

# St Albans Level 2 Strategic Flood Risk Assessment

## Final Report

July 2024

Prepared for:  
St Albans District Council



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# Contract

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This report describes work commissioned on behalf of St Albans District Council by an instruction dated 17 January 2024. Fiona Barraclough, Rebecca Crowther and Jasmine Mukkath of JBA Consulting carried out this work.

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## Acknowledgements

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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
RAG	Red-Amber-Green
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
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.

**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 chance 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.

**Dry island:** Land which may not be at risk of flooding itself but is surrounded by flood risk and therefore may become cut off during a flood event.

**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) (FMfP) is an online mapping portal which shows the Flood Zones in England. The FMfP shows river and sea flooding across different flood zones (Flood Zones 1, 2 and 3 (being split into 3a and 3b)) and includes modelled and historic flood outlines. The FMfP does not however take in to account the presence of flood defences or the 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

**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 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 1,000m<sup>2</sup> 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.

**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.

**Toe Line:** The level of the lowest part of a structure, generally forming the transition to the underlying ground.

**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

## Introduction and context

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of St Albans District Council's planning policies. This report uses the best available information, including input from key stakeholders. This Level 2 Strategic Flood Risk Assessment (SFRA) for St Albans City and District Council (SADC) was prepared alongside a Level 1 SFRA addendum to support Local Plan examination anticipated in 2025. The SFRA assesses additional land promoted to SADC for potential development, changes to the proposed development sites within the District, and changes in national planning policy and guidance, including the update to the National Planning Policy Framework (NPPF) in July 2021 and December 2023, the update to the Planning Practice Guidance (PPG) in August 2022, and the updates to the EA climate change guidance in July 2021 and May 2022.

## SFRA objectives

The Government's PPG on Flood Risk and Coastal Change advocates a tiered approach to risk assessment involving Level 1 and Level 2 assessments.

The aim of the Level 2 assessment is to build on identified risks from the Level 1 assessment for proposed development sites, to provide a greater understanding of fluvial, surface water, groundwater, and reservoir related flooding risks to the site. From this, SADC and developers can make more informed decisions and pursue development in an effective and efficient manner. The Level 2 assessment also identifies sites for further risk analysis at the site-specific Flood Risk Assessment (FRA) stage.

## Level 2 SFRA outputs

The Level 2 assessment includes detailed assessments of the proposed site options. The Level 2 assessment includes:

- An up-to-date SFRA, taking into account the most recent policy and legislation in the NPPF (2023) and PPG (2022).
- An assessment of all sources of flooding including fluvial flooding, surface water flooding, groundwater flooding, mapping of the functional floodplain and the potential increases in fluvial and surface water flood risk due to climate change, and how these may be mitigated.
- An assessment of existing flood warning and emergency planning procedures, including an assessment of safe access and egress during an extreme event.
- Advice and recommendations on the likely applicability of Sustainable Drainage Systems (SuDS) for managing surface water runoff.
- A comprehensive set of maps presenting flood risk from all sources that can be used as an evidence base for use in the emerging Local Plan.
- Advice on whether the sites are likely to pass the second part of the exception test and the sequential test with regards to flood risk and on the requirements for a site-specific FRA and outline specific measures or objectives that are required to manage flood risk.

As part of the Level 2 SFRA, detailed site summary tables have been produced for the proposed sites at significant flood risk, covering the above. To accompany each site summary table, there is associated PDF mapping, with all the mapped flood risk outputs.

## Summary of Level 2 SFRA

The Regulation 18 Draft Local Plan that was published for consultation in 2023 has 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. The screened-in sites were further assessed in detailed site summary tables. This SFRA incorporates recent changes to national and local planning policy.

Detailed site summary tables setting out the flood risk analysis and NPPF requirements for each site at significant risk of flooding, as well as guidance for site-specific FRAs, have been produced. To accompany each site summary table, there is a static mapping, showing flood risk outputs per site. A broadscale assessment of suitable SuDS has been provided, giving an indication where there may be constraints to certain types of SuDS techniques.

The following points summarise the Level 2 assessment:

- **Fluvial flooding** - 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. There are other smaller watercourses and drainage channels that also present fluvial flood risk in St Albans. The sites at the most significant risk of fluvial flooding are M6, M25, M26, B5, B8, UC27 and the assessed site on Hollywell Hill.
- **Flood Warning Areas (FWAs)** - Several proposed sites are located within existing EA FWAs. For proposed development within existing EA FWAs, developers should consult the EA to ensure that adequate flood warning procedures and evacuation processes are in place and that RMAs are not put under any additional burden.
- **Surface water flooding** - In St Albans, surface water overland flow routes largely follow the topography of the watercourses and road networks in urban areas. There are also isolated areas of ponding at topographic depressions. Significant surface water flood risk is present across the majority of the sites assessed in this study, with only a few sites being marginally affected. The sites at most significant surface water risk are M5, M6, P1, UC17, UC24, UC39, and UC43, as well as the assessed sites in Lattimore Road, Cotlandswick and Holywell Hill.
- **Access and egress** - The majority of the sites assessed have potential access and egress issues as a result of fluvial and surface water flooding of the surrounding roads. At these sites, consideration should be made as to how safe access and egress can be provided during flood events, both for people and emergency vehicles. Consideration should also be given to the nature of the risk, for example whether the flooding forms a flow path or bisects the site where access across the site from one side to another may be compromised. The sites

against which the mapping shows potential access and egress issues are UC8, UC12, UC24, UC27, UC36, UC39, UC46, M5, M6, M25, M26, B4, B5, P1 and P2, as well as assessed sites on Sandridge Road, Holywell Hill Road, Lattimore Road, Griffiths Way, Park Street, Therfield Road, Ariston Works and Harpenden Street.

- **Climate change** - Fluvial and surface water climate change mapping indicates that flood extents are predicted to increase. As a result, the depths, velocities, and hazard of flooding may also increase. The significance of the increase will depend on the topography of the site and the climate change percentage allowance used; fluvial extents would be larger than Flood Zone 3, but maximum extents are likely to be similar to Flood Zone 2. Site-specific FRAs should confirm the impact of climate change using latest guidance. It is recommended that SADC work with other RMAs to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the district.
- **Historic flooding** - Only 1 site is shown to fall partially within the EA Historic Flood Map dataset, however the EA Recorded Flood Outlines dataset and HCC records also show historic flooding near sites B4, B5, M5, P1 and UC27.
- **Sewer flooding** - All the sites fall within areas of St Albans with recorded flood incidents, the sites that fall within areas with the highest incidence ( $\geq 50$ th percentile) are: OS1, UC10, UC12, UC17, UC26, UC27, UC49, P2 and the assessed Ariston Works development site.
- **Groundwater flooding** - The following sites in St Albans are shown to have high ground water levels in the JBA emergence map: M20, P2, B4, UC10, UC12, UC26, UC49 and OS. An appropriate assessment of the groundwater regime for a site should be carried out at the site-specific FRA stage.
- **Reservoirs** - There are 6 sites assessed within the site summary tables that are shown to be at risk of reservoir flooding during a 'Dry Day' scenario and 6 sites in a 'Wet Day' scenario. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is very low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRA (where relevant). Where development is proposed downstream of a reservoir, developers should consult the Environment Agency and reservoir owner, as this may affect the risk designation of the reservoir.
- **Watercourses** - Two sites are located where there is Main River (including culverted reaches of Main River) will require an easement of 8m either side of the watercourse from the top of the bank. These are the M6 which is bisected in a north-east to south-west direction by the River Ver and B5 which is bisected by Butterwick Brook in a north-west to south-east direction. A further 3 sites also contain an ordinary watercourse: B4, P1 and OS1. This may introduce constraints regarding what development will be possible and consideration will need to be given to access and maintenance at locations where there are

culverts. Developers will be required to apply for appropriate permits so the activity being carried out over easements does not increase flood risk.

- **SuDS** - A strategic assessment was conducted of SuDS options using available datasets. A detailed site-specific assessment of suitable SuDS techniques would need to be undertaken at site-specific level to understand which SuDS option would be best.

At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses so that the potential effects of proposals can be evaluated at site level. The modelling should verify flood extents, depths, velocities, and hazards (including latest climate change allowances), inform development zoning within the site, and prove, if required, whether the exception test can be passed.

For sites allocated within the Local Plan, the Local Planning Authority (LPA) should use the information in this SFRA to inform the exception test. At planning application stage, the developer must design the site adopting the sequential approach in line with the recommendations in national and local Planning Policy and supporting guidance and those set out in the Level 1 SFRA, its 2024 Addendum and this Level 2 SFRA.

