure requirements.

The Hertfordshire Water Cycle study was published in March 2017 by Hertfordshire County Council. The key objectives of the study were to clarify the potential impact of growth on the available capacity of existing water networks and identify the range of potential strategic interventions that can address potential future water infrastructure deficits. Some of the main implications on planning and development in St Albans are outlined below:

- An analysis of the key trunk sewer network capacity demonstrated that it will likely be sufficient to accommodate estimated levels of growth in the short/medium term, supported by small investments in local infrastructure.
- Any development proposals on the southern and eastern edge of St Albans are likely to require strategic interventions by 2051, particularly large-scale trunk sewer upgrades.
- A high growth scenario up to 2051 demonstrates that strategic intervention could be required across the southern part of the district (mainly to improve the capacity of Maple lodge STW and Blackbirds STW). This could require

adaptation of local planning policies and / or construction methods to limit foul flows and promote large scale water recycling.

2.7 Drainage and Wastewater Management Plans

Thames Water's published its first DWMP in May 2023, which lays out the company's long term strategic plan for infrastructure investment. The plan seeks to reduce pressures on drainage and wastewater by setting out what extensions, improvements and maintenance is required to meet demand and what investment is needed to deliver a sustainable service over a 25-year period, taking into account the impacts of population growth and climate change. The Plan is split across two areas: London and the Thames Valley. Hertfordshire authorities are located within the Thames Valley. The identified interventions for each area are split into near term (2025-2035); and medium to long term (2035-2050). A summary of the interventions that affect St Albans are provided in Appendix A.

2.8 Water Resource Management Plans

Under the duties set out in sections 37A to 37D of the Water Industry Act 1991, all water companies across England and Wales must prepare and maintain a WRMP. This must be prepared at least every five years and reviewed annually.

WRMPs should set out how a water company intends to achieve a secure supply of water for their customers and a protected and enhanced environment.

Thames Water have recently published their draft 2024 WRMP, available on their website here. This sets out how they intend to provide a secure and sustainable water supply over the next 50 years, looking ahead to 2075.

3 Planning policy for flood risk management

3.1 National Planning Policy Framework and Guidance

There have been important changes in flood risk guidance since completion of the South-West Hertfordshire 2018 Level 1 SFRA, namely there have been major revisions to the NPPF in July 2021 and December 2023, as well as to the PPG in August 2022. The most significant change is that the requirement for the Sequential Test to be performed for all sources of flood risk (rather than just fluvial) and requires climate change to be considered for high, medium, and low risk areas. The South-West Hertfordshire Level 1 SFRA, prepared under the superseded NPPF and PPG, was comprehensive and included the screening of potential sites for all sources of flood risk. However, planning inspectors will examine the Local Plan evidence against current policy and guidance, therefore further content must be prepared for the Level 1 SFRA to demonstrate compliance with the latest policy. Some of the most pertinent changes are outlined below:

- Paragraph 168 of the NPPF states that the aim of the sequential test is to “steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding."
- The NPPF has omitted reference to Flood Zones (Diagram 2) when performing the sequential test. There is also the explicit statement that Table 2 (was Table 3) cannot be used to support performance of sequential test. Table 2 (was Table 3) now is intended to guide flood zone incompatibility, and not whether ‘development is appropriate’.
- The test must now consider whether development can be located in the lowest areas of flood risk both now and in the future (the test applies to all source of flood risk – whereas prior to the changes to the NPPF, the test was only performed for present day flood risk for the “Flood Zones” i.e. river and sea flood risk). However, the PPG has not yet been updated to illustrate how this exercise should be performed to include all sources of flood risk.
- There is improved clarity about when the test needs to be applied, including when it’s appropriate to progress to the exception test. Key terms are defined (e.g. ‘wider sustainability benefits to the community’) and a new section is provided on how to demonstrate development has reduced flood risk overall.
- The PPG recommends that SFRAs should also aim to address the impacts of climate change on all identified sources of current and future flood risk, especially giving consideration to how land use change and development may exacerbate flood risk. The PPG advises that where climate change is likely to significantly

exacerbate flood risk, planning permission for developments can be time limited and contain conditions for a review of the permission and for relocation to be considered.

- In promoting climate resilience, LPAs should also necessarily adopt an integrated and catchment-wide approach, where water resources, wastewater management, water quality and environmental health are managed alongside flood risk. This can be achieved through improved connectivity with other strategies e.g. water cycle studies and drainage and wastewater management plans. This approach will ensure measures which deliver multiple benefits – including those which unlock sustainable development.
- Flood Zone 3b (i.e. the functional flood plain) has been extended from 5% AEP to 3.33% AEP (land with ≥ 3.33% annual probability of flooding) or land that is designed to flood (as part of a floods scheme for instance). It is advised that the functional flood plain is not defined solely by probability but should take into account local conditions. Local planning authorities are expected to come to an agreement on the boundaries of the functional floodplain with the Environment Agency.
- The PPG states that flood risk assessments should account for uncertainties in the assessment process when developing mitigation strategies and the implications for safety of the development throughout its lifetime. Site specific flood risk assessments, therefore, should seek to provide a comprehensive evidence base for the LPA to apply the sequential and exception test (where necessary).
- The safety of a development now accounts for impact of flooding on the services provided by development, including compensatory flood storage. Guidance is provided on how the cumulative impacts of flooding can be mitigated. Furthermore, the residual risk of flooding from flood risk management infrastructure or site-specific measures should be assessed. The lifetime of development should be considered for a minimum period of 75 years.
- There is new guidance on development control in unsustainable locations, including safeguarding of land for future FCERM measures and relocation of development to land that is less susceptible to flood risk.
- There is a strengthening of guidance on nature-based solutions (NBS) such as Sustainable Drainage Systems (SuDS) and Natural Flood Management (especially for river restoration and culvert removal). SuDS must seek to meet the '4 pillars' central to good SuDS design, which meets a wide range of benefits (such as Biodiversity Net Gain (BNG), carbon sequestration and urban cooling). As such, local policy should encourage NBS in locations which will achieve the greatest benefits. The guidance is proponent of early consideration of NBS in development design.

The main implications for application of the sequential test are:

- The sequential test must be based on mapping that enables decision making based on a risk-based sequence.

- All sources of flood risk can potentially be included in the sequential test including surface water, groundwater, sewer flooding and reservoir flooding (or other water impounding features).
- It follows that proposed new development placed in locations at high or medium risk from flooding from other sources now and in the future (note that the explicit requirement to include climate change in the test, as set out in the August 2022 'Flood risk and coastal change' section of the PPG will require the preparation of additional modelling and mapping) should be accompanied by evidence that the exception test can be satisfied (in a Level 2 SFRA).

3.2 Local plan

The St Albans Local Plan 1994 will be replaced with the St. Albans City and District Local Plan 2041. This SFRA document has been prepared as part of the evidence base of the emerging new plan.

A Strategic Housing Land Availability Assessment (SHLAA) update was undertaken in 2018 as part of the comprehensive evidence base of site availability to support the draft Local Plan Regulation 18 consultation. Since 2018, under new national planning policy, the SHLAA have been replaced by the Housing and Economic Land Availability Assessment (HELAA). A 'Call for Sites' for the District was undertaken between 25 January and 8 March 2021, and a HELAA was published in 2021. This HELAA also included sites promoted from previous SHLAA submissions received since 2016. Further to the HELAA, an Urban Capacity Study (UCS) was undertaken to identify brownfield sites in urban areas, while sites classified as previously developed land (PDL) in the Green Belt were also considered. Following an assessment process, 102 sites were allocated in the Regulation 18 Draft Local Plan that was published for consultation in 2023, and a further 15 potential sites that were identified following the Regulation 18 stage have been assessed as part of this SFRA addendum.

The following neighbourhood plans have now been formally adopted into the Development Plan for the District:

- Redbourn
- Sandridge
- St. Stephen
- Wheathampstead
- Harpenden

3.3 The risk-based approach

As previously discussed, the NPPF takes a risk-based approach to development in flood risk areas. The Sequential Test previously applied for fluvial and coastal flooding but since the recent revisions in 2021 and 2023 the approach has adjusted the requirement for the Sequential Test (as defined in Para 168 of the NPPF) so that all sources of flood risk are now included in the consideration. At the time of preparation of this addendum no updated

guidance has been published to describe how the approach to the Sequential Test should be modified to account for all sources of flood risk. The requirement has been addressed by adopting the following approach:

The South Hertfordshire Level 1 SFRA set outs criteria which include all sources of flood risk when screening sites. While there is no available risk mapping for other sources of risk (reservoir, groundwater and sewer flooding) that is comparable with that for the rivers and surface water, the criteria use available datasets showing indicative risk to mitigate low levels of risk that is not likely to represent a significant constraint to development. The application of the test would be accompanied by a commitment as part of the local plan that development on proposed sites would be placed on land with low risk of flooding from all sources. In circumstances where it is not possible to place all proposed development on land with low risk of all sources or circumstances arose where encroachment on land affected by any source of flood risk could not be avoided, then it would be necessary to provide supplementary evidence that the exception test could be satisfied.

Appendix B discusses the mapping used to inform flood risk in this addendum and the implications of the limitations of the data sets used.

3.3.1 Flood Zones – fluvial risk

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

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

The fluvial Flood Zones are:

- **Flood Zone 1** – Low probability: less than a 0.1% chance of river flooding in any given year.
- **Flood Zone 2** – Medium probability: between a 1% and 0.1% chance of river flooding in any given year.
- **Flood Zone 3a** – High probability: greater or equal to a 1% chance of river flooding in any given year.
- **Flood Zone 3b** – Functional Floodplain: land where water has to flow or be stored in times of flood. SFRAs identify this fluvial Flood Zone in discussion with the LPA and the Environment Agency. The identification of the functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes.

The fluvial Flood Zones (Flood Zones 2 and 3a) in the Appendix E retain the extents from the Environment Agency's 'Flood Map for Planning' The mapping incorporates more detailed hydraulic modelled data where available. All the models used for the Level 1 SFRA and this addendum have been fully incorporated into the EA fluvial Flood Zones. However, a significant proportion of the district is covered by two older fluvial models, namely the Upper Colne (2010) model and the Lee (2010) model. These are currently being revised by the Environment Agency and are not available at the time of this study being undertaken. For this Level 1 SFRA update it would not be practicable or proportionate to seek to increase coverage of more up to date modelling.

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

Functional floodplain (Flood Zone 3b) is identified as land which would flood with 3.33% AEP, where detailed hydraulic modelling exists. The 3.33% AEP or 2% AEP defended modelled flood extents have been used to represent Flood Zone 3b, where available from the Environment Agency. However, for the Upper Lee catchment area of the district there is no detailed model coverage available and so Flood Zone 3a has been used as a conservative indication of flood extent. Further work should be undertaken as part of a detailed site-specific FRA to define the extent of Flood Zone 3b where no detailed modelling exists.

3.3.2 Flood Zones – other sources of flooding

It is not possible to prepare compatible reservoir flood risk, sewer flood risk or groundwater flood risk as the appropriate analyses and data is not available. The available mapping for does not describe a risk-based scenario, as they do not indicate the relative risk to land based on the probability and as such, these datasets do not provide a logical basis for zoning. The mapping could however be used to direct proposed new development away from locations that could potentially be affected by reservoir, groundwater or sewer flood risk. However, it is important to note that this is different to the risk pertaining to river and sea flooding and further assessment would be required to understand the magnitude of the potential hazard.

The available surface water mapping is most comparable, but it does not strictly describe the same conceptual risk zone as is defined for river and sea flooding (even though it is notionally associated with the same probability) as the mapping is based on different assumptions. However, it does result in a product that can accommodate sequential testing, as it can facilitate strategic decisions that direct development to land with lower risk of surface water flooding. Using this mapping, it is not anticipated that the sequential test for surface water would normally require alternative sites at lower risk to be considered, because the widespread and dendritic nature of surface water flood risk differs conceptually to river and sea flood risk. However, in some circumstances, for example, for relatively

small sites that are potentially substantially affected by surface water, alternatives sites may be considered.

While the available risk data sets do not completely align with the approach to river and sea flood zones, the criteria set out in the Level 1 SFRA is in accordance with the sequential approach to development outlined in paragraph 167 of the NPPF. As a result, this approach is considered to be appropriate, and provides the recommended method of applying the sequential test for all sources of flooding. Appendix B discusses further the limitations of available mapping for surface water, groundwater, reservoir, and sewer flood risk.

3.3.3 The Sequential Test

In the first instance, land at the lowest risk of flooding from river and surface water should be considered for development and at this stage consideration should be given to potential flood risk from reservoirs, groundwater and sewers. The test performed is called the 'Sequential Test'. Figure 3-1 summarises the approach with respect to using the available Zone mapping for rivers. The LPA will apply the Sequential Test to strategic allocations. The Strategic Test does not apply to minor developments and change of use. For all other developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test.

