



www.jbaconsulting.com

JBA
consulting

Sevenoaks Level 1 Strategic Flood Risk Assessment

Final

Prepared for
Sevenoaks District
Council

Date
January 2026

Document Status

Issue date	January 2026
Issued to	Sevenoaks District Council
BIM reference	QRG-JBA-XX-XX-RP-HM-0001-A01-C02-Level1_SFRA
Revision	A01-C02
Prepared by	Grace Sheppard BSc Assistant Analyst Jackson Pawley BSc Assistant Analyst
Reviewed by	Peter Rook BSc MSc MCIWEM C.WEM FGS Principal Analyst
Authorised by	Ed Hartwell BSC MSc MCIWEM C.WEM Project Director

Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

Accessibility

JBA aims to align with [governmental guidelines on accessible documents](#) and [WGAG 2.2 AA standards](#), so that most people can read this document without having to employ special adaptation measures. This document is also optimised for use with assistive technology, such as screen reading software.

Contract

JBA Project Manager	Jordane Bates BSc (Hons)
Address	Pipe House, Lupton Road, Wallingford, OX10 9BS
JBA Project Code	2025s1310

This report describes work commissioned by Carlyn Kan, on behalf of Sevenoaks District Council by an instruction dated 20th August 2025. The Client's representative for the contract was Carlyn Kan of Sevenoaks District Council. Grace Sheppard, Jordane Bates and Jackson Pawley of JBA Consulting carried out this work.

Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Sevenoaks District Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Sevenoaks District Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

JBA disclaims any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to JBA's attention after the date of the Report.

The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between August 2025 and January 2026, and is based on the conditions encountered and the information available during the period. The scope of this Report and the services are accordingly factually limited by these circumstances.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by JBA has not been independently verified by JBA, unless otherwise stated in the Report.

Copyright

© Jeremy Benn Associates Limited 2026

Contents

Executive Summary	xiv
1 Introduction	19
1.1 Purpose of a Strategic Flood Risk Assessment (SFRA)	19
1.2 Relevance of the SFRA	19
1.3 Levels of SFRA	20
1.4 Local Plan Area	20
1.5 Consultation	22
1.6 Structure of this report	23
2 Policy and strategy for flood risk management	27
2.1 Roles and responsibilities	27
2.2 Key legislation for flood and water management in the district	28
2.3 Key national, regional, and local policy documents and strategies	31
3 Sequential and Exception Tests	37
3.1 National Planning Policy Framework and Guidance	37
3.2 The Sequential Test	37
3.3 The Exception Test	40
3.4 Applying the Sequential Test and Exception Test to individual planning applications	42
4 Understanding flood risk	45
4.1 Defining flood risk	45
4.2 Topography, geology, and soils	47
4.3 Historical flooding	52
4.4 Fluvial flood risk	53
4.5 Surface water flood risk	56
4.6 Sewer flood risk	57
4.7 Groundwater flood risk	58
4.8 Residual risk	60
5 Impact of climate change	65
5.1 Climate change guidance	65
5.2 Peak river flows	67

5.3	Peak rainfall intensities	69
5.4	Groundwater	71
5.5	Adapting to climate change	71
6	Flood risk infrastructure	72
6.1	Asset management	72
6.2	Standards of Protection	72
6.3	Maintenance	73
6.4	Major flood risk management assets in the district	74
6.5	Existing and future flood alleviation schemes	80
6.6	Other defence works	80
7	Flood risk management requirements for developers	81
7.1	Early consultation with statutory and non-statutory consultees	81
7.2	Site-specific FRAs	81
7.3	Emergency planning	82
8	Principles for site design and master planning	83
8.1	Modification of ground levels	83
8.2	Raised floor levels	84
8.3	Development and raised defences	84
8.4	Buffer strips	86
8.5	Property Flood Resilience (PFR)	86
9	Surface water management and SuDS	88
9.1	Sustainable Drainage Systems (SuDS)	88
9.2	Sources of SuDS guidance	88
9.3	Roles of the LLFA and LPA	90
9.4	Considerations for SuDS design	91
9.5	Other surface water considerations	95
10	Flood warning and emergency planning	98
10.1	NPPF requirements	98
10.2	Emergency planning	98
10.3	Local arrangements for managing flood risk	99
10.4	Flood alerts and flood warnings	100
11	Cumulative Impact Assessment	101