For developments that have not been allocated in the Local Plan, developers must undertake the sequential test followed by the exception test (if required) and present this information to the LPA for approval. Developers will need to apply the exception test in the following instances:

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

'Highly vulnerable' development should not be permitted within Flood Zone 3a or Flood Zone 3b. 'More vulnerable' and 'Less vulnerable' development should not be permitted within Flood Zone 3b. Based on site assessments, the following sites are required to pass the exception test: B5, B8, M6, M20, M25, M26, UC27 and the development on Holywell Hill.

Whilst the Exception Test is only explicitly required for sites within fluvial/tidal flood zones, where sites are at significant risk from other sources of flooding, LPAs should carefully weigh up the benefits of development against the risks, and it will still need to be demonstrated through a site-specific FRA that site users will be safe throughout the lifetime of the development.

Flood risk issues can be complex, and the significance of issues requires professional judgement, based on the location, topography and nature (including depth, velocity and hazard) of flooding, rather than simply whether part of a site falls within a given flood extent. This is determined as part of this Level 2 assessment for sites allocated within the Local Plan. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should investigate in more detail to inform the exception test for windfall sites.

It is recommended that as part of the early discussions relating to development proposals, developers discuss requirements relating to site-specific FRAs and drainage strategies with

both the LPA and the Lead Local Flood Authority (LLFA), to identify any potential issues that may arise from development proposals.

# 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 EA and other relevant flood RMAs, such as lead local flood authorities and internal drainage boards.” **(NPPF, paragraph 166)**

A level 1 SFRA was published in March 2018 for South-West Hertfordshire, which included the District of St Albans. This included the screening of 492 potential development sites in St Albans for all sources of flood risk.

St Albans District Council published a Regulation 18 Draft Local Plan 2041 in summer 2023 which included a draft allocation of 102 sites. While the majority of these 102 preferred sites are located in Flood Zone 1, subsequent screening showed that 25 are at high risk from at least one source of flooding. In January, the Council commissioned this Level 2 SFRA for the District to inform the Regulation 19 final draft Local Plan. A further 15 unallocated sites were screened following the promotion of additional land for potential development. Some 11 of these sites were identified as being at higher flood risk and have been included in this Level 2 assessment.

In order to support the emerging new Local Plan, updates were required for the Level 1 SFRA which reflect the implications of the August 2022 changes to the PPG. This was produced in the form of an addendum to the Level 1 SFRA which is intended to be used alongside the Level 2 SFRA to inform decisions on the location of future development and the preparation of land use planning policies for the long-term management of flood risk.

As the data available for SFRA's and the relevant legislation is continually changing, an SFRA should be a live document and updated to reflect changes where applicable and practicable.

## 1.2 Levels of SFRA

The PPG identifies the following two levels of SFRA:

- A Level 1 assessment is required where flooding is not a significant constraint in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the sequential test. The Level 1 SFRA addendum for St Albans District has been carried out alongside this Level 2 SFRA.
- A Level 2 assessment is required where land in Flood Zone 1 or at low risk from other sources cannot appropriately accommodate all necessary development, creating the need to apply the NPPF's exception test. In these circumstances the



assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This report fulfils the requirements of a Level 2 SFRA. In accordance with the July 2021 and December 2023 changes to the NPPF, the Level 2 SFRA considers the risk of flooding from all sources now and in the future and the implications with respect to the implementation of development at the proposed allocation sites. This addresses the requirements that the exception test applies to flood risk from any source.

### 1.3 SFRA objectives

The objectives of this Level 2 SFRA are:

1. Provide individual flood risk analysis for site options using the latest available flood risk data, thereby assisting St Albans District Council in applying the exception test to their proposed site option.
2. Use available data to provide information and a comprehensive set of maps presenting flood risk from all sources for each site option.
3. Where the exception test is required, provide recommendations for making the site safe throughout its lifetime.
4. Take into account the most recent policy and legislation in the NPPF, PPG and LLFA SuDS guidance.

### 1.4 Consultation

SFRAs should be prepared in consultation with other risk management authorities (RMAs). The following parties (external to St Albans District Council) have been consulted during the preparation of this Level 2 SFRA:

- Hertfordshire County Council as LLFA
- Environment Agency
- Thames Water

### 1.5 How to use this report

Table 1-1 below outlines the contents of this report and details how different users can apply this information.

Table 1-1: Outline of the contents of each section of this report

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA	For general information and context.

Section	Contents	How to use
2. The Planning Framework and Flood Risk Policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.	Users should refer to this section and the relevant sections of the 2024 Level 1 SFRA Addendum for any relevant policy which may underpin strategic or site-specific assessments.
3. Sources of information used in preparing the Level 2 SFRA	Summarises the data used in the Level 2 assessment and site mapping.	Users should refer to this section in conjunction with the site summary tables and mapping to understand the data presented. Developers should refer to this section when understanding the requirements for a site-specific FRA.
4. Impact of Climate Change	Outlines the latest climate change guidance published by the EA and how this was applied to the SFRA. Sets out how developers should apply the guidance to inform site-specific FRAs.	This section should be used alongside the relevant sections of the 2024 Level 1 SFRA Addendum to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
5. Level 2 Assessment Methodology	Summarises the sites taken forward to a Level 2 assessment and the outputs produced for each of these sites. Includes an assessment of flood risk at the 'amber sites' (those sites identified at a lower but still notable flood risk than those requiring a full Level 2 assessment).	This section should be used in conjunction with the site summary tables and mapping to understand the data presented.
6. Flood Risk Management Requirements for Developers	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Refers to relevant sections in the L1 SFRA for mitigation guidance.	Developers should use this section alongside the relevant sections of the 2024 L1 SFRA Addendum to understand requirements for FRAs, what conditions/ guidance documents should be followed, and information on flood mitigation options.
7. Surface water management and	Refers to relevant sections in the L1 SFRA Addendum	Developers should use this section to understand the

Section	Contents	How to use
SuDS	for information on SuDS and surface water management and provides an overview of SuDS suitability across the study area.	suitability of SuDS across the study area and refer to the 2024 L1 SFRA Addendum for further information on types of SuDS, the hierarchy and management trains information.
8. Summary of Level 2 assessment and recommendations	Summarises the results and conclusions of the Level 2 assessment, and signposts to the L1 SFRA and its 2024 Addendum for planning policy recommendations.	Developers and planners should use this section to see a summary of the Level 2 assessment and understand the key messages from the site summary tables. Developers should also refer to the 2024 Level 1 SFRA Addendum recommendations when considering requirements for site-specific assessments.
Appendix A: Site Summary Tables	Provides a detailed summary of flood risk for sites requiring a more detailed assessment, which considers flood risk, emergency planning, climate change, broadscale assessment of possible SuDS, exception test requirements and requirements for site-specific FRAs. Also provided is PDF mapping for each Level 2 site assessed within a site summary table showing flood risk at and around the site.	Planners should use this section to inform the application of the sequential and exception tests, as relevant. Developers should use these tables to understand flood risk, access and egress requirements, climate change, SuDS, and FRA requirements for site-specific assessments. Planners and developers should use the supplementary maps in conjunction with the site summary tables to understand the nature and location of flood risk.
Appendix B: Mapping User Guide	The User Guide provides details of the layers used within the supplemental PDF mapping.	Planners and developers should refer these maps to understand the provenance of the data used.

**Note:** Hyperlinks to external guidance documents/websites are provided in [green](#) through the SFRA.

## 1.6 SFRA study area

SADC is a local authority in South-West Hertfordshire. The local authority District includes 20 wards with the highest densities located within the city of St. Albans. Other notable sized settlements are Harpenden, London Colney, Redbourn, Wheathampstead, Park Street, Chiswell Green and Bricket Wood.

St Albans is bounded by seven other authorities:

- Dacorum Borough Council
- Three Rivers District Council
- Central Bedfordshire Council
- Hertsmere Borough Council
- Welwyn Hatfield Borough Council
- North Hertfordshire District Council
- Watford Borough Council

The major watercourses which run through St Albans district are:

- The River Lee which flows through Batford, Harpenden in the north of the district.
- The River Colne which runs along the south-easterly boundary of the district where the River Ver joins with the Colne at Bricket Wood.
- A tributary of the Colne, River Ver flows through the central band of the district flowing from northwest to south south-east.

Additionally, there are numerous tributaries of the River Colne in the upper catchment within St. Albans district. For further details and mapping of the St Albans study area see Appendix B of the Level 1 SFRA addendum report.

## 2 The Planning Framework and Flood Risk Policy

This section of the Level 2 SFRA provides an overview of the planning framework, flood risk policy, and flood risk responsibilities. In preparing the subsequent sections of this SFRA, appropriate planning and policy amendments have been acknowledged and considered.

### 2.1 Roles and responsibilities for Flood Risk Management

RMA's are comprised of different organisations that have responsibilities for flood risk management. The RMA's in and around St Albans and their responsibilities are detailed in Section 2.10 of the 2018 Level 1 SFRA report.