Figure 3-2 is a modification of Diagram 2 in the Planning Practice Guidance that has been adjusted so the Test accommodates the Sequential Testing of other sources of flood risk. The level 1 SFRA defines a site at low risk of flooding using the following parameters:

- Site is within Flood Zone 1.
- Site is not within Flood Zone 3a plus climate change.
- Site is <10% at risk from surface water flooding in the 1 in 1,000-year event.
- Site is <10% within highest risk category in JBA Groundwater map (groundwater is <0.025m below the surface in the 1 in 100-year event).
- Site is not within the Historic Flood Map.
- Site is not at risk of reservoir flooding.
- Site is not at risk of breach from canal flooding.
- Site does not contain an Ordinary Watercourse.

The LPA should work with the Environment Agency to define a suitable area of search for the consideration of alternative sites in the Sequential Test. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land or Employment Land Availability Assessments.

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for. Table 2 of the PPG defines the vulnerability of different development types to flooding with respect to river flood risk. Table 3 of the PPG shows whether, having applied the Sequential Test first, that vulnerability of development is suitable for that Flood Zone and where further work is needed.

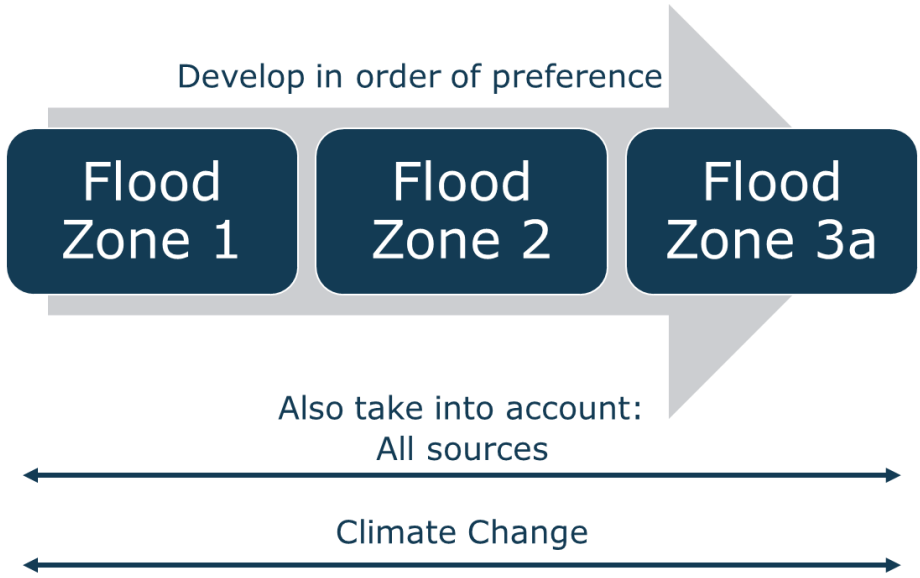
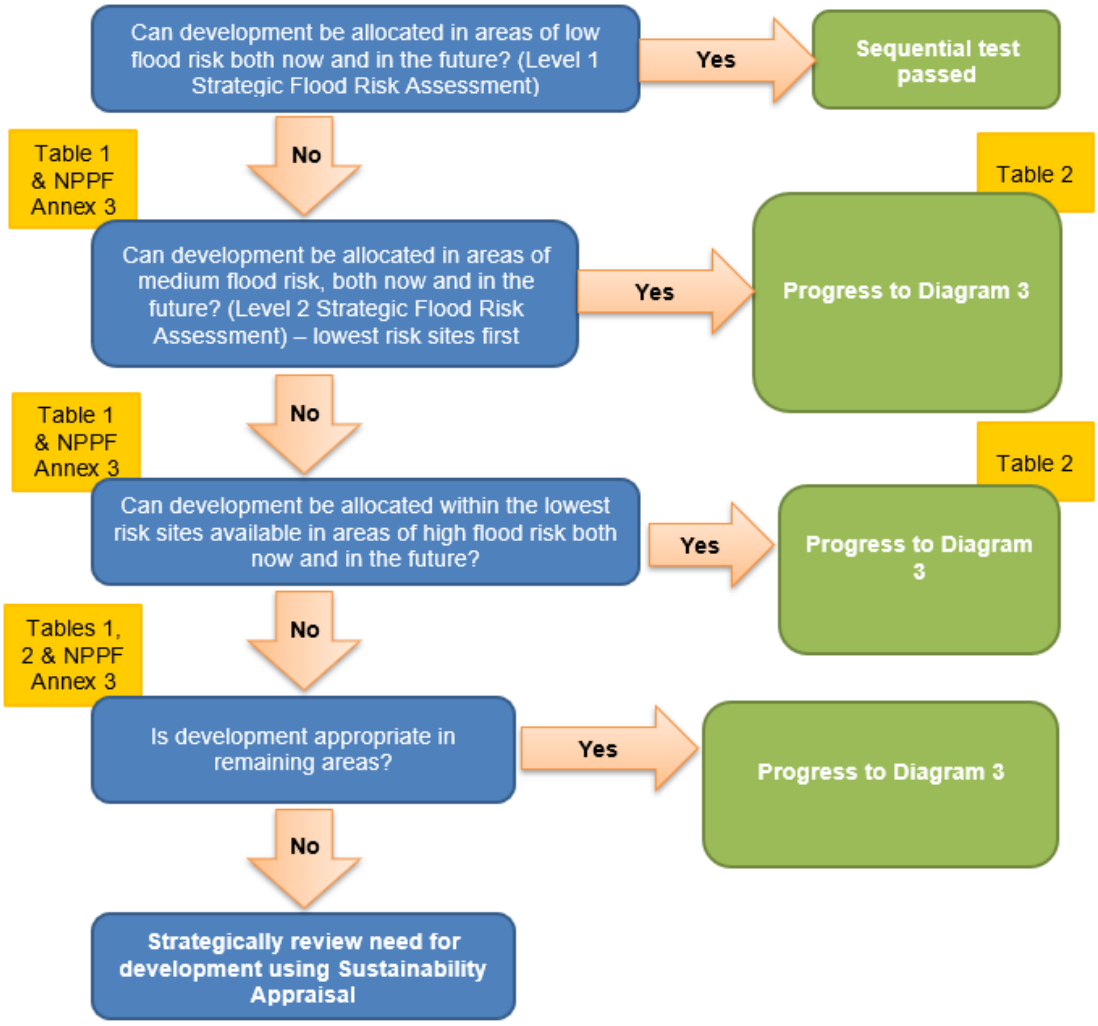


Figure 3-1: The Sequential Test

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

This is a stepwise process, but one that requires nuance as several of the criteria used are not strictly quantitative and require experienced judgement. Each step in the process must be documented, and evidence used to support decisions recorded. In addition, the latest NPPF states that the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. Section 4 provides further information on considering climate change.



Note - other sources of flood risk should also be considered, as per the update to NPPF but formal zone mapping is not available

Figure 3-2: Local Plan sequential approach to site allocation (Source: NPPF, 2023)

3.3.4 The Exception Test

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

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

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

Whilst the Exception Test is only explicitly required for sites within Flood Zones 2 or 3, the Sequential Test requires consideration of all sources, and the LPA should carefully weigh up the benefits of development against the risk where sites are identified to be at significant risk from other sources of flooding. In any case, developers will still need to demonstrate that users of any site will be safe throughout the lifetime of the development. Figure 3-3 summarises the Exception Test.

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

For developments that have not been allocated in the Local Plan, developers must undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

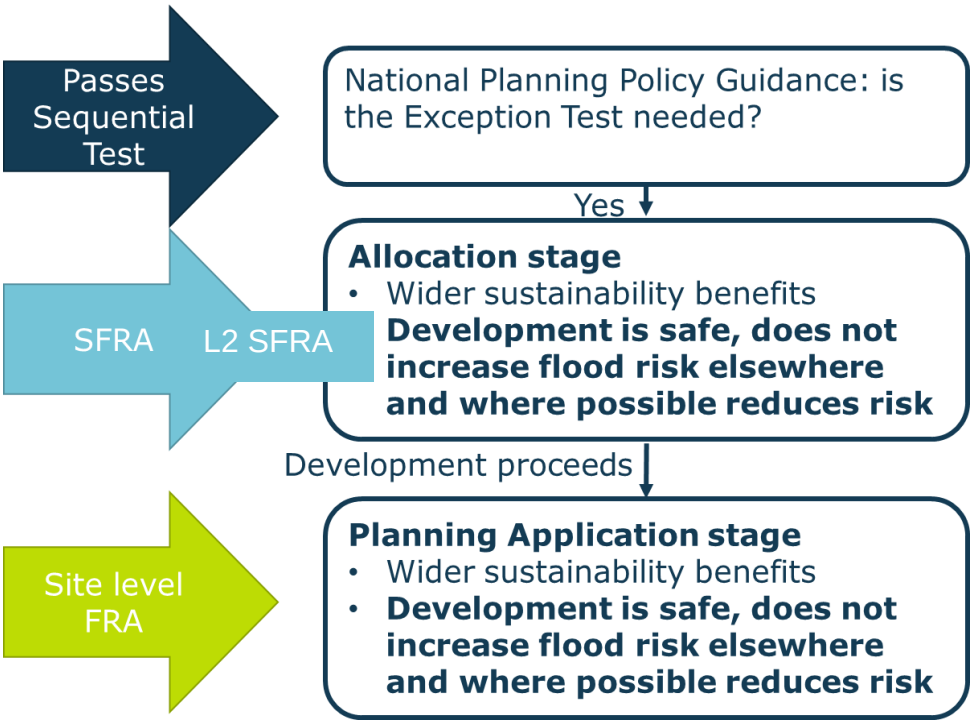


Figure 3-3: The Exception Test

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

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

Local planning authorities will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove

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

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

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

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

In circumstances where the potential effects of proposed development are material, a Level 2 SFRA is likely to be needed to inform the Exception Test in these circumstances for strategic allocations to provide evidence that the principle of development can be supported. At Planning Application stage, a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.4 Making a site safe from flood risk over its lifetime

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

The actual risk is the risk to the site considering existing flood mitigation measures. The fluvial/surface water 1% AEP + climate change flood event is a key event to consider because the National Planning Policy Guidance refers to this as the ‘design flood’ against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.

Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.

Residual risk is the risk that remains after the effects of flood defences have been taken into account and/ or from a more severe flood event than the design event. The residual risk can be:

- The effects of an extreme (e.g. 0.1% AEP) event, beyond the defence's standard of protection. Where there are defences, this could cause them to overtop, which may lead to failure if this causes them to erode; and/or

- Structural failure of any flood defences, such as breaches in embankments or walls.

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

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

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

3.5.1 Sequential Test

St Albans City & District Council, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers are required to undertake the Sequential Test to all development sites, unless the site is either:

- A strategic allocation and the test have already been carried out by the LPA;
- A change of use (except to a more vulnerable use);
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m^2); or
- A development in Flood Zone 1, unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

Even if the Sequential Test is not required, a site-specific flood risk assessment will still be required for most developments located in a risk zone or greater than one hectare. However, demonstration through an FRA alone that a development can be made safe throughout its lifetime (without increasing risk elsewhere) does qualify it exemption from the sequential test.

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

Local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear e.g. school catchments, in other cases it may be identified by other Local Plan policies. For some sites e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include:

- Site allocations in Local Plans

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

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

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternatives, although clearly the individual circumstances of locationally-specific enterprises (e.g. rural land-based businesses) will have a limiting effect on the range of alternatives that can reasonably be considered.

The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

3.5.2 The Exception Test

If, following application of the Sequential Test it is not possible for the development to be located in areas with a lower probability of flooding the Exception Test must then be applied if required (as set out in Table 3 of the PPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations). For sites that do not meet the criteria for a site at low risk of flooding, the following approach should be taken during a site-specific Flood Risk Assessment (FRA):

- Assess the level of actual risk and identify the root causes of existing and predicted flooding.
- Obtain confirmation that actual existing drainage assets likely to be affected by proposed development have the capacity to accommodate flood flows and volumes for the lifetime of development.
- Identify the scope of measures required in an FRA so the assessment addresses the risk identified.
- If necessary, identify any additional infrastructure or land required to provide the mitigation required together with an outline scale of the commitment to strategic investment in flood management measures.

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

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

Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

Applicants should detail the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

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

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

- The design of any flood defence infrastructure
- Access and egress
- Operation and maintenance
- Design of the development to manage and reduce flood risk wherever possible.
- Resident awareness
- Flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
- Any funding arrangements required for implementing measures.

4 Impacts of climate change

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often. The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

4.1 Revised Climate Change Guidance

The Climate Change Act 2008 creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050.

In 2018, the government published new UK Climate Projections (UKCP18). The Environment Agency used these projections to update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances which were released in July 2021.

The Environment Agency published updated climate change guidance fluvial risk in July 2021 on how allowances for climate change should be included in both strategic and site-specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The same approach was then adopted for rainfall allowances in May 2022.

Developers should check the government website for the latest guidance before undertaking a detailed Flood Risk Assessment.