11.1	Introduction	101
11.2	Results	104
12	Strategic flood risk solutions	105
12.1	Partnership working	105
12.2	Biodiversity Net Gain	106
12.3	Natural Flood Management	106
12.4	Catchment and floodplain restoration	108
12.5	Structure removal and/or modification (e.g. weirs)	108
12.6	Bank stabilisation	108
12.7	Green infrastructure	109
13	Summary, recommendations, and next steps	110
13.1	Recommendations from SFRA findings	110
13.2	Requirements for a Level 2 SFRA	113
13.3	SFRA report recommendations	114
	Appendices	A-1
A	Data Sources used in this SFRA	A-2
B	Guide for using available flood risk data in applying the Sequential Test	B-3
C	Site Screening	C-1
D	Mapping	D-1
E	Southern Water and Thames Water DWMP review	E-2
F	Cumulative Impact Assessment	F-3

List of Figures

Figure 1-1: Sevenoaks District Council alongside its neighbouring authorities.	21
Figure 1-2: Water company coverage across the district	22
Figure 3-1: The Sequential Test.	38
Figure 3-2: Application of the Sequential Test for plan preparation.	39
Figure 3-3: Application of the Exception Test to plan preparation.	41
Figure 4-1: Conceptual model depicting how risk can be defined.	45
Figure 4-2: Source-Pathway-Receptor model.	46
Figure 4-3: EA 1m LiDAR data showing the topography across the district.	49
Figure 4-4: Bedrock geology across the Sevenoaks District.	50
Figure 4-5: Superficial geology across the Sevenoaks District	51
Figure 4-6: Historical flooding in the Sevenoaks District.	52
Figure 4-7: Watercourses in the Sevenoaks District.	55
Figure 4-8: Reservoirs with flood extents that impact the district.	64
Figure 5-1: Management Catchments (assigned by the EA) across the district.	66
Figure 9-1: Four pillars of SuDS design (The SuDS Manual C753, 2015).	91
Figure 9-2: SuDS Management Train.	93
Figure 9-3: Groundwater Source Protection Zones in the Local Plan area.	96
Figure 9-4: Nitrate Vulnerability Zones in the Local Plan area.	97
Figure 11-1: Catchments within the Cumulative Impact Assessment.	102
Figure 11-2: Result of the Cumulative Impact Assessment.	104

List of Tables

Table 1-1: Sets out the contents of the report and how to use each section.	23
Table 2-1: Roles and responsibilities for RMAs.	27
Table 2-2: National, regional, and local flood risk policy and strategy documents.	32
Table 4-1: Flood Risk hydraulic model used in the Level 1 SFRA	54
Table 4-2: SIRF data from Southern Water	58
Table 4-3: JBA Groundwater Emergence Map category descriptions.	59
Table 4-4: Reservoirs with flood extents that impact the district.	62
Table 5-1: Peak river flow allowances for the Darent & Cray Management Catchment	68

Table 5-2: Peak river flow allowances for the Medway Management Catchment	68
Table 5-3: Summary of modelling datasets used to inform climate change.	69
Table 5-4: Peak rainfall intensity allowances for small and urban catchments for the Darent & Cray Management Catchment.	70
Table 5-5: Peak rainfall intensity allowances for small and urban catchments for the Medway Management Catchment	70
Table 6-1: Flood risk asset maintenance responsibilities based on the FWMA (2010).	73
Table 6-2: Grading system used by the EA to assess flood defence condition.	74
Table 6-3: Locations shown in the EA 'AIMS' data set.	77
Table 9-1: Example SuDS design constraints and possible solutions	94

Abbreviations

AEP	Annual Exceedance Probability
BNG	Biodiversity Net Gain
CaBA	Catchment Based Approach
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIA	Cumulative Impact Assessment
CIRIA	Construction Industry Research and Information Association
CSF	Catchment Sensitive Farming
DCG	Design and Construction Guidance
Defra	Department for Environment, Food and Rural Affairs
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EU	European Union
FAA	Flood Alert Area
FCERM	Flood and Coastal Erosion Risk Management
FFL	Finished Floor Levels
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FRR	Flood Risk Regulations
FSA	Flood Storage Area
FWA	Flood Warning Area
FWAG	Farming and Wildlife Advisory Group
FWMA	Flood and Water Management Act
FWS	Flood Warning Service
GI	Green Infrastructure
GSPZ	Groundwater Source Protection Zone
IDB	Internal Drainage Board
IDD	Internal Drainage District
JBA	Jeremy Benn Associates
KCC	Kent County Council
KRF	Kent Resilience Forum
LFRMS	Local Flood Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority

LNRS	Local Nature Recovery Strategy
LPA	Local Planning Authority
LPU	Local Plan Update
LRF	Local Resilience Forum
mAOD	metres Above Ordnance Datum
MHCLG	Ministry of Housing Communities & Local Government
MMS	Middle Medway Strategy
NaFRA2	New National Flood Risk Assessment
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NVZ	Nitrate Vulnerable Zones
OS	Ordnance Survey
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBMP	River Basin Management Plans
REUL	Retained European Union Law
RMA	Risk Management Authority
RoFRS	Risk of Flooding from Rivers and Sea
RoFSW	Risk of Flooding from Surface Water
SAB	SuDS Approval Body
SDC	Sevenoaks District Council
SERT	South East Rivers Trust
SFRA	Strategic Flood Risk Assessment
SIRF	Sewer Incident Report Form
SoP	Standard of Protection
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKCP18	UK Climate Projections 2018
WFD	Water Frame Directive
WRMP	Water Resources Management Plan

Definitions

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

Brownfield: A previously developed parcel of land.

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

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

Design flood: 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 surface water flooding likely to occur with a 1% annual probability (a 1 in 100 change each year), plus an appropriate allowance for climate change, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

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

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. These were revoked in December 2023.

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

Fluvial Flooding: Flooding resulting from water levels exceeding the bank level of a main river or 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 multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity.

Greenfield: An undeveloped parcel of land.

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 (EA). They are usually the larger rivers and streams. The EA has permissive powers (not duties) to carry out maintenance and improvement works on main rivers).

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

Natural Flood Management (NFM): Techniques that work with nature to reduce the risk of flooding for communities.

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 (IDB) has permissive powers (not duties) on ordinary watercourses.

Permissive powers: Authorities have the power to undertake flood risk management activities, but not a duty to do so. This will depend on priorities in flood risk management.

Resilience Measures: Measures aimed at adapting an internal property, limiting the damage caused if water enters the building; this could include increasing the height of electric sockets.

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

Return period: 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 Management Authority (RMA): The EA; 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.

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.

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

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

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

Surface Water Management Plan (SWMP): A SWMP should outline the preferred surface water management strategy and identify actions, timescales and responsibilities of each partner.

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the planning policies for Sevenoaks. The review process is known as the Local Plan Update (LPU). This report uses the best available information, including input from key stakeholders. The SFRA applies the latest national planning policy and guidance, including:

- [National Planning Policy Framework \(NPPF\) \(gov.uk\)](#), last updated in December 2024.
- [Planning Practice Guidance \(PPG\): Flood risk and coastal change \(gov.uk\)](#) updated in September 2025.
- The latest [Environment Agency climate change guidance \(gov.uk\)](#) (updated in July 2021 and May 2022).
- The Environment Agency '[How to prepare a strategic flood risk assessment \(gov.uk\)](#) guidance, last updated in August 2025.
- The Association of Directors of Environment, Economy, Planning & Transport (ADEPT) '[Strategic flood risk assessment good practice guidance \(adeptnet.org.uk\)](#)'.

This 2025 document supersedes the previous 2024 Sevenoaks District Council Level 1 SFRA.

Introduction

To support the review and LPU for Sevenoaks District Council (referred to hereafter as the Council), the key objectives of the assessment are:

- To collate and analyse the latest available information and data for current and future (i.e., climate change) flood risk from all sources, and how these risks may be mitigated against.
- To inform decisions in the emerging LPU, including informing the sustainability appraisal, the selection of development sites, and planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support the Council in the preparation of the LPU.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the LPU.
- To help decide when a Flood Risk Assessment (FRA) will be required for individual planning applications.
- To provide advice for applicants carrying out site-specific FRAs, including those at risk from sources other than river flooding, or at risk of flooding in the future due to climate change, and outline specific measures or objectives that are required to manage flood risk.

- To provide the basis for applying the Sequential Test on planning applications, including by identifying sources of flooding other than those in 'Flood Zones' and those at risk of flooding in the future.
- To identify opportunities to reduce the causes and impacts of flooding and gather information on the land that is likely to be required for flood risk management structures.