### 2.2 Relevant legislation

The following legislation is relevant to development and flood risk in St Albans. Hyperlinks are provided to external documents:

- [Flood Risk Regulations \(2009\)](#) - these transpose the European Floods Directive (2000) into law and require the EA and LLFAs to produce PFRA's and identify nationally significant Flood Risk Areas.
- [Town and Country Planning Act \(1990\)](#), [Water Industry Act \(1991\)](#), [Land Drainage Act \(1991\)](#), [Environment Act \(1995\)](#), and [Flood and Water Management Act \(2010\)](#) – as amended and implanted via secondary legislation. These set out the roles and responsibilities for organisations that have a role in Flood Risk Management.
- [The Land Drainage Act \(1991\), as amended](#) and [Environmental Permitting Regulations \(2018\)](#) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an ordinary watercourse or main river.
- The [Water Environment Regulations \(2017\)](#) – these transpose the European Water Framework Directive (WFD) (2000) into law and require the EA to produce River Basin Management Plans (RBMP's). These aim to improve/maintain the water quality of aquatic ecosystems, riparian ecosystems and wetlands so that they reach 'good' status.
- Other environmental legislation such as the [Habitats Directive \(1992\)](#), [Environmental Impact Assessment Directive \(2014\)](#), and [Strategic Environmental Assessment Directive \(2001\)](#) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

### 2.3 Relevant flood risk policy and strategy documents

This section highlights policies and other relevant documents for the St Albans area. Hyperlinks are provided to external documents.

- [Thames Catchment Flood Management Plan \(2009\)](#) - the EA's overview of flood risk across the Thames River catchment and recommended ways of managing it.
- [Thames River Basin District \(RBD\) RBMP \(2022\)](#) - the EA's most recent review and update of the RBMPs took place in December 2022. RBMPs enable local communities to find more cost-effective ways to further improve water environments.
- [Thames RBD Flood Risk Management Plan \(FRMP\) \(2022\)](#) - the FRMP is a plan to manage significant flood risks within the Thames RBD. St Albans lies within the Thames FRMP area but does not fall within any FRAs.
- [Thames Water Resources Management Plan \(2024\)](#) - sets out how the water companies intend to achieve a secure supply of water for their customers and a protected and enhanced environment.
- [Thames Water Drainage and Wastewater Management Plan \(DWMP\) \(2023\)](#) a 25-year plan that sets out how Thames Water will manage wastewater now and, in the future, to meet the challenges of a changing climate and growing population.
- [Climate change guidance for flood risk assessment \(2022\)](#) - the EA's guidance was last updated in 2022. New UK Climate Projections (UKCP18) were used to update peak river flow allowances, and these are now based on management catchments rather than RBDs. There has also been a change in how peak river flow allowances should be applied, with a greater focus placed on the 'central' allowance. In May 2022 peak rainfall allowances were updated and are now based on management catchments rather than the previous flat rates for the whole country.
- [The Hertfordshire PFRA \(2011\)](#) - The Hertfordshire PFRA was published in 2011, with an addendum report published in 2017, and provides information on significant historic and predicted local flood risk. No Nationally Significant Flood Risk Areas (FRAs) were identified, however the assessment estimated that 6800 properties in St Albans were potentially at risk of flooding from a 1 in 200-year flood event. the 2017 addendum to the PFRA is [available on the Government website here](#).
- [Hertfordshire Local Flood Risk Management Strategy \(2019\)](#) - explains local flood risk sources in Hertfordshire and how the council manage flood risk in an integrated and effective way.
- [Hertfordshire County Council Water Cycle Study \(2017\)](#) - This study was intended to assist HCC 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.

Further details relating to these policies and documents can be found in Section 2 of the Level 1 SFRA report and Level 1 SFRA Addendum.

### 2.3.1 Thames River Basin District Flood Risk Management Plan

The **Thames RBD FRMP** (2022) is a plan to manage significant flood risks within the Thames RBD. St Albans lies within the Thames FRMP area but does not fall into any FRAs. The Thames RBD also recognises areas at flood risk outside of these FRAs, areas of local significance are referred to as 'Strategic Areas'. St Albans is in the Colne Valley Strategic Area, some strategic measures identified for this area are focused on collaboration with key local partners and stakeholders to reduce flood risk.

The measures and objectives for each area can be found on the EA's online Flood Plan Explorer, [here](#). These measures should be reviewed and delivered as part of the planning process where possible.

### 2.3.2 Thames Water Drainage and Wastewater (DWMP) Management Plan

Water and sewerage companies have a statutory duty under the Environment Act to produce DWMPs. The first plans were published in 2023. DWMPs must cover a minimum period of 25 years, looking at current and future capacity, pressures, and risks to their networks, such as climate change and population growth.

DWMPs should detail how the companies will manage these pressures and risks through their business plans and how they will work with other RMAs or drainage asset owners.

Thames Water published their first DWMP in May 2023, which covers the period from 2025 through to 2050. Appendix A of the Level 1 SFRA Addendum discusses in greater detail the contents of the DWMP and the implications for the St Albans District. The plan document is available on their website, [here](#). Further information on the Thames Water DWMP is available on their website, [here](#).

## 2.4 LLFAs, Surface Water and SuDS

The 2023 NPPF states that:

- 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (NPPF 2023, paragraph 175).

When considering planning applications, LPAs should consult the LLFA on the management of surface water to satisfy that:

- The proposed minimum standards of operation are appropriate.
- Through planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime.

The 2018 Level 1 South-West Hertfordshire SFRA and 2024 addendum prepared for St Albans should be referred to when assessing flood risk. The 2024 Addendum was

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produced to ensure the most recent updates to the PPG in May 2022 and the NPPF in December 2023 have been incorporated into the Level 1 SFRA. In the latest version of the NPPF, there is a strong presumption in favour of SuDS for the management of surface water runoff from new developments.

For proposed development in St Albans, reference should be made to HCC's SuDS guidance for developers which are set out standards to ensure that Surface Water Drainage Assessments or Flood Risk Assessments satisfy national planning policy as well as the LLFAs SuDS policies. The guidance can be downloaded from the Council's website [here](#).

The 2023 NPPF states that:

“All plans should apply a sequential, risk-based approach to the location of development” and should achieve this by “using opportunities provided by new development... to reduce causes and impacts of flooding.” (paragraph 167).

As such, SADC expects SuDS to be incorporated on minor development as well as major development and if possible, development in areas at material risk of flooding should be avoided. Masterplans should be designed to ensure that space is made for above ground SuDS features and that the requirements of existing surface water flow paths and storage volumes are appropriately accommodated. Underground attenuation should only be used on sites as a last resort, adequate technical justification will need to be provided for its use.



### 3 Sources of information used in preparing the Level 2 SFRA

This section outlines the datasets used in assessing the sites in the Level 2 SFRA.

#### 3.1 Data used to inform the SFRA

Table 3-1 provides an overview of the supplied data used to inform the appraisal of flood risk for St Albans.

Table 3-1: Overview of supplied data for St Albans Level 2 SFRA

Source of flood risk	Data used	Data source
Historic (fluvial)	Historic flood map Recorded flood outlines	Environment Agency
Historic (all sources)	Historic flooding incident reports	Hertfordshire County Council
Fluvial (including climate change)	Lee (2010) 1D ISIS model (with 2018 climate change re-runs) Upper Colne (2010) 1D-2D ISIS-TUFLOW model (with 2018 climate change re-runs) London Colney (2018) 1D-2D Flood Modeller-TUFLOW model Ver (2019) 1D-2D Flood Modeller-TUFLOW Flood Map for Planning (Rivers and Seas)	Environment Agency  Re-runs carried out by JBA in 2024 for the latest climate change uplifts for the River Ver and the London Colney
Surface water (including climate change)	Risk of Flooding from Surface Water dataset	Environment Agency
Sewers	Internal and external historic sewer flooding incident reports	Thames Water
Groundwater	Groundwater emergence map	JBA
Reservoir	National Inundation Reservoir Mapping (Long term flood risk map)	Environment Agency
Flood defences	AIMS Spatial Flood Defences dataset	Environment Agency
Other datasets	Source Protection Zones Detailed River Network Flood Alert and Flood Warning areas Groundwater Vulnerability	Environment Agency

Source of flood risk	Data used	Data source
	Risk of Flooding from Rivers and Sea National Receptor Dataset	
	BGS Geology 625K datasets (Bedrock Geology and Superficial Deposits)	British Geological Survey

### 3.2 Fluvial Flood Zones

#### 3.2.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a show the same extent as the Flood Map for Planning (FMfP) (which incorporates latest modelled data) so these extents were maintained. It should be noted that the following models are currently being updated by the Environment Agency:

- Upper Colne (2010)
- Lee (2010)

It is expected that Flood Zones 2 and 3a will be updated once these are available. Over time, the online mapping is likely to be updated more often than the SFRA, so SFRA users should check there are no major changes in their area.