4.2 Applying the climate change guidance

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

- The vulnerability of the development – see the NPPF (https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification)
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA.
- The River Basin and Management Catchment that the site is in – St Albans lies in the Thames River Basin District. The district falls within the Colne and Upper Lee Management Catchments.
- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s).
- The ‘built in’ resilience measures used, for example, raised floor levels

- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

4.3 Relevant allowances for St Albans

Table 4-1 shows the updated peak river flow allowances that apply in St Albans City & District Council for fluvial flood risk for the different management catchments (last updated in July 2021). These allowances supersede the previous allowances by River Basin District.

Table 4-2 shows the updated rainfall intensity allowances that apply in the St Albans District for pluvial flood risk for the different management catchments (as of May 2022). These peak rainfall intensity allowances that apply for small catchments (less than 5km^2) and urbanised catchments for surface water flood risk. Both the central and higher central allowances should be considered to understand the range of impact. These allowances supersede the previous country wide allowances.

Table 4-1 Peak River flow allowances for the Management Catchments in St Albans

Management Catchment	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Colne	Central	10%	8%*	21%
	Higher	16%	16%	35%
	Upper	30%	38%	72%
Upper Lee	Central	3%	-1%*	10%
	Higher	9%	7%*	22%
	Upper	23%	27%	59%

* In some areas, the allowance for a later epoch is lower than that for an earlier epoch- in this scenario, the greater of the two allowances should be applied.

Table 4-2: Peak rainfall intensity allowances for small and urban catchments by Management Catchment in St Albans

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)		Total potential change anticipated for the '2070s' (2061 to 2125)	
		3.33% AEP	1% AEP	3.33% AEP	1% AEP
Colne	Central	20%	20%	25%	25%
	Upper	35%	40%	35%	40%
Upper Lee	Central	20%	20%	20%	25%
	Upper	35%	40%	35%	40%

4.4 Representing climate change in the Level 1 SFRA

Representation of climate change within the SFRA was discussed with the EA. The following models were provided with suitable climate change runs for the 2070s central and/or higher central fluvial estimates.

Central:

- Ver 2019 - 3.33% AEP, 1% AEP and 0.1% AEP plus 21% climate change
- London Colney 2018 - 3.33% AEP, 1% AEP and 0.1% AEP plus 21% climate change

Higher Central:

- Ver 2019 - 3.33% AEP, 1% AEP and 0.1% AEP plus 35% climate change
- London Colney 2018 - 1% AEP plus 35% climate change

The following models were not provided with suitable climate change runs for the 2080s central and/or higher central estimates. These models are currently being revised by the Environment Agency and therefore have not been re-run for this study due to the age of the models:

- Upper Colne 2010
- Lee 2010

For any sites not covered by the EA's detailed modelling or not able to be run for appropriate climate change allowances, Flood Zone 2 and 3 was used as an indicative climate change extent. This is appropriate given the Upper End climate change estimates are often similar to the Flood Zone 2 extents; therefore, the difference in effects of climate change would not be substantial. Appendix B details the models and where proxy data has been used.

The 0.1% AEP surface water extent can be used as an indication of surface water risk, and the risk from smaller watercourses, which are too small to be covered by the EA's Flood Zones. Modelled Climate Change uplifts for the 3.3% and 1% AEP events were included as

part of this SFRA and are presented in in Appendix as ‘Surface Water Extent plus Climate Change’ for the following events and scenarios:

- 3.3% AEP plus 35% Climate Change
- 1% AEP plus 40% Climate Change

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

Climate change mapping has been provided in Appendix F: Impact of Climate Change on Flood Zones. The climate change outputs have been presented under:

‘Fluvial Flood Extent with Climate Change’ including central and higher central allowances'. It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity and hazard may increase compared to the 100-year current-day event.

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

- Confirm which national guidance on climate change and new development applies by visiting GOV.uk (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances).
- Apply this guidance when deciding the allowances to be made for climate change, having considered the potential sources of flood risk to the site (using this SFRA), the vulnerability of the development to flooding and the proposed lifetime of the development. If the site is just outside the indicative climate change extents in this SFRA, the impact of climate change should still be considered because these may get affected should the more extreme climate change scenarios materialise.
- Refer to Section 7 which provides further details on climate change for developers, as part of the FRA guidance, and the SFRA User Guide in Appendix C.

4.5 Impact of climate change on flood risk

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

It is recommended that St Albans City & District Council work with other Risk Management Authorities to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the district. Climate change mapping is provided in Appendix F,I and J.

4.5.1 Impact of climate change on fluvial flood risk

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

Areas in the St Albans district most sensitive to fluvial impacts of climate change, based on flood extents, are around the London Colney stream and around the Upper Colne at Colney Heath. The increases in flood extent are less severe around watercourses such as the River Ver located around steep-sided chalk valleys with well-defined flood plains.

4.5.2 Impact of climate change on surface water flood risk

The impact of climate change on surface water flood risk has been assessed by applying a 40% uplift ('Upper End' for 2060 to 2115) to the 30-year and 100-year Risk of Flooding from Surface Water mapping. The climate change uplift extends and connect existing surface water flow paths generated during a 1 in 100-year event and expanded areas of surface water ponding on low-lying ground, this is particularly notable around the fluvial floodplain. Areas that particularly show sensitivity are Frogmore, St Julians, Sopwell, Sandridge, areas adjacent to Redbourn Road and along the Lower Luton Road Wheathampstead and in Ayot Green.

4.6 Impact of climate change on groundwater flood risk

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

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

4.7 Adapting to climate change

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

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.

- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses; and
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. SADC planners and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option.

It is recommended that the differences in flood extents from climate change are compared by St Albans City & District Council when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/ egress and how much land could still be developable overall.

5 Understanding flood risk in St Albans

This section updates relevant sections on flood risk in the St Albans district, where new information has become available. The main sources of flooding affecting St Albans are from watercourses, surface water, and sewers, as detailed in information provided by Hertfordshire County Council, the EA, and Thames Water.

This is a strategic summary of the risk in St Albans. Developers should use this section in addition to the Level 1 SFRA to scope out the flood risk issues they need to consider in greater detail in a site-specific FRA to support a Planning Application.

Appendix B contains a list of the sources of data used in the SFRA and the approach to using hydraulic model data to inform the mapping.

5.1 Historical Flood Risk

Since the Southwest Hertfordshire Level 1 SFRA was published several flood incidents have been recorded in the district. Relatively regular surface water flooding incidents have been recorded in Harpenden, Redbourn, Hemel Hempstead, London Colney, Bricket Wood and central St Albans. Isolated incidents of groundwater flooding were recorded in a few locations in London Colney and Sandridge.

A summary of available flood incidents is provided in Table 5-1.

Table 5-1 Flood incidents recorded for the St Albans District

Date	Settlement / location	Description of incident
May 2023	Oakfield Road, Roundwood Park, Kimpton Bottom, Southdown Road & Westfield Drive, Harpenden	Surface water flooding from road runoff resulted in both internal and external property flooding following heavy rains. The likely cause was attributed to blocked highway drains.
	Fryth Mead, St Albans	Internal and external flooding due to road runoff.
	Kimpton Road & Garden Court, Wheathampstead	Internal and external flooding from road runoff due to inadequate drainage.
	Harpenden Lane, Redbourn	External property flooding from road runoff.
November 2022, October 2020, September 2019	Ladies Grove, St Albans	Internal and external property flooding from surface water due to road runoff from blocked drains.
October 2022	Warwick Road, St Albans	Internal and external property flooding from road runoff due to drainage system being overwhelmed.

Date	Settlement / location	Description of incident
July 2021	Marshalls Heath Lane	External property flooding from road runoff
June 2021, January 2021	Lancaster Road, St Albans	External property flooding from overflowing road drains following intense rainfall.
June 2021, September 2020, August 2020	Drakes Drive, St Albans	External property flooding from road runoff due to inadequate drainage and blocked drains.
January 2021, August 2020	Camp Road, St Albans	External property flooding due to blocked road gully.
January 2021	Kay Walk, St Albans	External property flooding due to inadequate road drainage. Overflowing ditches in adjacent land was observed.
	Barley Mow Lane, Smallford	Repear external and internal property flooding due to inadequate drainage.
	Langley Grove, Sandridge	Surface water pooling at Colman Green Lane, causing flooding external property and adjacent field.
	Cotswold Close, St Albans	External property flooding, unknown origin
December 2020	Harlesden Road, St Albans	External property flooding due to runoff from inadequate drainage.
October 2020	Grange Street & Hall Palace Gardens, St Albans	External property flooding due to surface water.
October 2020	Hill End Lane, St Albans	External road flooding due to runoff, exacerbated by blocked drains.
October 2020, August 2020	Firewood Avenue, St Albans	External property flooding following heavy rainfall.
October 2020, August 2020	The Leys, St Albans	External property flooding from malfunctioning drainage.
October 2020, August 2020	Luton Road, Lyndhurst Drive, Oakfield Road, Pigeonwick, Willoughby Road & Meadow Walk, Redbourn Lane	External property flooding due to blocked drains.
October 2020, August 2020	Blackboy Wood, Pine Grove, & Mount Pleasant Lane, Bricket Wood	Repeat road flooding occurred and internal flooding due to blocked highway drains
October 2020, August 2020	Sewell Close, St Albans	External property flooding from road runoff. Road drains were observed to be overflowing.
September 2020	Carlisle Avenue, St Albans	External property flooding due to block road gully

Date	Settlement / location	Description of incident
September 2020, August 2020	Bettespol Meadows, Church End, High Street, Rose Acre, Silk Mill Road, Lybury Lane, St Albans Road & Wheatlock Mead, Redbourn	External and Internal property flooding due to road runoff following heavy rainfall. Overwhelmed drainage systems are the likely cause of flooding.
August 2020	Kimberley Road	External property flooding due to runoff due to malfunctioning drainage systems.
	Eaton Road	Road flooding following heavy rainfall.
	Normandy Road	Surface water and foul water caused external property flooding, Raw sewage ingress into floodwater was recorded.
	Oster Street	External property flooding from road runoff. Overflowing roadside gullies was observed.
	Shirley Road	External property flooding from road runoff due to blocked drains following heavy rainfall.
	Thornton Street	External property flooding from road runoff due to blocked drains.
	Folly Lane	External property flooding from road runoff due to blocked drains.
	Garden Court, Saxon Road and Lamer Lane, Wheathampstead	External property flooding from road runoff due to blocked drains.
November 2018	Lower Dagnall Street	Basement flooding from unknown origin
May 2018	High Street, London Colney	Repeat flooding of public walkway, unknown origin of flooding.
Unknown date		Basement flooding due to shallow groundwater is also recorded at a unknown date
October 2018	Tennyson Road, St Albans	External property flooding from overtopping pond following heavy rainfall.
August 2018	Gladeside, St Albans	External property flooding from surface water.

Date	Settlement / location	Description of incident
December 2017	Nexus Court and Holywell Hill, St Albans	External property flooding due to road runoff.
August 2017	Park Street, St Albans	Repeat external flooding from road runoff. Surface water channel on park street was observed to be blocked.
Unknown	Butterwick Brook, Sandridge	Ground water flooding in field valley bottom.

Flood incident data has been mapped in Appendix D at a square kilometre scale, to avoid identifying individual properties.

5.2 Fluvial flood risk

Flood zones 3b, 3a and 2 have been updated with revised modelling for the River Ver since the publication of the Level 1 SFRA. The flood extents for flood zones 3b, 3a and 2 are much more constrained to the River Ver's narrow floodplains, with the modelling elsewhere remaining unchanged with the exception of Flood Zone 3b. As modelling for the 3.33% AEP is not available for the River Lee, the 3b flood extent for the Lee is now based on the 2% AEP defended outline, any notable increases in extent are only evident around Wheathampstead. It should be noted that revised modelling is being undertaken for the Upper Colne and Lee, it is expected that this information will be incorporated into the flood zone mapping once this becomes available. Appendix B provides further details of the data used to inform the Flood Zones extents.

The extent of fluvial flood risk can be seen in Appendix E.

5.3 Culverts

The Environment Agency's Asset Information Management System (AIMS) identifies 31 culverts within St Albans. As noted in the Level 1 SFRA, many of these relatively short culverts as part of the highway drainage network. Flood risk from culverts can be exacerbated due to presence of blockages within culverts or trash screens, under-capacity or poor condition due to inadequate maintenance.

There are several long culverts along the London Colney, Hanstead Ditch, on Kings Road and Salisbury Hall Brook. Flood incidents have been recorded in the vicinity of the London Colney but these have not been attributed to performance of the culvert in this location. The majority of the culverts in St Albans are owned and maintained by Hertfordshire County Council, while the rest are owned by private landowners. Hertfordshire County Council identifies two culverts in St Albans City and District Council within their Section 21 Asset Register (last updated in 2015), these culverts are located at Jersey Farm and on Oaklands Lane in Smallford.

5.4 Surface water flooding

Surface water runoff is most likely to be caused by intense rainfall, where the amount of water falling can completely overwhelm the drainage networks, which is not designed to cope with extreme storms. The flooding can also be complicated by blockages to drainage networks, sewers being at capacity and/ or high-water levels in watercourses that cause local drainage networks to back up.