Summary of the district and flood risk

The study area is located in west Kent, in the southeast of England, covering an area of approximately 370km². The M25 and M26 travel through the northern part of the district.

The district's main towns are Sevenoaks, Swanley and Edenbridge, alongside smaller settlements including Kemsing, Otford and Westerham.

Flood risk from all sources has been assessed in this SFRA. This study has shown that the most significant sources of flood risk across the district are fluvial and surface water. The points below summarise the findings:

Fluvial:

The two principal watercourses within the district are the River Darent, tributaries of which include the Honeypot Stream and the Watercress Stream, and the River Eden which is a major tributary of the River Medway. Tributaries of these watercourses include primarily smaller Ordinary Watercourses and unnamed drains.

The River Darent (an Environment Agency Main River) flows northwards from Westerham, through Sevenoaks, and eventually into the River Thames approximately 6km north of Sevenoaks District. According to SFRA flood zones mapping, the urban areas at risk of fluvial flooding from the River Darent (and tributaries including the River Guzzlebrook) include:

- Westerham
- Northern Sevenoaks (including Dunton Green and Bat and Ball)
- Otford
- Eynsford
- Farningham
- Horton Kirby.

The River Eden flows from west to east in the southern half of Sevenoaks District, reaching its confluence with the River Medway at Penshurst (both are Environment Agency main rivers). According to SFRA Flood Zones mapping, the urban areas at risk of fluvial flooding from the Rivers Eden and Medway include Edenbridge, Penshurst and Leigh.

Fluvial flood risk is discussed in Section 4.4 and the flood extents are shown in Appendix D1.

Surface Water:

The EA's RoFSW highlights several areas in the district at risk of surface water flooding. There is generally low risk of surface water flooding in the central and northern parts of the district, due to steeper elevations in these areas. Surface water is shown to predominantly follow the routes of watercourses or dry valleys with some isolated ponding located in low lying areas, notably in the south of the district. Furthermore, mapping identifies some constrained surface water flow paths within the District's urban areas, including Sevenoaks, Swanley, Edenbridge and Kemsing.

Surface water flood risk is discussed in Section 4.5 and the flood extents are shown in Appendix D2.

Climate Change: Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas, due to climate change. Flood extents will increase; in some locations this may be minimal, but flood depth, velocity and hazard may have more of an impact due to climate change. This SFRA provides an assessment of the impacts of climate change on fluvial and surface water flood risk. The approach to climate change is discussed in Section 5 and the flood extents for fluvial and surface water flood risk are also shown in the Appendix D3 and D4 respectively.

Sewer: Thames Water and Southern Water provide water and sewerage services across the district and have provided details of historic sewer flooding across district.

Southern Water's Sewer Incident Report Form (SIRF) indicates that 49 incidents of sewer flooding have been reported within the district between 2011 and 2021.

Sewer flood risk is discussed in Section 4.6.

Groundwater:

JBA Groundwater emergence mapping across the district shows that the majority of the study area (mainly in the southern and central areas), is at 'negligible risk' of groundwater emergence. Groundwater flooding in many northern parts of the Sevenoaks District is deemed 'not likely'. Areas along the Main Rivers in the district, including the River Eden and River Darent, are at greater risk of groundwater emergence.

There is no national risk-based groundwater flood dataset of a suitable resolution to inform the areas at risk from groundwater flooding; however, emergence mapping when considered in conjunction with topography and surface water flow paths can indicate areas where groundwater is likely to emerge, and the flow paths it may take once above the ground. Groundwater flood risk is discussed in Section 4.7 and the JBA emergence map is shown in Appendix D5.

Reservoirs: There are 6 reservoirs located within the district, and 7 located outside the district, which present a potential risk of flooding within the district. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRAs (where relevant) in accordance with the updated PPG: Flood risk and coastal change. Reservoir flood risk is

discussed in Section 4.8.1. The 'Dry Day', 'Wet Day', and 'Fluvial Contribution' flood extents are shown in Appendix D6.

Defences

The EA Asset Information Management System (AIMS) dataset provides information on flood defence assets across the district.

Locations including Brasted, Westerham, South Darent, Chipstead and Longford benefit from flood walls along the River Darent, as shown in the EA's AIMS dataset. Flood walls are also present in Edenbridge along the River Eden. Other formal flood defences, including engineered high ground, is present along the River Darent at Westerham and Farningham.

Further information on defences across the district is available in Section 6.4 and shown Appendix D7.