The following provides additional information on the FMfP:

- Where flood outlines are not informed by detailed hydraulic modelling, the FMfP is based on generalised modelling to provide an indication of flood risk. Whilst the generalised modelling is generally accurate on a large scale, they are not provided for specific sites or for land where the catchment of the watercourse falls below 3km<sup>2</sup>.
- For watercourses with smaller catchments, the EA's Risk of Flooding from Surface Water (RoFSW) map provides an indication of the floodplain of small watercourses and ditches. It is more accurate in upper to mid river valley locations than lower valley locations near the coast. This is because it does not represent the floodplain for small watercourses as well in largely flat areas.
- Even where more detailed models of Main Rivers have been used by the EA to inform the FMfP, they will be largely based on remotely detected ground model data and not topographic survey. Furthermore, FMfP may not include all the most recent modelled outputs, hence the Level 2 SFRA has derived its own Flood Zones based on latest available data.
- For this reason, the FMfP is not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. Accordingly,

for site-specific assessments it will be necessary to perform more detailed studies in circumstances where flood risk is an issue.

### 3.2.2 Flood Zone 3b

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 3.3% AEP (1 in 30 years), where detailed hydraulic modelling exists. The 3.3% AEP modelled flood extents have been used to represent Flood Zone 3b, where available. 3.3% AEP extents were available for the following models:

- River Ver
- London Colney

For areas covered by detailed models, but with no 3.3% AEP output available, the 2% or 1% AEP outputs were used as a proxy for the Upper Colne and Lee models respectively.

As this is quite a conservative approach, the 5% AEP outputs have been used to identify areas where the Flood Zone 3b extent is likely to be similar/considerably different from the 1% AEP output and this has been used to inform the site screening process. Flood Storage Areas, as identified in the Flood Map for Planning dataset, have also been incorporated. In St Albans, this consists of an area around the floodplains of the River Lee near Kingfisher Close in Wheathampstead.

For areas outside of the detailed model coverage, Flood Zone 3a (1% AEP) has been used as a conservative indication. 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 Climate change

The Appendix B mapping included in this SFRA is provided as part of the assessment of climate change risk for fluvial and surface water flooding using modelled outputs with the latest climate change uplifts where available. Section 4 details how climate change has been represented within this Level 2 SFRA.

Developers should undertake detailed modelling of climate change allowances as part of a site-specific FRA, following the climate change guidance set out by the EA, [available on the Government website here](#).

## 3.4 Surface water

Mapping of surface water flood risk in St Albans has been taken from the EA's RoFSW mapping. Surface water flood risk is subdivided into the following four categories:

- **High:** An area has a chance of flooding greater than 3.3% AEP (1 in 30) each year.
- **Medium:** An area has a chance of flooding between 1% AEP (1 in 100) and 3.3% AEP (1 in 30) each year.

- **Low:** An area has a chance of flooding between 0.1% AEP (1 in 1,000) and 1% AEP (1 in 100) each year.
- **Very Low:** An area has a chance of flooding of less than 0.1% AEP (1 in 1,000) each year.

Care should be taken with use of the national EA RoFSW map as it does not account for culverts, structures, channel hydraulics, or sewer capacity, and therefore can provide an overestimated risk. The outputs are mainly intended for high-level assessments of surface water flood risk. If a particular site is indicated in the EA mapping to be at risk from surface water flooding, a more detailed assessment may be required to illustrate the flood risk more accurately at a site scale. Such an assessment should use the RoFSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

Detailed modelling using site survey will be necessary where there is a significant risk of surface water flooding. The EA is preparing updated and improved surface water mapping as part of work being carried out to update the National Flood Risk Assessment (NaFRA2). It is anticipated that this data will be available in 2024 and at that time it is recommended that the surface water risk assessment is reviewed. It is not expected that the updated mapping will fundamentally change the locations identified to be at risk from surface water flooding, but the improved analysis techniques will reduce some of the uncertainties associated with the assessment.

### 3.5 Groundwater

In general, less is known about groundwater flooding than other sources and availability of data is limited. Groundwater flooding can be caused by:

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

Groundwater flooding is different to other types of flooding. It can last for days, weeks, or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops.

The JBA Groundwater Emergence map used to assess potential areas that are likely to be at higher risk of groundwater flooding. This mapping shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels.

For the purposes of this SFRA, the JBA Groundwater Emergence map was used to locate areas where this groundwater is most likely to emerge. For this assessment, areas where groundwater levels are predicted to be within 0.5m (or shallower depths) of the ground surface were identified. For locations that met this parameter, a combination of the 0.1%

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AEP surface water extent from the EA's RoFSW map and EA 1m resolution LiDAR was used to identify where any groundwater emerging in these locations is most likely to flow and this is included in the site table.

The results of this assessment for each site are summarised in Appendix A. It should be noted that this assessment only identifies areas likely to be at risk of groundwater emergence and where this water might flow. It does not predict the likelihood of groundwater emerging or attempt 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.

### 3.6 River networks

Main Rivers are represented by the EA's Statutory Main River layer. Ordinary Watercourses are represented using the OS Open Rivers layer. Caution should be taken when using these layers to identify culverted watercourses which may appear as straight lines but, in reality, are not. Developers should check if a Flood Risk Activity Permit (FRAP) or any other permits or permissions will be needed prior to any activities being carried out to any main rivers.

Developers should be aware of the need to identify the route of, and flood risk associated with, culverts. CCTV condition survey will be required to establish the current condition of the culvert and hydraulic assessments will be necessary to establish culvert capacity of both culverts on site and those immediately offsite that could pose a risk to the site. The risk of flooding should be established using site survey, including the residual risk of culvert blockage.

### 3.7 Flood warning

Flood Warning Areas and Flood Alert Areas are represented by the EA's relevant GIS datasets. The sites affected by Flood Warning and Flood Alert Areas are detailed in the site summary tables in Appendix A.

### 3.8 Reservoirs

The risk of inundation as a result of a breach or failure of a number of reservoirs within the area has been identified from the EA's [Long Term Flood Risk Information website](#). Reservoir risk has been divided into 'Wet Day' and 'Dry Day' extents. The 'Wet Day' extent shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held when local rivers had already overflowed their banks. The 'Dry Day' extent shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held when local rivers are at normal levels. Further information can be found on the [Defra data download website here](#).

### 3.9 Sewer flooding

Historical incidents of flooding are detailed by Thames Water through their records of flooding incidents relating to public foul, combined or surface water sewers from January 2018 until January 2024. Due to licencing and confidentiality restrictions, sewer data has not been represented on the mapping but is referred to within the site summary tables.

Modelling carried out by Thames Water in their Drainage and Wastewater Management Plan (DWMP) has been used to indicate areas which may require further investigation to determine capacity constraints within the network and identify any upgrades required to enable growth.

Thames Water has recognised that the Harpenden Wastewater Treatment Works, located in the eastern part of the district, will reach quality and/or flow exceedance over the coming AMPs. Further investigation is required to understand what upgrades will be required.

### 3.10 Historic flooding

Historic flooding was assessed using the EA's Historic Flood Map and Recorded Flood Outlines mapping and a shapefile of historic flooding incidences provided by Hertfordshire County Council.

### 3.11 Flood defences

Flood defences are represented by the EA's Asset Information Management System (AIMS) Spatial Defences dataset. Their current condition and Standard of Protection (SoP) are based on those recorded in the tabulated shapefile data. A few of the sites along the River Lee are protected by embankments but these have a relatively low SOP (20% AEP or less). Elsewhere, there are no formal defences only 'Natural high ground' along both banks of the major watercourses and along some of the small drainage channels which will offer some protection from these watercourses. Additionally, there are two flood storage areas which contribute to a reduction in flood risk within St Albans, the Markyate and Wheathampstead FSAs which are both located in the north of the study area along the River Lee.

### 3.12 Residual risk

The residual flood risk to sites is identified as where potential blockages or overtopping/failure/breach of defences could result in the inundation of a site, with the potential for sudden release of water with little warning.

Potential culvert blockages that may affect a site were identified on OS Mapping and the EA's Detailed River Network layer to determine where watercourses flow into culverts or through structures (i.e. bridges) in the vicinity of the sites. Any potential locations were flagged in the site summary tables. These will need to be considered by the developer as part of a site-specific FRA.

Residual risk from breaches of flood defences, whilst rare, needs to be considered in FRAs. 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, if required.

A few sites along the River Lee are within close proximity to embankments which present a residual risk should they fail. Several sites assessed within district are also in close proximity to culverts which run beneath footpaths, roads, and railway lines, and present a residual flood risk should they become blocked.