The EA Risk of Flooding from Surface Water mapping (RoFSW) shows that several communities are at risk of surface water flooding in St Albans: Batford, Wheathampstead, Smallford, Harpenden, Redbourn, Sandridge, Sopwell. Frogmore, Colney Heath, Bullen's Green and Harperbury Park. The mapping shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys and can pond in low-lying areas. Around built-up areas runoff routes are confined to roads, elsewhere there are also prominent run-off flow routes along valleys in rural parts of the catchment.

As noted in the Level 1 SFRA, surface water flood risk is largely confined within the valleys of the main rivers and ordinary watercourses of St. Albans District. Surface water ponding is most notable in the upper catchments of the rural watercourses at low points in the topography. In the urban parts of the catchment, surface water flow paths are generated along impermeable surfaces. Within the main urban extents, the main surface water paths flow through the road network towards the Ver in the West and Butterwick Brook

Within the main settlements, surface water flow paths are predicted to form on the impermeable surfaces with sufficient gradients. Within St. Albans city, surface water follows routes along the road network south-westwards into the River Ver, and eastwards into Butterwick Brook. There are significant surface water flow paths present in Harpenden and Sandridge in the 1 in 30-year rainfall event, where runoff appears to be channelled through dry valleys.

The nationally produced RoFSW modelling omits large linear flood management infrastructure and subsurface drainage elements such as surface water sewers, combined sewers and highway drainage, which can significantly affect the modelled pattern of flooding. As noted in the Level 1 SFRA, this is the case with the Midland Mainline railway embankment, running southwards through the centre of the district, which is not represented in the RoFSW modelling. The risk being represented by the RoFSW should be interpreted with adequate consideration given to the limitations of this dataset. Appendix B discusses in greater detail the implications of using this dataset to inform surface water flood risk.

Appendix H provides the surface water flood risk mapping for St. Albans.

5.5 Groundwater flooding

The Level 1 SFRA uses the JBA groundwater flood map to identify areas within the district that are at high risk of groundwater flooding. These are Marshalwick, Sandridge, Wheathampstead, Redbourn, Batford and Bricket Wood. Heightened groundwater levels

are likely around the flood plains of the main rivers and tributaries running through St Albans due the presence of chalk bedrock and gravel deposits.

The JBA groundwater flood map provides an indication of where groundwater is most likely to emerge and flow. The mapping cannot be used to predict the likelihood of groundwater emerging or to quantify the volumes of groundwater that might be expected to emerge in a given area. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding. The limitations of the use of the JBA Groundwater flood map are further outlined in Appendix B and Appendix C.

The groundwater flood map for St. Albans is provided in Appendix K.

5.6 Flooding from sewers

Thames Water is the water company responsible for the management of the public sewerage systems across St Albans. Thames Water provided an updated record of reported flooding incidents relating to public foul, combined or surface water sewers from January 2018 until January 2024. Table 5-2 below displays this data by postcode sectors to avoid identifying specific streets or properties.

Based on this data, the largest number of incidents within a single postcode area is recorded in AL2, which covers the areas around Chiswell Green, Bricket Wood, Park Street and London Colney. High numbers of incidents were also reported in parts of AL3 and AL4, which also cover the areas of Townsend, Sandridge and Jersey Farm.

As noted in the Level 1 SFRA, the presence of fluvial, surface water and groundwater flood risk in these areas should be assessed alongside sewer flood risk to determine the possibility of interaction with the sewer network.

Table 5-2 Thames Water sewer flooding register for St. Albans.

Postcode Area	Locality	Internal property flooding		External property flooding		Total
		2 in past 10-years	1 in past 10-years	2 in past 10-years	1 in past 10-years	
AL1 1	St. Albans City	9	0	0	1	10
AL1 2		13	0	1	0	14
AL1 3		3	0	7	4	14
AL1 4		7	0	2	0	9
AL1 5		9	0	3	0	12
AL2 1	St. Albans City, Bricket Wood, Colney Street, Frogmore, London Colney, Napsbury	21	0	2	0	23
AL2 2		16	0	1	0	17
AL2 3		40	0	2	0	42
AL3 4		4	0	0	0	4

Postcode Area	Locality	Internal property flooding		External property flooding		Total
		2 in past 10-years	1 in past 10-years	2 in past 10-years	1 in past 10-years	
AL3 5	St. Albans City, Redbourn, Sandridge, Gorhambury, Childwickbury	18	0	1	3	22
AL3 6		4	0	0	0	4
AL3 7		12	0	6	0	18
AL4 0	St. Albans City, London Colney, Jersey Farm, Sandridge, Wheathampstead, Marshalswick	17	0	2	0	19
AL4 8		14	0	3	2	19
AL4 9		24	0	2	0	26
AL5 1	Harpenden, Kinsbourne Green	11	0	1	0	12
AL5 2		5	0	0	0	5
AL5 3		9	0	1	0	10
AL5 4		11	0	0	0	11
AL5 5		12	0	0	0	12
TOTAL		**259**	**0**	**34**	**10**	**303**

5.7 Flooding from reservoirs, canals and other artificial sources

5.7.1 Canal

There are no canals within the district, and therefore there is no risk of canal flooding.

5.7.2 Reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975, available on the Government website here, and are on a register held by the EA. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

The EA hold mapping showing what might happen if reservoirs fail. Developers and planners should check the Long-Term Risk of Flooding website before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. The EA provide two flooding scenarios for the reservoir flood maps: a ‘dry-day’ and a ‘wet-day’. The ‘dry-day’ scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The ‘wet-day’ scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood. It should be noted that these datasets give no indication of the likelihood or probability of reservoir flooding. In addition to these scenarios, the dataset also shows the wet-day extent where river flooding has been added to the reservoir model

referred to as the 'fluvial contribution'. It should be noted that the fluvial flooding shown here does not always align with the extents shown in the Flood Map for Planning.

There are 5 designated reservoirs within and close to the district which could contribute to this risk, these are shown in Table 5-3 below. The mapping also suggests that the flooding would not cause extensive flooding and would be confined within the main watercourses due to the well-defined river valleys that are characterise the district.

Table 5-3 Reservoirs impacting flood risk in St Albans

Reservoir	Location (Eastings, Northings)	Reservoir owner	Risk designation
Bowmans Green Lake (aka Willows Lakes)	519469, 205240	Bowmans Leisure Limited	High-risk
Luton Hoo Lake	510900, 219904	Luton Hoo Park Limited	High-risk
Redbourn Road Reservoir	511832, 211136	Redbournbury Fishery	High-risk
Markyate Flood Storage Area	505874, 217046	Environment Agency	High-risk
Radlett Brook Flood Storage Area	517000, 199200	Environment Agency	High-risk

It should also be noted that the EA maps represent a credible worst-case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential. However, it should be noted that flooding due to the breach or overtopping of a reservoir is extremely rare. The Multi-Agency Flood and Reservoir Inundation Plan developed for Hertfordshire identifies the key reservoirs across the county, the associated flood risk, and the required emergency response in the event of reservoir failure.

The reservoir flood mapping for both the ‘dry-day’ and ‘wet-day’ scenarios within St Albans has been provided in the Appendix N.

5.8 Flood Information Service

The Environment Agency provides a Flood Information Service covering the two main rivers within St Albans. This is a free service that residents and businesses can sign up to by phone, email or text message if their home or business is at risk of flooding.

Traditionally, the Environment Agency issues Flood Warnings to specific areas when flooding is expected, and more frequently Flood Alerts to larger areas, when flooding is possible.

There are 8 Flood Warning Areas in St Albans, covering the Rivers Colne, Ver Lee and Radlett Brook. Fluvial Flood Alert Areas cover wider areas of the Rivers Colne, Ver, Lee and Radlett Brook. There is a groundwater flood alert area covering a small area of Flamstead in St Albans.

The locations of all Flood Warning Areas and Flood Alert Areas in St Albans are shown in Appendix O and Appendix P respectively.

6 Flood defences and flood risk assets

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

6.1 Asset management

RMAs hold databases of flood risk management and drainage assets according to their jurisdiction as follows:

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

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

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

6.2 Standards of Protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 1% AEP SoP means that the defence is designed to protect up to the 1% AEP event.

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

It should be noted that the EA's on-going hydraulic modelling programme may revise flood risk datasets and, therefore, the SoP offered by flood defences in the area may differ from those discussed in this report. Developers should consider the SoP provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

Different authorities have responsibilities relating to maintenance of flood risk assets.

The EA and local authorities have permissive powers to maintain and improve main rivers and ordinary watercourses, respectively. The ultimate responsibility for maintaining watercourses rests with the landowner.

Highway's authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. They are also responsible for maintaining sections of watercourses where they are crossed by highways.

Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g. where there is frequent highway or sewer flooding.

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

It is important that the authorities work in partnership to maintain flood risk assets and manage flood risk across St Albans.

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

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

Table 6-1 Grading system used by the EA to assess asset condition

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

Source: One Business Condition Assessment Manual – EA 2023

6.4 Major flood risk management assets in St Albans

The EA retired the Flood Map for Planning 'Areas Benefiting from Defences' (ABD) dataset in December 2022 which has been replaced by the 'Reduction in Risk of Flooding from Rivers and Sea due to Defences' dataset.

This dataset will no longer be available on online mapping. Instead, a developer can enter their address on the EA website here to get information about their specific site and request flood risk assessment data for planning (also known as product 4). The data is available at a 50m resolution.

The EA 'AIMS' (Asset Information Management System) flood defence dataset gives further information on all flood defence assets within St Albans. The following locations benefit from flood defences the study area, where the design SoP is recorded this has been stated:

Table 6-2 Flood defences shown in the EA 'AIMS' data set

Asset name	Type and location	Asset operator	Design SoP (AEP)	Condition Rating (1-5)
None	Running along the banks of the River Ver near Redbourn Road, Townsend	Private	20%	Unknown
Westfield Road Embankments	Embankment running along both banks of the River Lee at Lower Luton Road, Batford	Private	50%	Unknown
None	Wall running along the right bank of the River Lee on Millstone Way, Batford	Private	50%	Unknown
None	Embankment running along the right bank of the River Lee at between Station Road and Lower Luton Road, Batford	Private	50%	Unknown
Kingfisher Close Flood Berm	Embankment running along the left bank of the River Lee at Kingfisher Close, Wheathampstead	Environment Agency	50%	Unknown

Asset name	Type and location	Asset operator	Design SoP (AEP)	Condition Rating (1-5)
None	Wall around Wheathampstead culvert on Station Road, Wheathampstead	Unknown	20%	Unknown

As noted in the Level 1 SFRA, there are also two Flood Storage Areas (FSAs) located in the north of the study area. Namely, these are the Markyate Flood Alleviation scheme in Dacorum and a smaller flood storage area in central Wheathampstead. The Marykate FSA is an on-line storage area located on the River Ver, in northern Markyate. The Wheathampstead FSA is located on the left bank of the River Lee, west of Station Road. Both these FSAs recognised in the EA's Flood Maps for Planning (Rivers and Seas) dataset. presented in Appendix L.

6.5 Existing and future flood alleviation schemes

Hertfordshire County Council provided details on existing and future flood schemes being planned for St Albans. A Property Flood Resilience (PFR) scheme was undertaken in London Colney providing flood resilience measures to flooded residents on a property-level basis. A flood working party project in Harpenden is being planned, which could result in a SuDS or NFM scheme.

6.6 Actual and residual flood risk

A Level 2 SFRA (for strategic allocations) or developer site-specific FRA will need to consider the actual and residual flood risk due to the presence of flood and drainage assets in greater detail (although it should be noted that Zone 3b is based on the actual flood risk considering defences).

6.6.1 Actual flood risk

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

The assessment of the actual risk should consider that:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is

a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.

- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day SoP afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary, land secured and safe-guarded that is required for affordable future flood risk management measures.
- By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources.

6.6.2 Residual risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been considered. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of flood gates to open or close or failure of pumping stations.

It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

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

The assessment of residual risk should consider:

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

- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.
- Climate change and/ or policy-dependent residual risks (such as those that may be created, if necessary, future defence improvements are required, or those associated with any managed adaptive strategies).

6.6.3 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and EA Flood Risks to People guidance document, available from the Government website here, provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds/ reservoirs, may need overtopping modelling or assessments at the site-specific FRA stage, and climate change needs to be taken in to account.

6.6.4 Defence breach

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

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

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

7 Flood risk management requirements for developers

This section provides updated guidance on site-specific FRAs. These are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with Planning Applications and should demonstrate how flood risk will be managed over the development's lifetime, considering climate change and vulnerability of users.

The Level 1 SFRA and this addendum provides a strategic assessment of flood risk within St Albans. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and the actual and residual risk, SoP, and safety at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the exception test can be satisfied.

A detailed FRA may show that a site is not appropriate for development of a particular vulnerability or even at all. The sequential and exception tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

7.1 Principles for new development

7.1.1 Apply the sequential and exception tests

Developers should refer to Section 3 for more information on how to consider the sequential and exception tests. For allocated sites, St Albans City & District Council should use the information in this SFRA to apply the Sequential test. For windfall sites a developer must undertake the Sequential test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the sequential test should the exception test then be applied if required.

Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test will need to be applied as proposals at the application stage will need to demonstrate flood risk is not increased elsewhere and is safe.

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

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

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

Developers should consult with the EA, Hertfordshire Council (as LLFA), and Thames Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design. Developers must consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance.

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific FRA. At a site level, developers will need to check before commencing on a more detailed FRA that they are using the latest available datasets. Developers should apply the most up-to-date climate change guidance (last updated in May 2022) and consider climate change adaptation measures.

7.1.3 Confirm that the development does not increase flood risk elsewhere

Section 8 sets out these requirements for taking a sustainable approach to surface water management. Developers should also confirm that mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary.

7.1.4 Make the development safe for future users

Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site, as discussed in Section 6.6

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

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

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

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

Wherever possible, developments should seek to help reduce flood risk in the wider area, e.g. by contributing to a wider community scheme or strategy for strategic measures, such

as defences or NFM or by contributing in-kind by mitigating wider flood risk on a development site. Developers must demonstrate in an FRA how they are contributing towards this vision.

7.2 Requirements for site-specific Flood Risk Assessments

7.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals of one hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size footprint or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the EA) (see Section 8.4.4 for more information on critical drainage problems).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.
- At locations where it is proposed to locate development in area with significant risk of surface water, groundwater, reservoir and sewer flooding.

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is in Flood Zone 1)
- Where evidence of historical or recent flood events have been passed to the LPA
- Land identified in an SFRA as being at increased risk in the future.
- Objectives of a site-specific FRA
- Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature, and location of the development.

Site-specific FRAs should establish:

- If the proposed development is likely to be affected by current or future flooding from any source, including residual flood risk.
- The structural safety of the building.
- The safety of the people in the buildings, including those with impaired mobility.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with the effects and risks are appropriate.
- The evidence, if necessary, for the LPA to apply the sequential test; and whether, if applicable, the development will be safe and pass the exception test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the EA and St Albans City & District Council. Guidance and

advice for developers on the preparation of site-specific FRAs is available from the following websites with hyperlinks provided:

- Standing Advice on Flood Risk (EA)
- Flood Risk Assessment for Planning Applications (EA)
- Site-specific Flood Risk Assessment: Checklist (NPPF PPG, Defra)
- Flood risk assessment: flood zones 1, 2, 3 and 3b - GOV.UK (www.gov.uk)
- Guidance for LPAs for reviewing FRAs submitted as part of planning applications has been published by Defra in 2015 and is available on the Government website here.

Guidance should be sought from the EA, St Albans City & District Council and Hertfordshire County Council at the earliest possible stage, and opportunities should be taken to incorporate environmental enhancements and reduce flooding from all sources both to and from the site through development proposals.

Developers should seek to go beyond managing the flood risk and support reduction of wider flood risk, whilst enhancing and conserving the natural environment. Further advice can be found at: Flood risk and coastal change - GOV.UK (www.gov.uk).

7.2.2 Site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. Early engagement with the EA and Hertfordshire County Council is advised.

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

Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity, and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should provide safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

When designing sites, developers should consider the Hierarchy of Drainage, as stated in the PPG, aiming to discharge surface water runoff as high up the drainage hierarchy as reasonably practicable:

- into the ground (infiltration)
- to a surface water body
- to a surface water sewer, highway drain, or another drainage system

- to a combined sewer

7.2.3 Modification of ground levels

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

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

Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624, available to download from the CIRIA website here.

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

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

7.2.4 Raised floor levels

If raised floor levels are proposed, these should be agreed with St Albans City & District Council and the EA. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The EA advises that minimum finished floor levels should be set 600mm above either the average ground level of the site, the adjacent road level and the 1% AEP plus climate change peak flood level, depending on whichever is highest. This may be reduced to 300mm where there is high certainty about the modelled flood level. An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA. Lowering existing FFLs below the existing levels within the 1% AEP plus climate change floodplain would not be acceptable and should be discouraged. New development offers opportunities to improve the resilience of buildings.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels. Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that

experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route.

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 and areas at significant risk of flooding from surface water or groundwater flooding should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the exception test. Access should be situated 600mm above the design flood level and waterproof construction techniques used.

7.2.5 Development and raised defences

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

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered. When considering any proposed measures or FFLs then the following should be assessed:

- the potential damages in the event of a flood, and
- likely speed of recovery after a flood.

7.2.6 Developer contributions

In some cases, and following the application of the sequential test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS). This relates to the Community Infrastructure Levy, a charge that can be levied by local authorities on new development in their area to help them deliver the infrastructure needed to support development in their area, and planning obligations including Section 106. The government website provides further information on the Community Infrastructure Levy and planning obligations.

7.2.7 Buffer strips

The provision of a buffer strip to ‘make space for water’ allows additional capacity to accommodate climate change and means access to the watercourse, structures and defences is maintained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology, and having to construct engineered riverbank protection. Any watercourse crossings should ensure that flood risk is not impacted. A buffer strip of 8m is required from any main river (including culverted main rivers, flood defences or flow control structures). Where flood defences are present, these distances should be taken from the toe of the defence.

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

difficult. Any development in these areas will likely require Flood Risk Activity Permits from the EA alongside any permission. There should not be built development within these distances from main rivers / flood defences (where present). Further advice and guidance on Flood Risk Activity Permits is available on the government website here.

7.2.8 Making space for water

The PPG sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality, and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

7.3 Resistance and resilience measures

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

There will be instances where developments, such as those that are water compatible and essential infrastructure are permitted in high flood risk areas. The above measures should be considered before resistance and resilience measures are relied on. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. The proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures include:

- Permanent barriers which can include built up doorsteps, rendered brick walls and toughened glass barriers.
- Temporary barriers which consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
- Community resistance measures which include demountable defences that can be deployed by local communities to reduce the risk of water ingress to several properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.

Flood resilience measures which aim to limit any permanent damage, prevent the structural integrity of the building being compromised and make the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls, and fixtures.

Guidance on flood resilient and flood resistant construction techniques is available on the government website, here. It is recommended that the developers follow the guidance in the CIRIA Property Flood Resilience Code of Practice.

There are also opportunities for 'change of use' developments to be used to improve the flood resistance and resilience of existing development, which may not have been informed by a site-specific flood risk assessment when it was first constructed.

7.4 Reducing flood risk from other sources

7.4.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1% AEP plus climate change fluvial event which would exceed both a surface water or a groundwater flood event of the same probability. Site design would also need to preserve any flow routes followed by the groundwater overland so that flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence that this will not be a significant risk. Other underground works, such as basements, may also need to be assessed as part of a site-specific FRA in certain prone areas susceptible to groundwater issues.

7.4.2 Surface water and sewer flooding

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

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

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

sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 1% AEP plus climate change storm event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques.

7.4.3 Reservoirs

As discussed in Section 5.7, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

Developers should contact the reservoir owner for information on:

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

The EA online Reservoir Flood Maps contain information on the predicted extents following a reservoir breach both when rivers are at normal levels and in conjunction with rivers in flood conditions (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extents shown in these online maps. Depths and velocities were also prepared as part of this study but have not been made publicly available.

The GOV.UK website on Reservoirs: owner and operator requirements provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan, and report an incident.

In addition, developers should consult the Thames Valley Local Resilience Forum about emergency plans.

Developers should use the above information to:

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

- The potential implications of proposed development on the risk designation of the reservoir should also be considered, as it is a requirement that in particular circumstances where there could be a danger to life, that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such an obligation should be identified and understood before new development is permitted, to ensure it can be achieved.

7.5 Emergency planning

Emergency planning covers three phases: before, during and after a flood. Measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

The 2023 NPPF (para. 173) requires site level FRAs to demonstrate that

“d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.”

- Certain sites will need emergency plans:
- Sites with vulnerable users, such as hospitals and care homes
- Camping and caravan sites
- Sites with transient occupants e.g. hostels and hotels
- Developments at a high residual risk of flooding from any source e.g. immediately downstream of a reservoir or behind raised flood defences
- Situations where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain “in-situ” and / or move to a higher floor or safe refuge area (e.g. at risk of a breach).

Emergency Plans will need to consider:

- The characteristics of the flooding which includes the speed of onset, depth, velocity, hazard, likelihood, duration, historic flooding
- The vulnerability of site occupants.
- Structural safety
- The impact of the flooding on essential services e.g. electricity, drinking water
- Flood warning systems and how users will be encouraged to sign up for them.
- Safe route of access and egress for users and emergency services, set above the estimated flood level and connected to a site away from the flood level. This includes single storey buildings or ground floors without access to upper floors to provide safe refuge.
- How a development can be evacuated prior to extreme flood event (0.1% AEP plus climate change

- How the consequences of residual risks will be safely managed, including additional measures to ensure that people will not be exposed to hazardous flooding.
- A safe place of refuge above the design flood level in areas where safe access and egress and advance warning may not be possible, having discussed and agreed this first with emergency planners.

Proposed new development that places an additional burden on the existing response capacity of the local authority will not normally be appropriate.

It is advised that emergency plans should be provided to support developments ensuring that residual risk is covered. However, it will not be appropriate to rely solely on emergency plans to mitigate residual risk. Further information should be included to understand the approach where residual risk from flood risk management infrastructure affects large areas. This information should be covered in site-specific Flood Risk Assessments (FRAs) and the accepted approach in locating development in these areas to ensure that new development is not put at risk.

The Thames Valley Local Resilience Forum provide Emergency Planning information about risks to the community, warn of hazardous conditions, such as flooding, snow, and drought, and provide information on preparing for emergency situations. Information is available from their website here.

Further information is available from the following documents / websites with hyperlinks provided:

- The National Planning Policy Guidance
- 2004 Civil Contingencies Act
- Defra (2014) National Flood Emergency Framework for England
- FloodRe
- The EA and Defra's Standing Advice for FRAs
- HCC's 'Flooding and water' website page
- EA's 'How to plan ahead for flooding'
- Sign up for Flood Warnings with the EA
- The National Flood Forum
- GOV.UK 'Prepare for flooding' page
- ADEPT Flood Risk Plans for new development

8 Surface water management and SuDS

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

8.1 Roles of the Lead Local Flood Authority and Local Planning Authority in surface water management

Hertfordshire County Council as the LLFA is a statutory planning consultee. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to confirm that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, the drainage team will provide advice to the Planning Department on the management of surface water. The LPA should satisfy themselves that the development's proposed minimum standards of operation are appropriate and, using planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the lifetime of the development.

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

Currently the use of SuDS is driven through planning policy. However, Schedule 3 of the FWMA 2010 is expected to be implemented in 2024 following a government review making SuDS mandatory for new developments in England. Schedule 3 will provide a framework for the approval and adoption of drainage systems, a SuDS Approving Body (SAB) within unitary and county councils, and national standards on the design, construction, operation, and maintenance of SuDS for the lifetime of the development.

8.2 Sustainable Drainage Systems (SuDS)

SuDS are designed to maximise the opportunities and benefits that can be secured from surface water management practices.

SuDS provide a means of dealing with the quantity and quality of surface water and can also provide amenity and biodiversity benefits. Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces. For example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures.

It is a requirement for all new major development proposals that SuDS for management of runoff are put in place, unless there is clear evidence that this would be inappropriate (NPPF para.175). HCC set out in their specific requirements for Surface Warter Drainage Strategies for all major developments in their LLFA Summary Guidance for developers. The

developer is responsible for ensuring the design, construction, and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and current drainage arrangements is essential.

It is important that SuDS are maintained for the lifetime for the development so that features can function as designed. Consideration should be given to enhancing SuDS to achieve biodiversity and pollution reduction benefits in addition to flood reduction.

8.3 Sources of SuDS guidance

8.3.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document. The manual can be downloaded from the CIRIA website.

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

Non-Statutory Technical guidance provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations. This guidance can be accessed on the Government website.

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

The Local Authority SuDS Officer Organisation (LASOO) produced their practice guidance in 2016 to give further detail to the non-statutory technical guidance. This guidance is available on the Susdrain website.

8.3.4 Hertfordshire County Council SuDS Guidance

Hertfordshire County Council have prepared SuDS guidance for developers which can be downloaded from their website. This document is intended to ensure that Surface Water Drainage Assessments or Flood Risk Assessments satisfy national planning policy as well as a the LLFAs SuDS policies. The guidance also provides advice to achieve multiple benefits such as mitigating flood risk, improve water quality, and address biodiversity concerns in the wider catchment.

8.4 Other surface water considerations

8.4.1 Groundwater Vulnerability Zones

The EA published groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that

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

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

8.4.2 Groundwater Source Protection Zones (GSPZ)

The EA also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on Defra's interactive mapping. Three main zones are defined as follows:

- **Inner protection zone (Zone 1)** - areas from where pollution can travel to the groundwater source within 50 days or is at least a 50m radius.
- **Outer protection zone (Zone 2)** - areas from where pollution can travel to the groundwater source within 400 days or lies within the nearest 25% of the total catchment area (whichever is largest).
- **Total catchment (Zone 3)** - the total area needed to support removal/discharge of water from the groundwater source.