How to use this report

The SFRA provides recommendations regarding all sources of flood risk across the district, which can be used to inform policy on flood risk within the emerging LPU. This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the Sequential Test, for both allocations and individual planning applications (Appendix B) and provides guidance on how to apply the Exception Test.

This SFRA is a strategic assessment of flood risk and does not replace the need for site-specific FRAs, where required. The SFRA provides guidance for the development industry and development management officers to establish when an FRA is required and to assess whether site-specific FRAs meet the required quality standard (Section 7). This should be used alongside the [EA's FRA Guidance \(gov.uk\)](#). The SFRA can be used to help identify which locations and development may require emergency planning provision.

The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events across the district are listed in Section 4.3. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned within the district are outlined in Section 6.5 and Section 8.5 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Table 1-1 sets out the contents of the SFRA and how users should use the information provided through the document and appendices.

Mapping

The SFRA mapping highlights on a strategic scale flood risk from fluvial, surface water and reservoirs sources, and where groundwater emergence may occur; as well as where the effects of climate change are most likely. The maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or depict small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this mapping.

The mapping data should always be supplemented by direct consultation with the relevant wastewater company to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

1 Introduction

1.1 Purpose of a Strategic Flood Risk Assessment (SFRA)

Sevenoaks District Council as the Local Planning Authority (LPA) are responsible for producing a Local Plan, determining planning applications, enforcement in response to breaches of planning control, and supporting neighbourhood planning.

The Council is currently compiling the evidence base to support the development of its new Local Plan. Consultation on the emerging Regulation 18 Local Plan took place between 3 October and 11 December 2025, with Regulation 19 publication expected in Summer 2026. The draft Local Plan can be found at the link below:

- [Sevenoaks District Local Plan – Regulation 18 Consultation 2025](#)

As set out in the NPPF (Paragraph 171) “Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.”

Sevenoaks District Council has commissioned JBA Consulting to update the previous Level 1 SFRA (2024). This updated Level 1 SFRA (2025) incorporates new flood risk data (NaFRA2).

1.2 Relevance of the SFRA

The '[How to prepare a Strategic Flood Risk Assessment guidance](#)' ([gov.uk](#)) (last updated in August 2025), sets out the requirements that the LPA must address within their SFRA and has been used to undertake this Level 1 SFRA.

This SFRA has been developed using the best available information, supplied at the time of preparation. Appendix 0 details the information supplied for the preparation of this SFRA. Over time new information will become available to inform planning decisions:

- The EA regularly reviews its hydrology, hydraulic modelling, and flood risk mapping.
- The EA published the new national flood risk mapping (NaFRA2) in early 2025 but further updates and additional datasets are expected later in 2025/2026.
- Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities (RMAs).

Links have been provided for relevant guidance documents and policies published by other Risk Management Authorities (RMAs) such as the Lead Local Flood Authority (LLFA) and the Environment Agency (EA). When using the SFRA to prepare FRAs it is important to check that the most up to date information is used.

As the data available for SFRAs and the relevant legislation is continually changing, an SFRA should be updated to reflect changes where applicable and reasonably practicable. Under any changes in guidance or legislation, the implications on the SFRA should be considered and a review undertaken where this is deemed reasonably necessary.

1.3 Levels of SFRA

The [PPG: Flood risk and coastal change \(gov.uk\)](#) identifies two levels of SFRA.

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. Where potential site allocations are not at major flood risk and where development pressures are low, a Level 1 assessment is likely to be sufficient, without the LPA progressing to a Level 2 assessment. The Level 1 assessment should be of sufficient detail to enable application of the Sequential Test, to inform the allocation of development to areas of lower flood risk.

A Level 2 assessment is required where land outside flood risk areas cannot appropriately accommodate all necessary development, creating the need to apply the NPPF's Exception Test if relevant, or if an LPA believe they may receive high numbers of applications in flood risk areas on sites not identified in the Local Plan. In these circumstances the assessment should consider the detailed nature of the flood characteristics from all sources, both now and in the future.

This report fulfils the requirements of a Level 1 SFRA.

1.4 Local Plan Area

Sevenoaks District is located in west Kent, in the south east of England, covering an area of approximately 370km². The M25 and M26 travel through the northern part of the district.

The districts main towns are Sevenoaks, Swanley and Edenbridge, alongside smaller settlements including Kemsing, Otford and Westerham.