### 3.13 Depth, velocity, and hazard to people

The Level 2 assessment seeks to map the probable depth and velocity of flooding as well as the hazard to people and use this within the site summary tables.

Where detailed model outputs were available, the 1% AEP plus climate change depth, velocity and hazard data has been used. In the absence of detailed hydraulic models, flood depth, velocity, and hazard are not available as part of the FMfP dataset so have not been included as part of this Level 2 SFRA and will need to be considered further during a site-specific FRA.

The depth, hazard, and velocity of the 1% AEP plus upper end climate change surface water flood event, produced by uplifting the EA RoFSW map using the pluvial upper end allowance, has also been mapped and considered in this assessment.

Hazard to people has been calculated using the below formula as suggested in Defra's FD2321/TR2 "Flood Risk to People". The different hazard categories are shown in Table 3-2. Developers should also test the impact of climate change depths, velocities, and hazard on the site, at FRA stage.

Table 3-2: Defra's FD2321/TR2 "Flood Risks to People" classifications

Description of Flood Hazard Rating	Flood Hazard Rating	Classification Explanation
Very Low Hazard/ Caution	<0.75	"Flood zone with shallow flowing water or deep standing water"
Danger For Some (i.e. children)	0.75 - 1.25	"Danger: flood zone with deep or fast flowing water"
Danger For Most	1.25 - 2.00	"Danger: flood zone with deep fast flowing water"
Danger For All	>2.00	"Extreme danger: flood zone with deep fast flowing water"

As part of a site-specific FRA, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood depth, velocity and hazard based on the relevant 1% AEP plus climate change event, using the relevant climate change allowance based on the type of development and its associated vulnerability classification. Not all this information is known at the strategic scale and the level of resolution may not be appropriate to enable site scale assessment of proposed development schemes.

### 3.14 Note on SuDS suitability

The hydraulic and geological characteristics of each site were assessed to determine the factors that potentially constrain schemes for surface water management. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments.

The assessment is based on catchment characteristics and additional datasets such as JBA’s Groundwater Emergence Mapping and British Geological Survey (BGS) Soil maps of England and Wales which allow for a basic assessment of the soil characteristics on a site-by-site basis. LiDAR data was used as a basis for determining the topography and average slope across each development site. Other datasets used include:

- Historic landfill sites
- Groundwater Source Protection Zones
- Detailed River Network
- Flood Zones derived as part of this Level 2 SFRA.

This data was then collated to provide an indication of particular groups of SuDS systems which might be suitable at a site. SuDS techniques were categorised into five main groups, as shown in Table 3-3. This assessment should not be used as a definitive guide as to which SuDS would be suitable but used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 3-3: Summary of SuDS categories

SuDS Type	Technique
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand Filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench



SuDS Type	Technique
Conveyance	Dry Swale, Under-drained Swale, Wet Swale

The suitability of each SuDS type for the site options has been described in the summary tables, where applicable. The assessment of suitability is broadscale and indicative only; more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS.

## 4 Impact of Climate Change

The sections below provide an overview of the approach taken to assess the impacts of climate change within this SFRA. For more detailed information about climate change please see Section 4 of the main Level 1 SFRA Addendum.

### 4.1 Revised climate change guidance

The EA published updated climate change guidance for fluvial risk in July 2021 on how allowances for climate change should be included in both SFRA's 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 guidance was further updated in May 2022 to address the changes to the requirements for rainfall allowances.

Before undertaking a detailed FRA, developers should [check the government website for the latest guidance](#).

### 4.2 Applying the climate change guidance

To apply the appropriate climate change guidance to a site, the following information is required:

- The vulnerability of the development – see [Annex 3 in the NPPF](#).
- 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. For development that will have an anticipated lifetime significantly beyond 100 years a higher allowance is required.
- The Management Catchment (assigned by the EA) that the site is located in.
  - Most of St Albans District lies within the Colne and tributaries Management Catchment.
  - The north of St Albans District lies within the Upper Lee Management Catchment.

Developers should consider the following when deciding which allowances to use to address flood risk for a development or local plan allocation:

- 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.

Developers should refer to the EA guidance when considering which climate change allowances to use, [available on the government website here](#).

### 4.3 Relevant allowances for St Albans District

Table 4-1 shows the updated peak river flow allowances that apply in St Albans for fluvial flood risk for the Colne and Upper Lee Management Catchments. These allowances supersede the previous allowances by RBD.

Table 4-1: Peak river flow allowances for the Management Catchments which cover St Albans

Management Catchment	Allowance category	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '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 change predicted for a later epoch is smaller than that for an earlier one- in those instances the larger allowance should be applied.

Table 4-2 shows the updated rainfall intensity allowances that apply in St Albans for surface water flood risk for the different Management Catchments. These allowances supersede the previous country wide allowances. These allowances should be used for site-scale applications and for surface water flood mapping in small catchments (less than 5km<sup>2</sup>) and urbanised drainage catchments.

Table 4-2: Peak rainfall intensity allowances for small and urban catchments for the Management Catchments which cover 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)	
		30-year return period	100-year return period	30-year return period	100-year return period
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 2 SFRA

##### Fluvial climate change

Fluvial models were re-run with the revised climate change uplifts where suitable modelling was available. Proxy data was used where modelling was not available or re-running was not deemed suitable following discussions with the EA taking into account the practicalities of re-running older models and the associated time and cost versus a marginal change in allowance. Where there were no detailed models available, or the existing models could not be re-run with the updated climate change guidance, Flood Zone 2 and 3 was used as an indicative climate change extent. The flood extent with the central and higher central allowances applied are shown in Appendix A. If development is proposed in areas where suitable climate change runs are not available, these may need to be run as part of a site-specific Flood Risk Assessment.

The following models and allowances were used to represent the 2080s central and higher central climate change estimate

- 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
- 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 and were unable to be run for the latest fluvial climate change allowances:

- Upper Colne 2010
- Lee 2010

The 0.1% AEP surface water extent can be used as an indication of the risk from smaller watercourses, which are too small to be covered by the EA's Flood Zones or where no detailed modelling exists.

### **Surface water climate change**

To inform this Level 2 SFRA, climate change modelling has been carried out for the whole district. Modelled Climate Change uplifts for the 3.3% and 1% AEP events were included as part of this SFRA and are presented in Appendix A for the following events and scenarios:

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

### **Developers**

Developers will need to undertake a more detailed assessment of climate change as part of the planning application process when preparing FRAs, 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. Developers should consult the EA to provide further advice on how best to apply the new climate change guidance.

Where the peak river flow allowance is particularly high there should be an allowance for encroachment out of Flood Zone 2 and development in these areas should be avoided until proven at a site-specific FRA stage.

#### **4.5 Impact of climate change on groundwater flood risk**

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

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended. Wherever a site is identified as being at risk from groundwater risk, a site-specific FRA will need to assess the potential for increased risk in the future as a result of climate change.

#### **4.6 Impact of climate change on the functional floodplain**

The potential impacts on Flood Zone 3b (3.3% AEP modelled extent) from climate change have been modelled for this SFRA where fluvial models could be re-run. Where there is no coverage, the impacts on flood extents may need to be considered at site-specific assessment stage. Modelled flood extents can be compared to the Flood Zone 3a extent,

and where no detailed modelling exists, Flood Zone 3a can also be compared against Flood Zone 2, for an indication of areas most sensitive to climate change.

#### 4.7 Impact of climate change on sewers

Surface water and fluvial flooding with climate change have the potential to impact on the sewerage system, so careful management of these is needed for development. Due to differing ages of settlements, there will be drainage systems consisting of different types of sewers. Increasing pressures from climate change, urban creep and infill development could impact on the performance of the sewerage system. Developers should read Thames Water's DWMP and consult with Thames Water to determine whether sites are at increased risk from sewer flooding in future.

#### 4.8 Adapting to climate change

The PPG climate change guidance contains information and guidance for how to identify suitable mitigation and adaptation measures 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 so that the 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.
- 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 SoP 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 SADC when proposing to allocate 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.

- Include the use of Natural Flood Management (NFM) techniques where possible to assist in the adaptation to climate change.

## 5 Level 2 Assessment Methodology

This section outlines how sites were screened against flood risk datasets to determine which sites required a Level 2 assessment. It also identifies other sites at lower risk with general recommendations for developers.