Online mapping shows there are currently three GSPZ's which lie partially or wholly within the district of St Albans.

8.4.3 Nitrate Vulnerable Zones

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

NVZs can be viewed on the EA's website. There are two pre appeal NVZ 2021 to 2024 areas affecting St Albans:

- Surface Water S443 - LEE NVZ
- Groundwater G93 - Hatfield

Currently, information on the 2021 to 2024 NVZs post-appeal is unavailable. Landowners can appeal an NVZ designation once notified if their land (or part of it):

- Does not drain into water that has been identified as polluted.
- Drains into water that should not be identified as polluted.

8.4.4 Critical Drainage Areas

A Critical Drainage Area (CDA) is an area with critical drainage problems (which has been formally notified to the LPA by the EA. Within CDAs, proposed development may present increased risks of flooding both on and off site if the surface water runoff is not effectively managed. A dataset containing CDAs is available to download from the EA website here. There are currently no CDAs identified within St Albans.

9 Strategic flood risk measures

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the Local Plan area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies. It is important that the ability to deliver strategic solutions in the future is not compromised by the location of proposed development.

When assessing the extent and location of proposed development, consideration should be given to the requirement to secure land for flood risk management measures that provide wider benefits.

Strategic flood risk measures should seek to deliver multiple benefits in terms of biodiversity, water quality, climate change adaptation and carbon reduction. The national Flood and Coastal Risk Management (FCERM) appraisal guidance provides further guidance on achieving a carbon reduction within flood risk management projects. Further information is also available in the 2019-2029 Hertfordshire County Council LFRMS.

9.1 Safeguarding land for flood storage

Where possible, the LPA may look to allocate land designed for flood storage functions. Such land can be explored through the site allocation process where an assessment is made, using this SFRA, of the flood risk at assessed sites and what benefit could be gained by leaving the site undeveloped. In some instances, the storage of flood water can help to alleviate flooding elsewhere, such as downstream developments. Where there is a large area of a site at risk that is considered large enough to hinder development, it may be appropriate to safeguard this land for the storage of floodwater.

Section 14; Paragraph 167 of the NPPF states that, to avoid where possible, flood risk to people and property, the LPAs should manage any residual risk by, ‘safeguarding land from development that is required, or likely to be required, for current or future flood management’.

Applicable sites assessed through this SFRA may include any current greenfield sites:

- That are large enough (>1 hectare) to store floodwater to achieve effective mitigation.
- With large areas of their footprint at high or medium surface water flood risk (based on the RoFSW).
- That is within the functional floodplain (Flood Zone 3b).
- With large areas of their footprint at risk from Flood Zone 3a.
- That are large enough and within a suitable distance to receive floodwater from a nearby development site using appropriate SuDS techniques which may involve pumping, piping or swales/drains.

Brownfield sites could also be considered, though this would entail site clearance of existing buildings, conversion to greenspace and contaminated land assessments. By using the sequential approach to site layout, the LPA and developers should be able to avoid the areas at risk and leave clear for potential flood storage. See the maps in Appendix E to P to spatially assess the areas of the sites at risk.

9.2 Flood storage schemes

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

Flood storage schemes aim to detain this additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. Methods to provide these schemes include:

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

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

This is demonstrated in the Markyate Flood Storage Area in Dacorum. There may also be opportunities to collaborate with neighbouring Local Planning Authorities to deliver flood storage schemes rural areas of St Albans which provide cross-boundary benefits to downstream communities, for example in the Colne catchment, which passes into the Watford and Three Rivers District.

9.3 Natural Flood Management (NFM)

Developments provide opportunities to work with natural processes to reduce flood and erosion risk, and to benefit the natural environment. Local Plan policy can promote the use of natural flood management techniques, identify and safeguard land needed for NFM, and set out expectations for NFM contributions from developments.

Natural flood management requires integrated catchment management and involvement from those who use the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies. For example, the role of NFM in holding back water needs to be balanced against the role of organisations such as the Hertfordshire County Council to keep water flowing through their drainage district.

Conventional flood prevention schemes may be preferred, but consideration of ‘re-wilding’ rivers upstream could provide cost efficiencies as well as considering multiple sources of flood risk; for example, reducing peak flows upstream such as through felling trees into streams or building earth banks to capture runoff, could be cheaper and smaller-scale

measures than implementing flood walls for example. In 2017, the Environment Agency published an online evidence base to support the implementation of NFM and maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them.

The following areas of potential are identified within St Albans:

- Additional woodland plating (floodplain, riparian and catchment):
  - Floodplain and Riparian: Throughout River Colne, River Ver and Lee catchments.
  - Catchment: East and South-east St Albans within the Colne and Lee catchments
- Enhanced floodplain reconnection (removal of existing defences or structures without causing risk to properties)
  - River Colne at London Colney, River Colne at Radlett (between Radlett Road and Smug Oak Lane) and River Ver at Sopwell, St. Albans (between Holywell Hill and Bluehouse Hill, and at Cottonmill Lane).
- Runoff attenuation features (to reduce 1 in 30-year and 1 in 100-year flows)
  - Areas surrounding St. Albans (How Wood, Napsbury Park and Willows Lakes to the south. In the east and south Nomansland, Sandridge and the land adjacent to the Rebourn Lane and Luton Road. In the north, the land adjacent to Lower Luton Road and Gray's Wood.

Detailed mapping of NFM opportunity areas can be found online. With flood management schemes, consideration needs to be given to the impact that flood prevention has on the water quality of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

9.4 Catchment and floodplain restoration

Compared to flood defences and flood storage, floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes. Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain
- Removal of redundant structures to reconnect the river and the floodplain, to introduce a more natural morphology
- Apply the Sequential Approach to ensure no new development within the floodplain

For those sites considered within the new Local Plan for St Albans, that also have watercourses flowing through or past them, the sequential approach should be used to locate development away from these watercourses. This will ensure the watercourses retain their connectivity to the floodplain. Loss of floodplain connectivity could potentially increase flooding. Detailed assessments and planning would need to be undertaken to gain a greater understanding of the response of a watercourse to any proposed channel modification. Works to a watercourse will still require a Flood Risk Activity Permit from the Environment Agency for Main Rivers, or an Ordinary Watercourse Consent from Hertfordshire County Council for Ordinary Watercourses.

Where developers are riparian owners, they have the responsibility to make sure water can flow freely, without obstruction and without increasing the risk of flooding to neighbouring properties. They should also assess existing assets (e.g. bridges, culverts, river walls, embankments) and renew them to last the lifetime of the development. Enhancement opportunities should be sought when renewing assets, e.g. bioengineered river walls, raising bridge soffits to account for climate change. Any works should be designed to be maintenance free, but there is an obligation to the riparian owner to undertake maintenance when required.

9.5 Habitat Creation

There are several areas across St Albans which are focused on the management, restoration, and creation of habitats across wetlands and woodlands. The Hertfordshire Biodiversity Partnership outline the habitats of these key biodiversity areas, which include:

- Uppe Lea Valley
- Upper Colne Valley
- Bricket Wood/Moor Mill
- River Ver/Gorehambury

Strategic flood risk management solutions can provide both onsite and offsite opportunities to fulfil Biodiversity Net Gain (BNG) requirements for new development sites. BNG become mandatory for new developments nationally in November 2023. Hertfordshire County Council provides guidance on implementing BNG within new developments through its Biodiversity net gain (BNG) site matching service

The Environment Agency's Regional Habitat Creation Programme provides opportunities to receive funding to create habitats, which could help to facilitate nature-based flood risk management schemes.

9.6 Green Infrastructure

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

- Open spaces – parks, woodland, nature reserves, lakes
- Linkages – river corridors and canals, and pathways, cycle routes and greenways

- Networks of “urban green” – private gardens, street trees, verges and green roofs.

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

Developers are encouraged to contribute to the network of green and blue-green infrastructure for St Albans within sites of all scales. The Hertfordshire Green Infrastructure Strategy Part 2b details 10 priority actions, St Albans is recognised as an area of focus within the following actions:

- GI Priority Action 3 - Deliver environmental enhancement in vulnerable river valleys and catchments.
- GI Priority Action 5 - Restore, enhance and conserve chalk scarp and grassland landscape character.

9.7 Engaging with key stakeholders

Flood risk to an area or development can often be attributed to a number of sources such as fluvial, surface water and/or groundwater. In rural areas the definition between each type of flood risk is more distinguished. However, within urban areas flooding from multiple sources can become intertwined.

Where complex flood risk issues are highlighted, it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions. Engagement with riparian owners is also important to ensure they understand their rights and responsibilities including:

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

More information about riparian owner responsibilities can be found on the Hertfordshire County Council's information leaflet and in the Environment Agency’s guidance on Owning a Watercourse (2018).

10 Assessment of flood risk in potential development areas

This Level 1 SFRA identified potential development sites across St Albans which fall within areas of flood risk. Due to these findings, a Level 2 SFRA has been carried out to further assess the flood risk at those sites proposed for development to inform the exception test.

10.1.1 Methodology

To identify the sites to be taken forward for Level 2 assessment, the following screening process was undertaken:

- All promoted sites were screened through JBA's FRISM software to identify fluvial, surface water, and reservoir risks to the site. The outputs of this FRISM screening are shown in Appendix Q.
- SADC identified the sites assessed as potentially suitable for development through the latest Housing and Economic Land Availability Assessment (HELAA) from all sites put forward through the 'Call for Sites' process and previous SHLAA process from 2016-2019.
- A high-level assessment of flood risk was then undertaken using the sites put forward by SADC as potentially suitable for development:
- All sites were assessed against the criteria set out in the Level 1 SFRA which sets out risk parameters for all sources of flooding:
    - Site is within Flood Zone 1
    - Site is not within Flood Zone 3a plus climate change
    - Site is <10% at risk from surface water flooding in the 1 in 1000-year event
    - Site is <10% within highest risk category in JBA Groundwater map (groundwater is <0.025m below the surface in the 1 in 100-year event).
    - Site is <25% within second highest risk category in JBA Groundwater map (groundwater is between 0.025m and 0.5m below the surface in the 1 in 100-year event)
    - Site is not within the Historic Flood Map
    - Site is not at risk of reservoir flooding
- A more conservative approach was taken for sites with marginal risk (between 5-10% coverage on a site) but significant surface water flow paths in the 0.1% AEP event. Sites were visually assessed to determine whether the site can be developed around the areas of risk, particularly if safe access or egress could be determined. If this is not the case, these were also highlighted for Level 2 assessment. All sites were also assessed for groundwater and reservoir risk against the criteria above, further sites were highlighted for Level 2 assessment.

10.1.2 Level 2 SFRA assessment

A consultation with SADC was then undertaken to discuss and finalise the sites requiring Level 2 assessment.

The ranking criteria undertaken is as follows:

- Sites at moderate to high risk from fluvial flooding
- Sites at moderate to high risk from surface water flooding
- Sites where particular groundwater or reservoir flooding issues are identified
- Sites with historic flood risk

The Regulation 18 Draft Local Plan that was published for consultation in 2023 which allocated 102 sites. Following the Regulation 18 stage a further 15 potential sites were identified to be taken forward to a detailed flood risk screening exercise. This exercise identified 36 sites being screened-in as having significant risk of flooding on the site from at least one source of flooding.

This information is provided in Appendix Q and gives more detailed information regarding the risks posed to each site. The detailed assessment of fluvial flood risk of all the sites found that 81 of these were at low risk of flooding from all sources. Of the sites at risk, 8 were within both Flood Zone 2 and Flood Zone 3 (either a or b). One site was identified as within the Environment Agency's historic flood outline. The assessment of surface water risk identified that 36 sites were at risk from the 1 in 1000-year RoFSW outline, and 21 of these sites have an area of greater than 10% at risk. The assessment of groundwater risk identified that 19 sites have an area of greater than 10% at risk within JBA Groundwater flood map categories 3 (between 0.025m and 0.5m below the ground surface) or 4 (within 0.025m of the ground surface). In total, 36 sites were taken forward for a Level 2 assessment based on the approach described above.

The sites requiring a Level 2 assessment have been assessed on a site-by-site basis in the Level 2 SFRA, to inform the requirement for the exception test.

11 Summary and recommendations

11.1 Overview

Various parts of the St Albans District are at risk of flooding from the following sources: fluvial, surface water, groundwater, sewers, reservoir inundation, and overtopping or breaches of flood defences. This study had included the most recent data available to update the overall assessment of flood risk in St Albans.

The following sections outlines the sources of flood risk which have been identified in St Albans.