Sevenoaks District Council is located within Kent County Council's administrative area and is bordered by eight other local authorities:

- Dartford Borough Council
- Gravesham Borough Council
- London Borough of Bexley Council
- London Borough of Bromley Council
- Tandridge District Council
- Tonbridge and Malling Borough Council
- Tunbridge Wells Borough Council
- Wealden District Council

An overview of the study area and the neighbouring authorities is displayed in Figure 1-1.

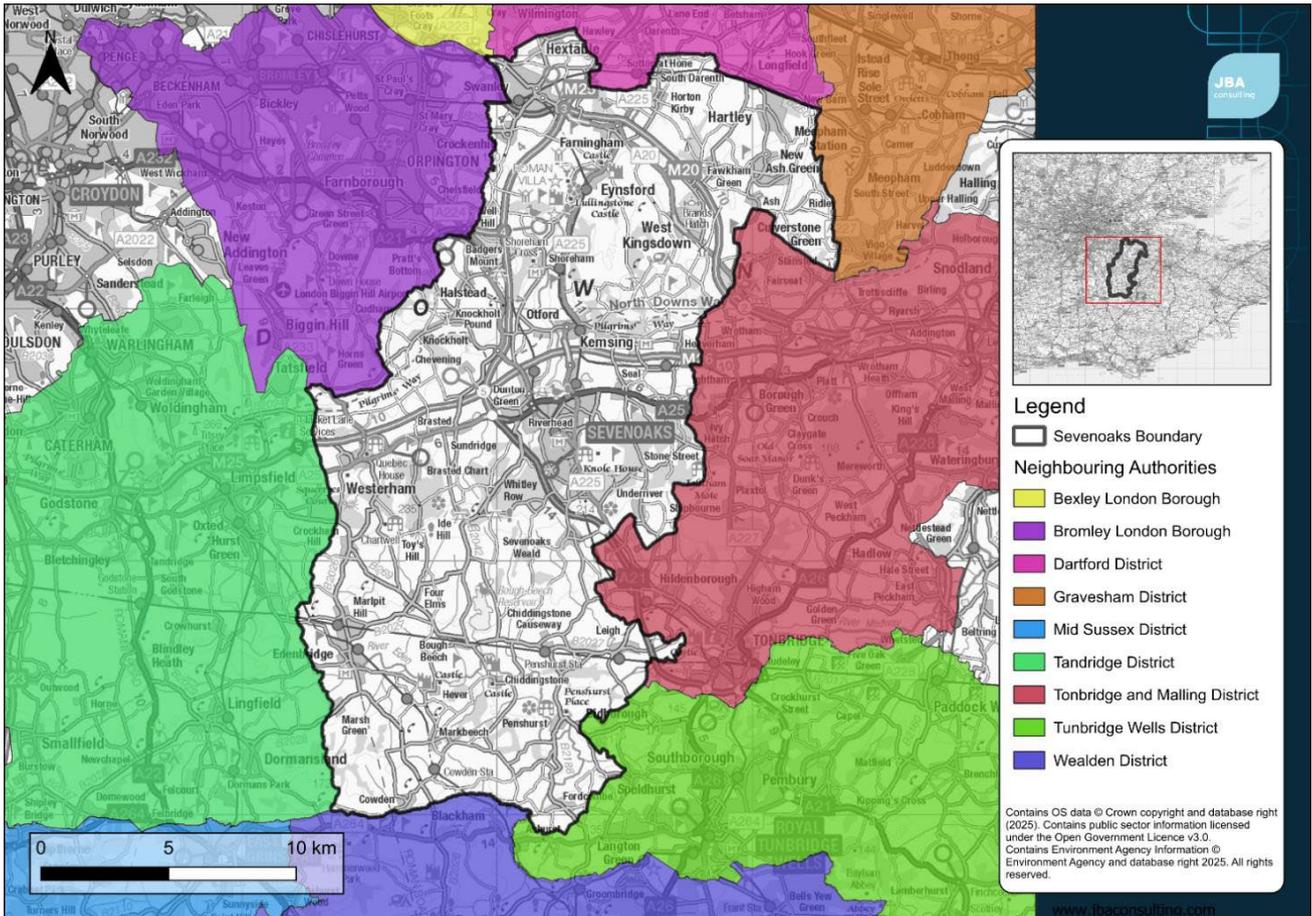


Figure 1-1: Sevenoaks District Council alongside its neighbouring authorities.