### 5.1 Site screening

St Albans District Council published a Regulation 18 Draft Local Plan 2041 in summer 2023 which included a draft allocation of 102 sites. While the majority of these 102 preferred sites are in Flood Zone 1, subsequent screening showed that 25 are at high risk from at least one source of flooding. In January, the Council commissioned this Level 2 SFRA for the District to inform the Regulation 19 final draft Local Plan. A further 15 unallocated sites were screened following the promotion of additional land for potential development. Some 11 of these sites were identified as being at moderate or high risk of flooding of at least one source of flooding, as defined by the criteria set out in Section 3.2.1 of the South-West Hertfordshire Level 1 SFRA and have been included in this Level 2 assessment.

It is important to identify opportunities to reduce the risk of flooding on and off the site(s) through the design of development and the value of compiling 'development guidelines' to understand the vision for site(s) and further information on how flood risk from all sources will be managed.

These sites were screened against available flood risk information and spatial data to provide a summary of risk to each site, including:

- the proportion of the site in each Flood Zone derived from detailed hydraulic model outputs where available, and where detailed modelling was unavailable the information is taken from the EA's FMfP (see Section 3.2 for a summary of how the Flood Zones were derived for this SFRA).
- the proportion of the site affected by climate change within the central and higher central allowances for the 1% AEP event where available. See Section 4.4 for a summary of available climate change allowances for use within this assessment.
- whether the site is shown to be at risk from surface water flooding in the RoFSW mapping for the 3.3%, 1%, and 0.1% AEP events, and the 1% AEP event plus 40% climate change allowance.
- whether the site is within, or partially within, the reservoir 'Dry Day' or 'Wet Day' flood extents.
- whether the site is within, or partially within, the Environment Agency (EA) Historic Flood Map dataset.
- whether the site is within 10m of a watercourse shown within the EA Statutory Main River Map.



- The proportion of the site that falls within category 3 (groundwater levels are between 0.025m and 0.5m below the ground) or category 4 (groundwater levels are within less than 0.025m of the ground surface) JBA Groundwater map.

The screening was undertaken using JBA in-house software called “FRISM”. FRISM is an internal JBA GIS package that computes a range of flood risk metrics based on flood and receptor datasets.

The results of the screening provide a quick and efficient way of identifying sites that are likely to require a Level 2 Assessment, assisting SADC with sequential test decision-making so that flood risk is taken into account when considering allocation options.

The screening also provides an opportunity to identify sites which may show to be 100% in Flood Zone 1, but upon visual inspection in GIS, have an ordinary watercourse flowing through or adjacent to them but for which no Flood Zone information is currently available. Although there are no Flood Zone maps available for these watercourses, it does not mean the watercourse does not pose a risk, it just means no modelling has yet been undertaken to identify the risk.

The Flood Zones are not provided for specific sites or land where the catchment of the watercourse falls below 3km<sup>2</sup>. For this reason, the Flood Zones are not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. The RoFSW has been used in these cases because this provides a reasonable representation of the floodplain of such watercourses to use for a strategic assessment.

## 5.2 Sites taken forward to a Level 2 assessment

Out of the 117 sites provided by SADC for the Level 2 screening assessment, 36 sites were carried forward to a Level 2 assessment.

Sites were screened against fluvial, surface water, groundwater, reservoir, and sewer flood risk using available data.

The criteria set out in the South-West Hertfordshire Level 1 SFRA was applied to the sites on the basis that sites that did not satisfy the threshold for any source of flood risk qualified for a detailed Level 2 assessment. The conditions for a site to be considered at low risk of flooding are as follows:

- 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

Sites which were within 5% of the threshold for low risk of flooding but showed non-negligible risk were further assessed on a site-by-site basis. Sites with the presence of any significant surface water flood risk issues at either the 3.33%, 1% or 0.1% AEP were also taken forward.

In order to assess whether a site was deemed to have significant surface water risk, professional judgment was used based on the extent and location of the surface water issues relative to the site and access and egress. For example, if there was an area of deep ponding, a prominent flow route bisecting a site, immediate constraints to site access at the boundary etc. Detailed site tables were used where the assessment of flooding from multiple sources or significant risk was required.

Table 5-1 summarises the sites which have been taken forward to the Level 2 assessment on this basis. A comprehensive summary of the results from site screening can be found in Appendix O of the Level 1 Addendum.

Table 5-1: Sites carried forward to a Level 2 assessment.

Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
B3	West Redbourn, Redbourn, AL3 7HZ	Surface water flow path bisecting the site	0%	0%	0%	100%	1%	2%	5%	6%
B4	East St Albans, AL4 9JJ	High groundwater and low surface water risk	0%	0%	0%	100%	0%	2%	8%	9%
B5	Glinwell, Hatfield Road, St Albans, AL4 0HE	Moderate fluvial, groundwater and surface water risk	0%	11%	14%	86%	2%	5%	22%	26%
B8	Harper Lane, north of Radlett, WD7 7HU	Majority of site at moderate groundwater risk, low fluvial and surface water risk	0%	1%	2%	98%	0%	0%	1%	2%
M20	Lower Luton Road, Harpenden, AL5 5AF	High groundwater risk	0%	0%	2%	98%	0%	0%	3%	2%

Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
M25	Baulk Close, Harpenden, AL5 4LY	Multiple sources of risk	3%	3%	21%	79%	0%	0%	6%	9%
M26	Highway Chipping Depot, Lower Luton Road, AL4 8JJ	Moderate fluvial and groundwater risk	0%	0%	32%	68%	0%	0%	1%	1%
M5	Sewage Treatment Works, Piggottshill Lane, Harpenden, AL5 5UN	Moderate surface water risk	0%	0%	0%	100%	3%	11%	27%	27%
M6	South of Harpenden Lane, Redbourn, AL3 7RQ	Moderate fluvial risk, high surface water and groundwater risk	8%	13%	29%	71%	17%	22%	39%	41%
OS1	Land to the North of Bricket Wood, bounded by the M25 and A405 North Orbital	High groundwater risk and low surface water risk and	0%	0%	0%	100%	1%	4%	12%	13%
P1	Smallford Works, Smallford Lane, AL4 0SA	High groundwater and surface water risk	0%	0%	0%	100%	0%	0%	38%	46%

Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
P2	Land at North Orbital Road, AL2 1DL	High groundwater risk and low surface water risk	0%	0%	0%	100%	2%	3%	6%	7%
UC10	Garage Block rear of 109-179 Hughenden Road, St Albans, AL4 9QW	High groundwater flood risk	0%	0%	0%	100%	0%	0%	0%	0%
UC12	Garage Block Between Hughenden Road and The Ridgeway, St Albans, AL4 9RH	High groundwater flood risk	0%	0%	0%	100%	0%	0%	0%	0%
UC17	Garage Block off Cotlandswick, London Colney, AL2 1ED	High groundwater and surface water risk	0%	0%	0%	100%	0%	10%	56%	58%
UC24	Garages Rear of Hill End Lane (North), St Albans, AL4 0AE	High surface water risk	0%	0%	0%	100%	29%	41%	59%	61%

Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
UC26	Garage Block to Malvern Close, St Albans, AL4 9SZ	High groundwater risk	0%	0%	0%	100%	0%	0%	0%	0%
UC27	Berkeley House, Barnet Road, London Colney, AL2 1BG	Moderate fluvial and groundwater risk	0%	0%	20%	80%	0%	0%	0%	0%
UC32	Garages off Creighton Avenue, St Albans, AL1 2LZ	High surface water risk	0%	0%	0%	100%	0%	14%	35%	37%
UC36	Garages off Park Street Lane, Park Street, AL2 2ND	High surface water and moderate groundwater risk	0%	0%	0%	100%	0%	20%	44%	43%
UC39	Garage Block to east of 8 Heath Close, Harpenden, AL5 1QN	High surface water risk	0%	0%	0%	100%	13%	33%	91%	95%
UC43	Garage block to west of 32-46 Riverside Road, St Albans, AL1 1SD	High surface water risk	0%	0%	0%	100%	0%	52%	81%	89%

Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
UC46	Garage Blocks adj. to 76 Oakley Road and 151 Grove Road, Harpenden, AL5 1HJ	High surface water and moderate groundwater risk	0%	0%	0%	100%	4%	11%	40%	41%
UC49	Garage Block rear of 18-30 Furse Avenue, St Albans, AL4 9NE	High groundwater risk	0%	0%	0%	100%	0%	0%	0%	0%
UC8	Public Hall, 6 Southdown Road, Harpenden, AL5 1TE	High surface water and moderate groundwater risk	0%	0%	0%	100%	7%	16%	38%	39%
N/A	Harpenden Station Car Park	Moderate surface water risk	0%	0%	0%	100%	0%	1%	10%	12%
N/A	44 – 52 Lattimore Road, St Albans	High surface water risk	0%	0%	0%	100%	4%	15%	52%	62%
N/A	Car Park to the rear of Portman House, Therfield Road St Albans	Moderate surface water risk	0%	0%	0%	100%	0%	0%	34%	37%

Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
N/A	Garage Block B off Cotlandswick, London Colney	High surface water and groundwater risk	0%	0%	0%	100%	10%	31%	40%	44%
N/A	186 Sandridge Road, St Albans	Significant surface water flow path on site	0%	0%	0%	100%	0%	0%	9%	12%
N/A	Motor Repair Garage, Park Street Lane, Park Street	High surface water and moderate groundwater risk	0%	0%	0%	100%	15%	22%	38%	33%
N/A	Griffiths Way Retail Park, St Albans AL1 2RJ	Moderate surface water and groundwater risk	0%	0%	0%	100%	5%	10%	25%	26%
N/A	Affinity Water, 107 Holywell Hill, St Albans	High risk of fluvial, surface water and groundwater risk	19%	31%	66%	34%	11%	23%	69%	75%
N/A	50 - 54 Lemsford Road St Albans	Surface Water flow path bisecting the site	0%	0%	0%	100%	0%	1%	5%	5%
N/A	Ariston Works	Surface Water ponding at lower lying parts of the site	0%	0%	0%	100%	1%	1%	3%	5%



Site Code	Location	Justification for Level 2	% of site within Flood Zone 3b (some figures are indicative flood zone 3b)	% of site within Flood Zone 3a	% of site within Flood Zone 2	% of site within Flood Zone 1	% of site in RoFSW 3.3% AEP extent	% of site in RoFSW 1% AEP extent	% of site in RoFSW 1% AEP plus 40% CC extent	% of site in RoFSW 0.1% AEP extent
N/A	Car Park and Garage Block to rear of Telford Court Alma Road St Albans	Surface Water ponding at lower lying parts of the site	0%	0%	0%	100%	0%	4%	5%	5%

It should be noted that the Flood Zone values quoted show the percentage of the site at flood risk from that Flood Zone/event but also include the percentage of the site at flood risk at a higher risk zone. For example, if 50% of a site is in the Flood Zones, taking each Flood Zone individually, 50% would be in Flood Zone 2 but say only 30% might be in Flood Zone 3a and only 10% in Flood Zone 3b. Flood Zone 1 is the remaining area of the site outside of Flood Zone 2, so Flood Zone 2 + Flood Zone 1 will equal 100%.

### 5.3 Site summary tables

As part of the Level 2 SFRA, detailed site summary tables have been produced for the sites listed above in Table 5-1. The summary tables can be found in Appendix A. Each summary table sets out the following information:

- Basic site information
- Location of the site in the catchment
- Area, type of site, current land use (greenfield/ brownfield), proposed site use
- Sources of flood risk
- Existing drainage features
- Fluvial – proportion of site at risk including description from mapping/modelling, utilising depth, hazard, and velocity information from detailed hydraulic models where available
- Surface Water – proportion of site at risk including description from RoFSW mapping using available depth, hazard, and velocity information
- Reservoir flood risk in both the 'Dry Day' and 'Wet Day' scenarios
- Flood history - historic incidents on or surrounding the site from the EA Recorded Flood Outline and Historic Flood Map datasets and historic incidences provided by Hertfordshire County Council
- Flood risk management infrastructure
- Description of residual risk
- Emergency Planning
- Flood Warning and Alert Areas
- Access and egress
- Fluvial climate change - summary of available climate change allowances and increase in flood extent compared to the 1% AEP event (Flood Zone 3a)
- Surface water climate change - summary of available climate change allowances and increase in flood extent compared to the 1% AEP event
- Requirements for drainage control and impact mitigation
- Broadscale assessment of possible SuDS to provide indicative surface water drainage advice for each site assessed for the Level 2 SFRA.
- Groundwater Source Protection Zones
- Historic landfill sites
- NPPF Planning implications

- Exception test requirements
- Requirements and guidance for site-specific FRA (including consideration of opportunities for strategic flood risk solutions to reduce flood risk)
- Key messages – summarising considerations for the exception test to be passed
- Mapping information – description of data sources for the mapped outputs used within the assessment

## 6 Flood Risk Management Requirements for Developers

This section provides 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 the vulnerability of users.

This report provides a strategic assessment of flood risk in St Albans district. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk, and any defences at a site, are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourse 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 undertaken for a windfall site may find that the site is entirely inappropriate for development of a particular vulnerability, or even at all.

The EA advise that large development sites and associated new infrastructure may be able to deliver ways to reduce the risk of flooding (from all sources) on the site and also off the site where a stand-alone flood alleviation scheme is not viable. On these sites, early engagement with the EA is recommended. The EA also request that any development close to the edge of the floodplain is set back as much as possible leaving a development buffer, as a precautionary approach.

Developers should refer to the following sections of the Level 1 SFRA Addendum for further information on the requirements for development.

- Section 7.1 - Principles for new developments
  - This section provides guidance for developers on applying the sequential and exception tests, consulting with statutory consultees, considering the risk from all sources of flooding, ensuring development seeks to reduce flooding and is safe for future users, enhancing the natural river environment and floodplain, and contributing to wider flood mitigation strategy within St Albans.
- Section 7.2 - Requirements for site-specific Flood Risk Assessments
  - When is an FRA required? (7.2.1)
  - Site layout and design (7.2.2)
  - Modification of ground levels (7.2.3)
  - Raised floor levels (7.2.4)
  - Development and raised defences (7.2.5)
  - Developer contributions (7.2.6)
  - Buffer strips (7.2.7)

- Making space for water (7.2.8)

## 6.1 Flood warning and emergency planning

Appendices P and Q of the Level 1 SFRA Addendum details the EA Flood Warning's and Flood Alert's available within St Albans at the time of publication. This Level 2 assessment has identified several proposed sites located within existing EA FWAs. For proposed development within existing EA FWAs, developers should consult the EA to ensure that adequate flood warning procedures and evacuation processes are in place and that RMAs are not put under any additional burden.

Section 7.5 of the Level 1 SFRA Addendum discusses NPPF requirements and what an emergency plan will need to consider and other relevant information on emergency planning. Further information is provided on [Hertfordshire County Council's 'Flooding and water' website page](#)

## 6.2 Reservoirs

This Level 2 SFRA identified 6 sites assessed within the site summary tables that are shown to be at risk of reservoir flooding during a 'Dry Day' scenario and 6 sites in a 'Wet Day' scenario. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is very low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRA (where relevant).

Section 7.4.3 of the Level 1 SFRA Addendum report details considerations that developers should follow when allocating development downstream of a reservoir.

## 6.3 Duration and onset of flooding

The duration and onset of flooding affecting a site depends on several factors:

- The position of the site within a river catchment, with those at the top of a catchment likely to flood sooner than those lower down. The duration of flooding tends to be longer for areas lower in river catchments.
- Reservoirs in upper catchments will provide some online flood storage that reduces the flood risk downstream and delays the onset of flooding. At the confluence of the larger watercourses and smaller tributaries, there may be different timings of peak flows, for example smaller tributaries would peak much earlier than watercourses with larger catchments.
- The principal source of flooding: where this is surface water, depending on the intensity and location of the rainfall, flooding could be experienced within 30 minutes of the heavy rainfall event e.g., a thunderstorm. Typically, the duration of flooding for areas at risk of surface water flooding, or from flash flooding from small watercourses, is short (hours rather than days).

- The preceding weather conditions prior to the flooding: wet weather lasting several weeks will lead to saturated ground. Rivers respond much quicker to rainfall in these conditions.
- Whether a site is defended, noting that if the defences were to fail, a site could be affected by very fast flowing and hazardous water within 15 minutes of a breach developing (depending on the size of the breach and the location of the site in relation to the breach), causing danger to life.
- Catchment geology: the permeability of a catchment affects its response time, for example chalk catchments take longer to respond than clay catchments.

Table 6-1 provides guidelines on the typical response time that may be expected for fluvial and surface water flooding. However, these are only broad guidelines, and it is recommended that a site-specific FRA refines this information based on more detailed modelling work where necessary.

Table 6-1: Guidelines on the duration of and onset of flooding

Principal source of flooding	Duration	Onset
Surface water	Up to 4 hours	Within 30 minutes
Fluvial	Between 4 and 24* hours	Within 2 to 8 hours

*\* Depending on where in the catchment a site is located, flooding could be rapid and flashy in the upper catchment (e.g. small tributaries), and slower responding and longer in duration in the lower catchment.*

## 7 Surface Water Management and SuDS

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

The Level 1 SFRA Addendum summarises guidance and advice on managing surface water runoff and flooding in Section 9. Below is a guide to what is included in sections not expanded on here, for reference alongside this Level 2 SFRA:

- Section 8.1 - Role of the LLFA and LPA in surface water management
- Section 8.2 - Sustainable Drainage Systems (SuDS)
- Section 8.3 - Sources of SuDS guidance
- Section 8.4 - Other surface water considerations covering Groundwater Vulnerability Zones, Groundwater Source Protection Zones, Nitrate Vulnerable Zones (NVZs) and Critical Drainage Areas

### 7.1 SuDS suitability across the study area

The permeability of the underlying soils can determine the infiltration capacity and percolation capacities. As such, a review of the soil characteristics has been undertaken using Soilscales [online soil maps](#) of England and Wales which allow for a basic assessment of the soil characteristics and infiltration capacity. Soilscales is not intended as a means for supporting detailed assessments, specific site investigations should be undertaken to determine the soil types across the study area. A high-level assessment of the suitability of SuDS is included in the site tables in Appendix A.