11.1.1 Fluvial flood risk

The main sources of fluvial flood risk in St. Albans are the River Lee in the north of the district, the Rivers Colne and Ver, and two tributaries of the Colne to the east, the Ellen and Butterwick Brooks. Flood Zones 2 and 3a in national mapping have changed since the publication of the Level 1 SFRA, which now incorporates the most recent modelling available for the River Ver. Flood Zone 3b has been revised as part of this study in line with the most recent updates to the PPG. In the River Lee catchment parts of Batford and Wheathampstead are located within Flood Zone 2 and 3. South-west St. Albans, Frogmore and Redbourn are situated within the Flood Zones of the River Ver, with the Flood Zone extents being the greatest at the confluence of the Ver and the Colne. The areas of eastern St Albans, Colney Heath and Napsbury Park fall within the Flood Zone extents associated with the Rive Colne and its tributaries.

11.1.2 Surface water flood risk

The RoFSW map shows a number of prominent overland flow routes that largely follow the topography of the watercourses and road networks in urban areas. There are some areas where there are additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments and in low-lying areas. This is notable around areas such as Ayres End, Sandridge, near bury Lane in Bernards Heath and along Hemel Hempstead Road in Redbourn, The mapping should be used with sufficient regard given to the limitations of the RoFSW modelling methodologies discussed in Section 5.4.

11.1.3 Impact of climate change on fluvial and surface water flood risk

Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas as a result of climate change. The mapping shows that fluvial flood extents are largely insensitive to climate change in in St

Albans, but it should be noted that flood depth, velocity and hazard may have more of an impact due to climate change. Surface water flooding is shown to be exacerbated by climate change, notable around certain areas of St Albans including Frogmore, St Julians, Sopwell, Sandridge, Redbourn and Wheathampstead. It is recommended that St Albans City & District Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development when developing climate change plans and strategies for the district.

11.1.4 Sewer flood risk

Thames Water provides and sewerage services across the entirety of the district. Thames Water have provided an updated record of historic sewer flooding across the district. Based on the records, sewer flooding has increased in incidence in most parts of the district, this includes Chiswell Green, Bricket Wood, London Colney, Townsend, Sandridge and Jersey Farm. Sewer flooding risk should be assessed for possible dependency with other sources of flood risk, particularly surface water and groundwater flooding.

11.1.5 Groundwater flood risk

The JBA groundwater emergence map shows that areas experiencing emergence levels within 0.5m of the surface or shallower are largely concentrated in the floodplains of the Rivers Lee, Ver and Colne, as well as Butterwick and Ellen Brooks. The Risk of Flooding due to Surface Water map suggests that any groundwater emerging in these areas is likely to follow the low-lying topography and path of the watercourses.

11.1.6 Flooding from reservoirs

There is a potential risk of flooding from reservoirs outside the district. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRAs (where relevant).

11.1.7 Defences

The EA AIMS dataset provides information on flood defence assets across the District. The engineered defences present in St Albans include a wall, embankments, and culverts that line parts of the River Colne, Lee and Ver. The current condition of these defences is unknown, with the design Standard of Protection varying between the defences.

11.2 Recommendations for strategic planning policy

The following recommendations are made for inclusion in planning policy by St Albans City and District Council:

- The location of new development in areas of lowest risk, in line with the sequential test, by steering sites to Flood Zone 1 from the Flood Map for Planning

and avoiding possible areas with significant risk of all sources flooding including surface water, groundwater, reservoir and sewer flooding. If a sequential test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the exception test shall be undertaken.

- Identify opportunities for development of brownfield sites in functional floodplain to reduce risk and provide flood risk betterment.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.
- Increase awareness and promote sign-up to the EA Flood Warnings within the St Albans district.
- Promote biodiversity, habitat improvements and Countryside Stewardship schemes help prevent soil loss and to reduce runoff from agricultural land.
- Consideration must be given to the status and timing of FRM measures and schemes to provide evidence on whether a proposed development may benefit from, hinder, adjust or facilitate delivery and implementation.

11.3 Recommendations for developers

The following recommendations are made for developers across five key areas that reflect the flood risk management principles discussed in Section 7.

Reduction of flood risk through appropriate site design:

- After application of the exception test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk should provide other wider sustainability benefits including flood risk betterment and contributions to flood resilience.
- Ordinary watercourses not currently afforded flood maps should be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.
- Confirm development is ‘safe’, and that dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then an assessment should be undertaken to detail the flood duration, depth, velocity, and flood hazard rating in the 1% AEP plus climate change flood event, in line with FD2320.
- Accommodation should be made for change in flood risk due to climate change impacts.
- Raise residential and commercial finished floor levels 600mm above the 1% AEP plus climate change fluvial flood level. Protect and promote areas for future flood alleviation schemes.

Promote SuDS to mimic natural drainage routes to improve water quality

- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.
- Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

Reduce surface water runoff from new developments and agricultural land

- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications.
- Identify opportunities to maintain and enhance permeable surfaces and greenspaces to help reduce surface water runoff whilst promoting other benefits, including biodiversity and wellbeing.

Enhance and restore river corridors and habitat

- Ensure that natural drainage features should be maintained.
- Identify opportunities for river restoration/enhancement to make space for water, to help meet mandatory BNG requirements.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.
- There should be no built development within 8m from the top of a watercourse or main river for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

Mitigation against residual risk and emergency planning

- Assess condition of existing assets and upgrade, if required, to confirm that the infrastructure can accommodate pressures/flows for the lifetime of the development.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.
- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be

assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.

- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 1% AEP rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 0.1% AEP event.
- Produce and implement robust emergency (evacuation) plans for major developments.

12 Appendices

A DWMP review

A.1 Drainage and Wastewater Management Plans (DWMPs)

DWMPs cover a period of 25 year and produced on a 5-yearly cycle by Water and Sewerage Companies (WaSCs). DWMPs are expected to set out how water companies will develop their systems to meet their obligations as sewerage undertakers under the Water Industry Act 1991 and the supplementary Urban Wastewater Treatment Act 1994 (for England and Wales). For the current cycle WaSCs are expected to produce DWMPs by the end of 2023 ahead of the 2024 Price Review (PR24) by Ofwat. The PR24 framework emphasises new environmental commitments to reducing storm overflows, improving biodiversity, improving bathing water quality, and reducing greenhouse gas emissions. The driver for these commitments is the Environment Act 2021, which places a legal binding duty on sewerage companies on England to achieve reductions in storm overflow discharges to mitigate public and environmental harm. It should be noted that DWMPs are currently produced as part of a non-statutory framework. However, it is expected that in England and Wales DWMPs will transition into statutory planning processes (under the Environment Act 2021) in their second cycle (i.e., 2030 to 2055). The new statutory term will be 'Drainage and Sewerage Management Plan (DSMP)'.

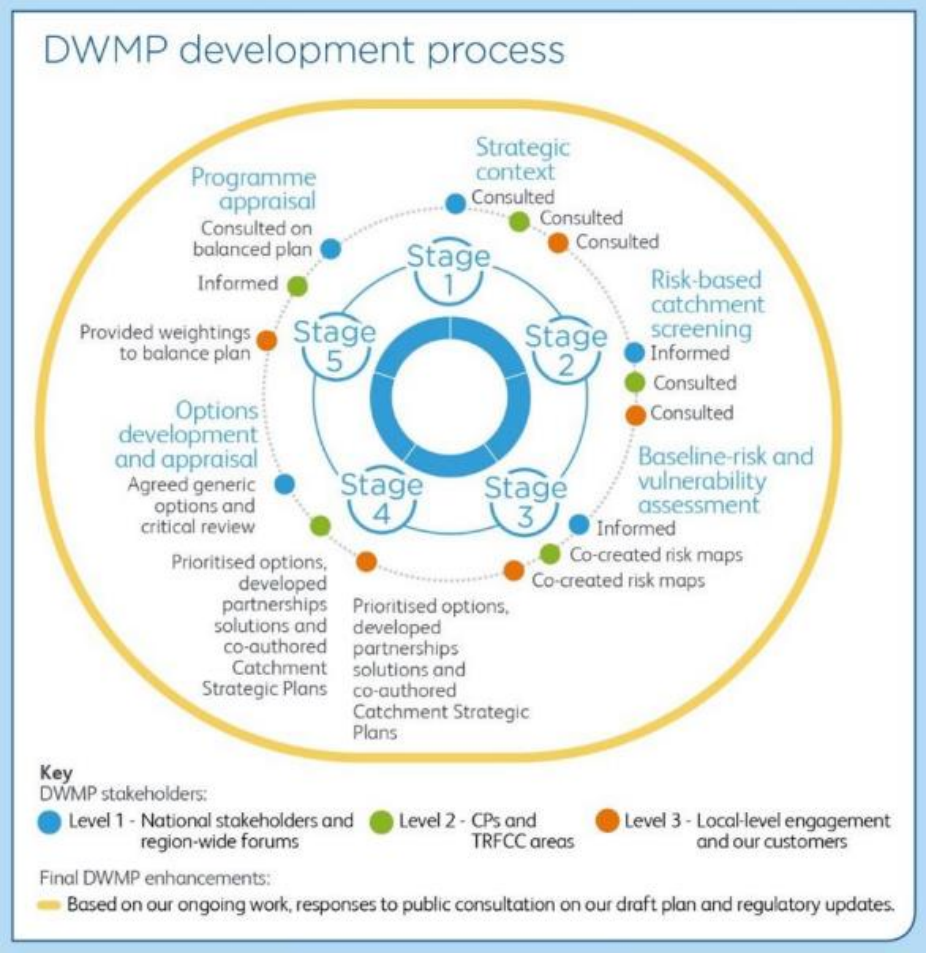


Figure 12-1 Thames Water DWMP development process (source: Thames Water)

DWMPs are produced at a river basin catchment scale, this includes risk assessments and mapping for sewer flood risk, the development process is shown in Figure 12-1. As such,

this information can be used to inform land use planning prioritisation and potentially Sequential and Exception tests. This review is performed to understand the extent to which the available data can be used to support the preparation of the Sequential Test.

A.2 Background

The Thames DWMP aims to set out the basis for long term investment proposals by and the commitment needed to make wastewater systems safe and secure. To address the different areas of the Thames Water region, the geographical structure of the DWMP is divided into four planning levels:

- Level 1 is the Thames Water company region.
- Level 2 consists of thirteen Thames Regional Flooding and Coastal Committee (TRFCC) areas or catchment partnerships.
- Level 3 is the individual Sewage Treatment Works (STWs) catchments, or tactical planning catchments. There are 382 catchments in total.
- Level 4 is only used in London and comprises sub-catchments of large STW catchments, called risk zones.

The DWMP has set 12 planning objectives for the entire region (level 1), six of which are reported nationally by all Water Companies, and six are address stakeholder needs.

A.2.1 Environment

- Sewage treatment works quality compliance: define the ability of the STW to treat and dispose of sewage in line with the current discharge permit quality conditions.
- Sewage treatment works flow compliance: define the ability of STW to treat and dispose of sewage in line with the current discharge permit dry weather flow (DWF) conditions.
- Risk of pollution incidents: define the risk of pollution discharges to the environment arising from either network or treatment sites.
- Storm overflow performance: define the ability of the sewerage system (including STW) to operate in storm conditions with an acceptable frequency of overflow to the environment.
- Carbon: achieve net zero carbon by 2030 for our business and to support our stakeholders' carbon neutrality goals.
- Wellbeing: provide beneficial impacts on population and human health.

A.2.2 Property flooding

- Internal sewer flooding risk: define the risk of properties flooding internally from our sewers.
- External sewer flooding risk: define the risk to outside areas within a boundary curtilage flooding from our sewers.

- % of population at risk of sewer flooding in a 1 in 50-year storm: define the percentage of our region's population at risk of sewer flooding from a 1 in 50-year storm, equating to a 2% probability of the storm event occurring in any given year.
- Reduce surface water runoff: reduce the volume and/or flow rate of surface water run-off into the combined and surface water sewers, to levels equivalent to runoff from greenfield areas.
- Reduce misconnections: reduce the number of misconnections of surface water entering the foul sewer network, or vice-versa.

A.2.3 Asset health

- Sewer collapses: define the risk of a sewer collapsing so that its ability to convey wastewater is compromised, specifically defined as the number of sewer collapses.

The following specific metric targets have been set for London and Thames valley by 2050:

- Reduce the number of customers at risk of internal and external hydraulic sewer flooding up to a 1 in 50-year storm by 100%
- Reduce storm discharges (where overflows are present) to <10 in an average year.
- Achieve 100% sewage treatment works permit compliance.

A.3 Risk based catchment screening

A Risk-Based Catchment Screening (RBCS) exercise was completed as part of the DWMP. The screening exercise informed the scope of the Baseline Risk and Vulnerability Assessment (BRAVA) enabling comparison across wastewater systems based on different levels of risk.

The screening involved using existing data to identify where there were current and/or potential risk or vulnerability in the wastewater system to future changes, such as new residential development or changes in climate. 17 indicators were used to assess performance, this covered the following risk categories:

- Environment
- Flooding
- Asset Health
- Wider catchment risks

The assessments showed that of 382 catchments, 293 reached the required threshold (two or more indicators breached) and necessitated a more detailed risk assessment to be undertaken. Overall, the following impacts due to population growth and climate change were found:

- For properties at risk of internal sewer flooding in a 1:30 year rainfall return period, the increase in risk over time is even across London and the Thames Valley with a 54% and 61% increase respectively by 2050.
- For properties that will be at risk of external sewer flooding in a 1:50 year rainfall return period, the increase in risk is higher for Thames Valley than in London with 54% and 30% increases respectively.