This strategic assessment should not be used as a definitive site guide as to which SuDS would be suitable but rather as an indicative guide of general suitability based solely on soil type. Several other factors can determine the suitability of SuDS techniques including land contamination, the depth and fluctuation of the water table, the gradient of local topography and primary source of runoff etc. When considering NVZs and if areas have pollutants, infiltration may only be suitable where treatment measures are provided, prior to any discharge to surface or groundwaters.

Further site-specific investigation should be conducted to determine what SuDS techniques could be utilised at a particular development. The result of this assessment does not remove the requirements for geotechnical investigation or detailed infiltration testing and does not substitute the results of site-specific assessments and investigations. The LLFA should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors. Hertfordshire County Council as LLFA have set out their requirements in their guidance prepared for developers which can be downloaded from the Council's website [here](#).

# 8 Summary of Level 2 assessment and recommendations

## 8.1 Assessment methods

As part of the Level 2 SFRA 36 sites have been assessed with detailed site summary tables. The summary tables set out the flood risk to each site, including Flood Zone coverage, and the modelled extents, depths, velocities, and hazard ratings of fluvial flooding (where hydraulic model data is available) and surface water flooding. Climate change mapping has also been used to indicate the impact which different climate change allowances may have on the sites (where appropriate model runs are available) or using Flood Zone 2 as an indication of climate change. Each table also sets out the NPPF requirements for the site as well as guidance for site-specific FRAs.

A broadscale assessment of suitable SuDS options has been provided giving an indication where there may be constraints to certain sets of SuDS techniques. This assessment is indicative and more detailed assessments should be carried out during the outline site planning stage by the developer to confirm the feasibility of different types of SuDS. It may be possible that those SuDS techniques highlighted as possibly not being suitable can be designed to overcome identified constraints.

Mapping for each site is included in Appendix A and should be viewed alongside the detailed site summary tables. There are hydraulic model outputs available across large parts of the study area (see Section 3.1), but where models are unavailable, the EA's Flood Zones from the FMfP have been used. Also, where the watercourses are smaller and not represented in the Flood Zones, the RoFSW mapping datasets have been used.

The Level 2 SFRA also identifies the need to consider the implications of allocating land that could potentially be affected by other sources of flooding, including groundwater and reservoir flood risk.

## 8.2 Considering the exception test for the proposed sites in St Albans

Table 8-1 provides a summary of sites which are required to pass the exception test, this has been determined based on its development classification and fluvial flood risk.

Table 8-1 Sites which require an exception test

Site reference	Site name	Justification
N/A	Affinity Water, 107 Holywell Hill	Site is within Flood Zones 2, 3a, and 3b and the NPPF development class is 'More Vulnerable'.



Site reference	Site name	Justification
B5	Glinwell, Hatfield Road, St Albans, AL4 0HE	The western side of the site is within Flood Zones 2, 3a and 3b and the NPPF development class is 'More Vulnerable'.
B8	Harper Lane, north of Radlett	A proportion of the south-western part of the site is located within Flood Zone 3a and 3b. The NPPF development class is 'More Vulnerable'
M6	South of Harpenden Lane, Redbourn	There is significant fluvial flood risk within all flood zones at the eastern side of the site and the NPPF development class is 'More Vulnerable'.
M20	Lower Luton Road, Harpenden, AL5 5AF	Part of the site is within Flood Zone 2, 3a and 3b and the development type is 'More Vulnerable'.
M25	Baulk Close, Harpenden, AL5 4LY	A proportion of the northeastern area of the site is located within Flood Zone 2, 3a and 3b The NPPF development class is 'More Vulnerable'.
M26	Former Highway Chippings Depot, Lower Luton Road	A part of the site is within Flood Zone 2 and the development type is 'More Vulnerable'.
UC27	Berkeley House, Barnet Road. London Colney	The site is within Flood Zone 2 and the NPPF development class is 'More Vulnerable'.

In principle, it is possible for the majority of sites assessed in the Level 2 SFRA to satisfy the flood risk element of the exception test, for example by:

- locating development away from the highest areas of risk into Flood Zone 1 (in the majority of sites assessed, the risk is either along a site boundary or the risk is posed by a flow path running through the site, so steering away from this is advised),
- considering safe access/ egress in the event of a flood (from all parts of the site, if say the site is severed by a flood flow path),
- using areas in Flood Zone 2 and 3a for the least vulnerable parts of the development in accordance with Table 2 (Flood risk vulnerability and flood zone 'incompatibility') in the PPG. No development at all should be permitted in Flood Zone 3b (aside from essential infrastructure, such as a bridge crossing the lowest points of a site),
- testing flood mitigation measures if these are to be implemented, to ensure that they will not displace water elsewhere (for example, if land is raised to permit

development in one area, compensatory flood storage will be required in another),

- considering space for green infrastructure in the areas of highest flood risk where this is appropriate.
- No dry islands will be created as a result of development on sites reaching this stage.

If larger sites are split in future into smaller land parcels for development, and some of those parcels are in areas of flood risk, the exception test may need to be re-applied by the developer at the planning application stage.

It is recommended that developers investigate surface water and other sources of flood risk in more detail at the planning application stage and may need to consider undertaking integrated modelling. The developer must design the site adopting the sequential approach in line with the recommendations in national and local Planning Policy and supporting guidance and those set out in this SFRA.

### **8.3 Planning policy recommendations**

The planning policy recommendations in Section 9.1 of the Level 1 SFRA Addendum (JBA, 2024) still stand for the site allocations and any windfall development that comes forward and should be referred to alongside this report.

### **8.4 Guidance for windfall sites and sites not assessed in Level 2 SFRA**

- For sites not represented in the EA's Flood Zones, or where Flood Zones do exist, but no detailed hydraulic modelling is present, it is recommended that developers construct detailed hydraulic models at these sites as part of a site-specific FRA using channel, structure, and topographic survey, to confirm flood risk during the 1% AEP plus climate change 'design event'. Site-specific flood modelling will likely need to be developed in locations where it is necessary to understand the effects of proposed development schemes on the existing flood flow paths and flood volume storage, in the present day and in the future.
- If a site's extent includes or borders an EA Main River (including a culverted reach of a Main River), an allowance of 8m is required from both banks for access and maintenance. Any future development will require a flood risk permit for any activity within 8m of a Main River.
- If an ordinary watercourse is within or immediately adjacent to the site area, consultation with the LLFA (Hertfordshire County Council) should be undertaken. If alterations or discharges are proposed to the watercourse, a land drainage consent will be required.
- Where necessary, blockages of nearby culverts may need to be simulated in a hydraulic model to confirm residual risk to the site.

- Surface water risk should be considered in terms of the proportion of the site at risk in the 3.3%, 1% and 0.1% AEP events (with an appropriate allowance for climate change), whether the risk is due to isolated minor ponding or deeper pooling of water, or whether the risk is due to a wider overland flow route.
- Surface water risk and mitigation should be considered as part of a detailed site-specific FRA and surface water drainage strategy.
- Access and egress should be considered at the site, but also in the vicinity of the site, for example, a site may have low surface water risk, but in the immediate locality, access/egress to and from the site could be restricted for vehicles and/ or people.
- If a site is located within 250m of a landfill site, there could be amenity, dirt, and contamination issues. Sites could be sensitive from the perspective of controlled waters and therefore any redevelopment must ensure there is no pollution risk to the water environment.

## 8.5 Use of SFRA data and future updates

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

The SFRA should be a 'living document', and as a result should be updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by Hertfordshire County Council, Thames Water and the EA. Such information may be in the form of:

- New hydraulic modelling results
- Flood event information following a future flood event
- Policy/ legislation updates
- EA flood map updates
- New flood defence schemes, or alleviation schemes.

The EA regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a detailed FRA. At the time of this report being prepared, the EA are revising the 2010 Upper Colne and Lee models, but the results have not yet been made available in the duration of this study. The EA are also currently undertaking new nationalised 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.

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

# Appendices

# A Site Summary Tables

(Includes site mapping)

## B Mapping User Guide

### B.1 Instructions for using mapping

The accompanying User Guide provides further details about the datasets used within the maps produced for each site.

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