A.4 Baseline risk and vulnerability assessment

The objective of the BRAVA is to assess infrastructure risks now and to provide a view of how these change in the future due to population and climate change across the region. A strategic view of the level of risk facing drainage and wastewater services now and in the longer term.

BRAVA assessment was undertaken at three spatial levels:

Level 3: Sewage Treatment Works catchment

Level 2: Thames Regional Flood and Coastal Committee (TRFCC) sub-committee level

Level 1: Entire Thames Water region

The assessment was informed by modelling of the region through several metrics, to understand areas of vulnerability now and in the future. The metrics are in line with national metrics used across the industry. This included both 'lagging' metrics, which use data from historic reported events and current performance to give a view of the 2020 status, and 'leading' metrics, which use modelled fata for 2020 and 2050 to give a future view of potential areas of risk. Overall, the risk assessment showed that both growth and climate change, if left unmitigated, will have a significant impact on the performance of the wastewater service over the next 25 years.

St Albans falls within the Hertfordshire TRFCC, the area has a low baseline and predicted 2050 risk of foul sewer flooding in a 1 in 50-year event.

A.5 Catchment strategic planning

The Hertfordshire CSP† emphasizes collaboration with stakeholders, innovative solutions, and sustainability. Goals include preventing sewer flooding, eliminating harm from storm overflows, and enhancing sewage treatment works for water quality protection. The CSP provides detailed strategies for achieving these objectives, incorporating feedback from public consultations and aligning with local environmental and sustainability goals, including those specific to St Albans.

† Thames Water. *Our DWMP*. Available online: Our DWMP | Drainage and wastewater management | Thames Water [Accessed: February 2024]

Figure 12-2 shows the hierarchy of solutions considered for each area. Thames Water aims to use this hierarchy to prioritise maximising the use of existing assets and the use of natural surface management systems over network improvements. This hierarchy is intended to allow for an adaptive approach to meet 2050 goals in ceasing reliance on storm overflows to manage flood risk and incrementally increasing network capacity.

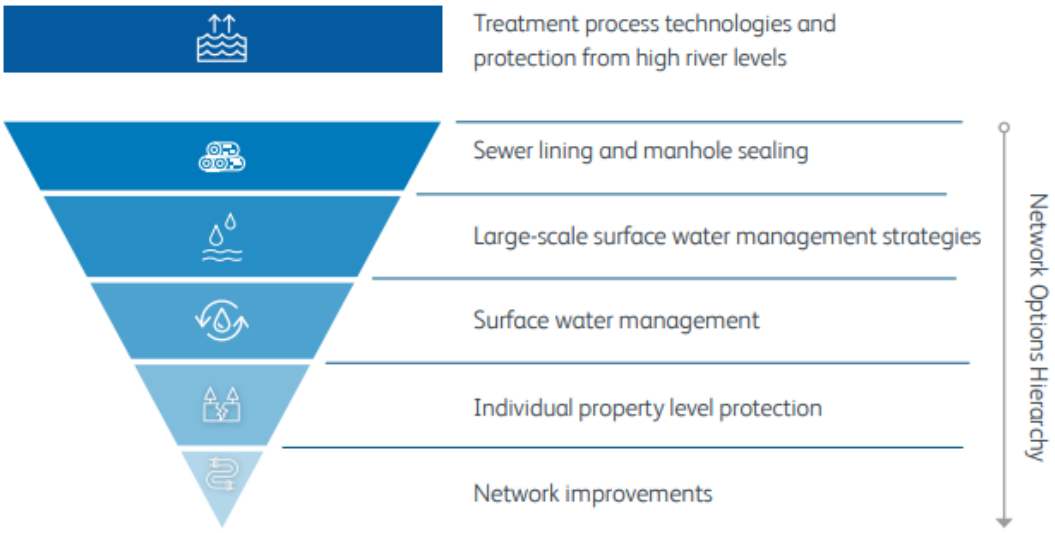


Figure 12-2 Thames Water DWMP options hierarchy

The strategies being pursued with respect to the above hierarchy includes the following:

- Sewer Lining and Manhole Sealing: Prioritizing areas of high infiltration risk to reduce unwanted flows in the sewerage systems and increase capacity.
- Large-Scale Surface Water Management Strategies: Implementing strategies in specific development areas to reduce rainfall entering the sewer network.
- Surface Water Management: Separating surface water from the foul sewer network and addressing misconnections to enhance sewerage systems.
- Individual Property Level Protection: Providing vulnerable homes with active and passive flood protection measures.
- Network Improvements: Identifying and addressing deficiencies in the sewerage network, including constructing large attenuation sewers and new water sewers.
- Treatment Process Technologies and Protection from High River Levels: Retrofitting or constructing new options for wastewater treatment to meet future demands and constructing flood bunds for protection against high river levels.

Thames Water outline the preferred plan for the Hertfordshire Thames Regional Flood and Coastal Committee (TRFCC) area:

- Reducing the number of annual storm discharges by 1098 by 2050, with average discharges for the 39 storm discharge locations not exceeding 10 occurrences per year. If insufficient investment is made, over 0.5% of properties would be at

risk in a storm up to 1 in 50-year in 2050. Implementation of this plan would reduce this to less than zero.

- Protecting 677 properties from internal sewer flooding for a 1 in 30-year storm, 1213 properties from external flooding from 1 in 30-year storm and 2521 properties from sewer flooding from a 1 in 50-year storm event.
- Upgrading capacity at 20 Sewage Treatment Works (STWs) by 2050
- Relining of 125km of sewers
- Disconnecting 116ha from sewers systems and reconnecting to surface water sewer through attenuation.
- Delivery of 156,803 tonnes of carbon embodiment and 148 tonnes of carbon sequestration through the plan.

The Harpenden STW is located on the eastern edge of St Albans, as such it falls within this STW catchment. Thames Water identifies the following primary challenges for The Harpenden STW catchment.

- Increased internal hydraulic sewer flooding - increased modelled risk from 0.1% (16) to 0.2% (29) of properties for a 1 in 30-year storm between 2025 and 2050.
- Increased external hydraulic sewer flooding - increased modelled risk from 0.2% (32) to 0.4% (57) of properties for a 1 in 30-year storm between 2025 and 2050.
- Increased hydraulic sewer flooding - increased modelled risk from 0.4% (63) to 0.7% (110) of properties for a 1 in 50-year storm between 2025 and 2050.
- Increased discharges from sewer overflows, the only overflow in this area, the Harpenden STW discharged 13 times in 2021.

Solutions to meet the above goals are set out for short term (2025-2050), medium term (2030-2035) and long term (2035-2050).

- Between 2025 and 2030, focus will be placed increasing confidence in plans for investment to enable the initiation of catchment level planning of surface water management solutions.
- Between 2030 and 2035 catchment planning to reduce surface runoff from entering the foul sewer will be progressed in addition to sewer network and STW works improvements to meet STW compliance requirements as well and growth and climate change drivers.
- Between 2035 and 2050, the implementation of surface water management solutions to enable the separation of surface of surface and foul sewer systems. In addition, the continuation of sewer network improvements and implementation of property level protection to individual buildings at risk of sewer flooding.

A.6 Implications of the resolution and scope of DWMP BRAVA data and mapping on the application of the Sequential Test

The following matters are material with respect to the application of DWMP BRAVA data and mapping to support the Sequential Test:

It is understood that the BRAVA table and mapping have been prepared for the purpose of Long-Term Investment Planning and not for the sequential placement of new development. The mapping shows where certain wastewater systems would require investment. However, as there is no certainty about any potential investment and the benefits this may bring, it is not necessarily possible to conclude that this should be used as the basis for the Sequential Test.

Results provide one risk category for each wastewater system, the actual level of risk within the areas shown might potentially vary substantially and thus the spatial resolution might not be appropriate for use in a comparative analysis of specific sites. The data resolution used as part of the DWMPs does not appear to be comparable to the river and sea flooding information and thus could not easily used alongside the existing data and mapping on a site-specific basis.

The data provided on the Thames Water websites are not provided in GIS format, which would be required to undertake the site screening as part of a Level 1 SFRA. Whilst it might not be possible to use the DWMP data and mapping in a comparative assessment to support the Sequential Test, the content might influence the timing and viability of potential allocations that are identified. For sites where it is understood that the DWMP data does potentially introduce sewer flooding matters that affect the implementation of development, then appropriate content will be included in a Level 2 SFRA assessment, by way of demonstrating that the principle of development can be supported.

B Data sources used in the SFRA

C SFRA User Guide

D Flood History

E Flood Zones

F Impact of Climate Change on Flood Zones

G Recorded Flood Outlines

H Risk of Flooding from Surface Water

I Impact of Climate Change on Surface Water Flood Risk (1 in 30-year)

J Impact of Climate Change on Surface Water Flood Risk (1 in 100-year)

K JBA Groundwater Mapping

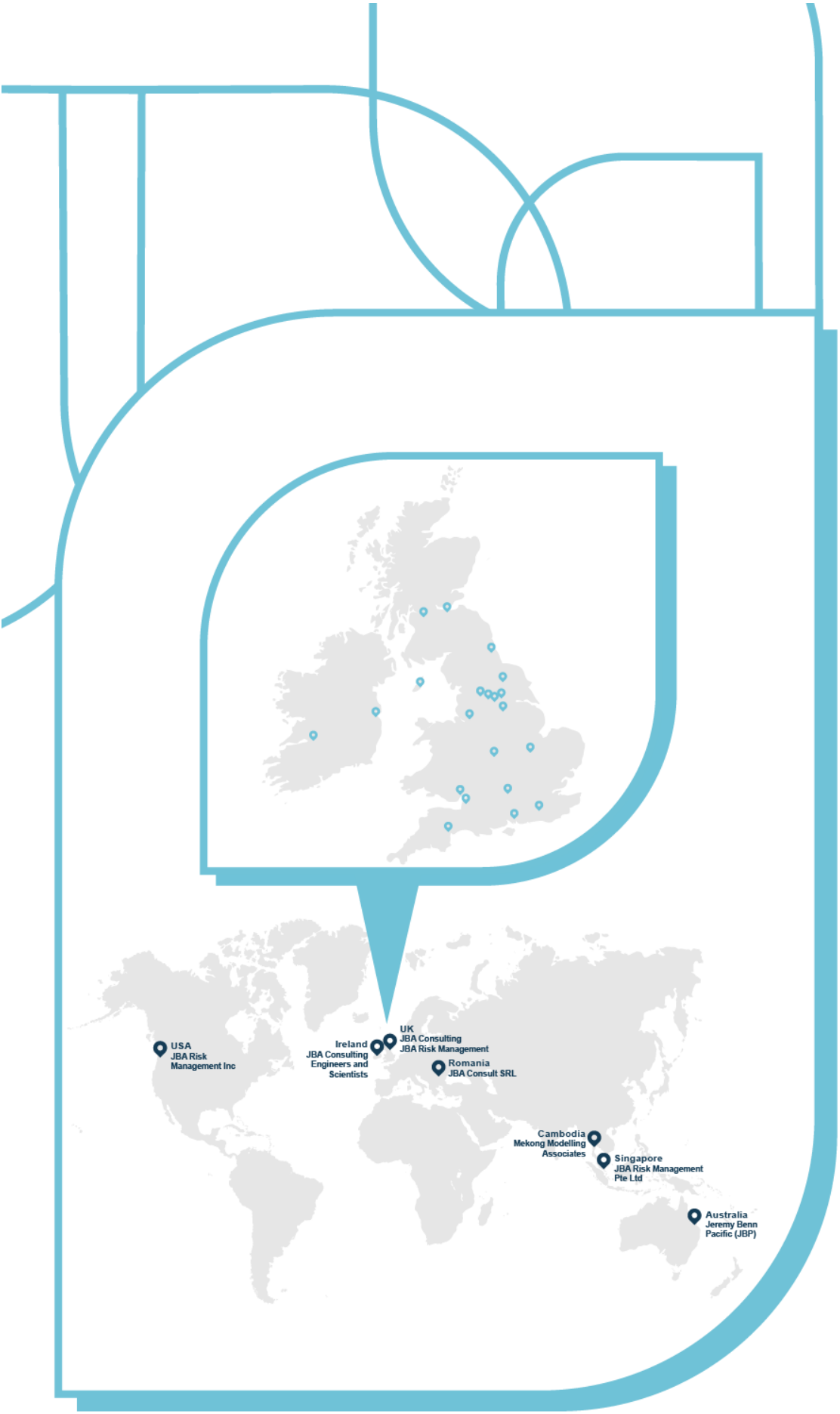
L Defences, assets, and structures

M Risk of Flooding from Rivers and Sea

N Reservoir flooding

O Flood Warning Areas

P Flood Alert Areas



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Q Site Screening Spreadsheet