The sewerage companies for the area are Southern Water and Thames Water, the areas that they operate in are shown in Figure 1-2 . South East water provide potable water. Kent County Council is the Lead Local Flood Authority (LLFA). The Upper Medway Internal Drainage Board (IDB) operates to the south of the District surrounding the Rivers Eden and Medway.

The River Medway rises in the High Weald, West Sussex, and flows in a north easterly direction through the southeast of the district towards Tonbridge. The River Eden (a tributary of the River Medway) flows in a westerly direction through the south of the district.

The River Darent rises in the settlement of Westerham to the west of the district and flows in a northerly direction through the catchment.

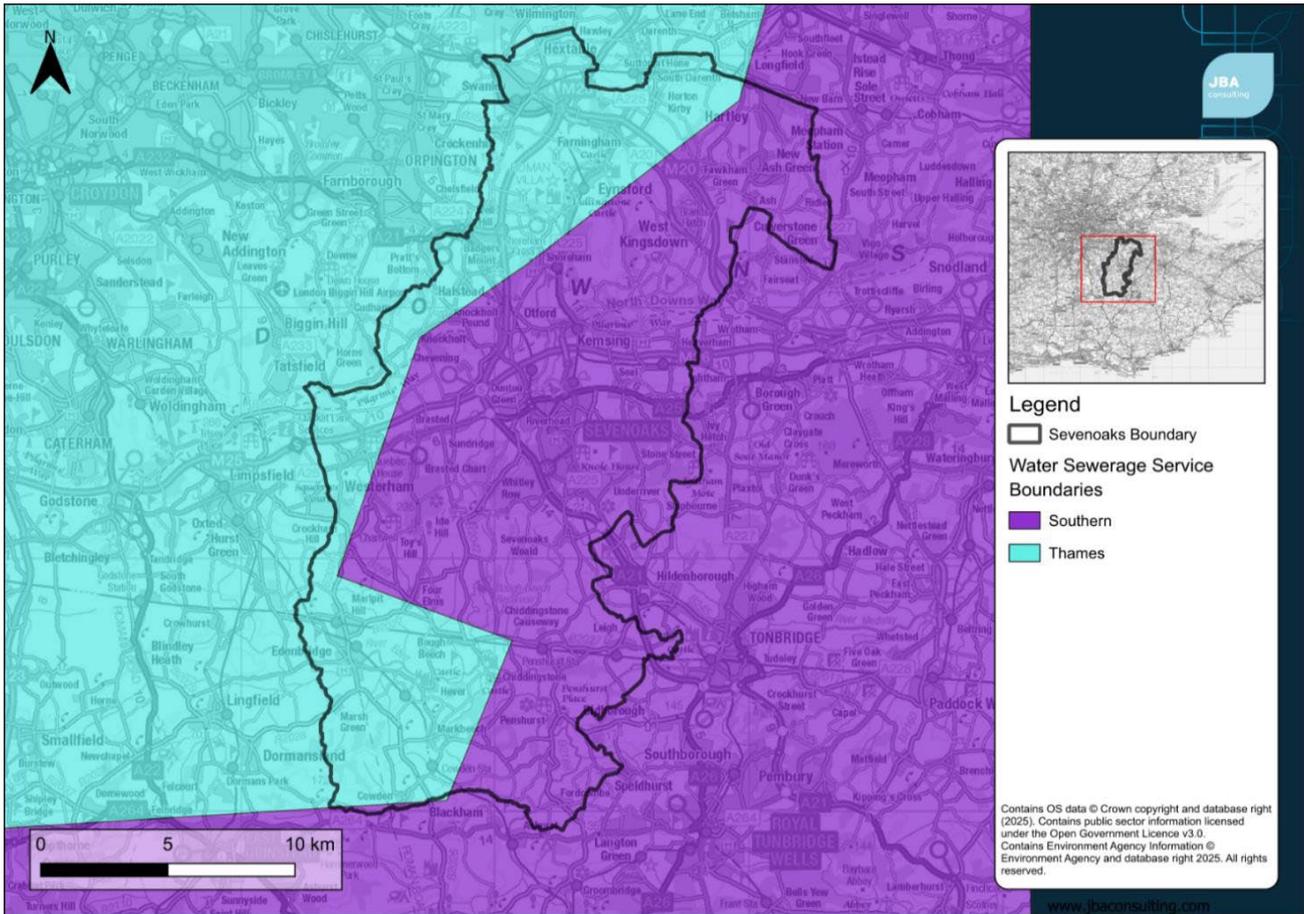


Figure 1-2: Water company coverage across the district

1.5 Consultation

SFRAs should be prepared in consultation with other RMAs. In addition to the LPA the following parties have been consulted during the preparation of this version of the SFRA through data requests and draft report reviews:

- Environment Agency
- Kent County Council (as Lead Local Flood Authority)
- Southern Water
- Thames Water
- Neighbouring Authorities to Sevenoaks District:
 - Dartford Borough Council
 - Gravesham Borough Council
 - London Borough of Bexley Council
 - London Borough of Bromley Council
 - Tandridge District Council
 - Tonbridge and Malling Borough Council
 - Wealden District Council

1.6 Structure of this report

Table 1-1 sets out the contents of this Level 1 SFRA report and appendices, and how to use each section.

Table 1-1: Sets out the contents of the report and how to use each section.

Section	Contents	How to use
Executive summary	This section focuses on how the SFRA can be used by planners, developers, and neighbourhood planners.	Users should refer to this section for a summary of the Level 1 findings and recommendations.
1. Introduction	This section provides a background to the study, the Local Plan stage the SFRA informs, and the Local Plan Area. It also details the organisations involved in the SFRA.	Users should refer to this section for general information and context.
2. Policy and strategy for flood risk management	This section sets out the relevant legislation, policy, and strategy for flood risk management at a national, regional, and local level.	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.
3. Sequential and Exception Tests	This section provides an overview of national planning policy, application of the sequential approach, and the Sequential/Exception Test process. It provides guidance for the Councils and developers on the application of the sequential and Exception Test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
4. Understanding flood risk	This section introduces the concept of flood risk and provides an overview of the characteristics of flooding affecting the district and key risks including historical flooding incidents and flood risk from all sources, as well as characteristics that influence flood risk including topography, geology and soils.	This section should be used to understand all sources of flood risk across the district including where has flooded historically.

Section	Contents	How to use
5. Impact of climate change	<p>This section outlines the latest climate change guidance published by the EA and how this was applied to the SFRA.</p> <p>It also sets out how developers should apply the guidance to inform site-specific FRAs.</p>	<p>This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.</p>
6. Flood risk infrastructure	<p>This section provides a summary of current flood defences and asset management and future planned schemes.</p>	<p>This section should be used to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site specific stage.</p>
7. Flood risk management requirements for developers	<p>This section contains guidance for developers on FRAs, considering flood risk from all sources, and principles of managing flood risk in developments.</p>	<p>Developers should use this section to understand requirements for FRAs and what conditions/guidance documents should be followed, as well as mitigation options.</p>
8. Principles for site design and master planning	<p>This section contains guidance for developers on principles of managing flood risk in developments through site design and master planning.</p>	<p>Developers should use this section to understand what should be considered within the site design and master planning stages of a development.</p>
9. Surface water management and SuDS	<p>This section provides an overview of SuDS, including signposting to relevant guidance, as well as guidance for developers on surface water drainage strategies, considering any specific local standards and guidance for SuDS from the LLFA.</p>	<p>Developers should use this section to understand what national, regional, and local SuDS standards are applicable. Hyperlinks are provided.</p>
10. Flood warning and emergency planning	<p>This section provides an overview of the requirements for emergency plans, include any local emergency planning arrangements, and an overview of the available flood alerts and warnings.</p>	<p>Developers should use this section to understand requirements for emergency planning.</p>

Section	Contents	How to use
11. Cumulative Impact Assessment	This section details the cumulative impact assessment, which identifies which catchments are most likely to be sensitive to increased flood risk as a result of future development.	Planners should use this section to help develop policy recommendations for the cumulative impact of development
12. Strategic flood risk solutions	This section sets out wider strategic solutions that may offer potential to reduce flood risk across the district, including natural flood management. It also details current partnership working opportunities within the district.	Planners should use this section to help develop policy recommendations for strategic flood risk solutions to reduce flood risk across the district. Developers should use this section to consider options for strategic solutions and natural flood management techniques.
13. Summary, recommendations and next steps	This section summarises sources of flood risk in the district and outlines planning policy recommendations. It also sets out the next steps.	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when considering site specific assessments.
Appendix A	Details the data used to inform the SFRA, including when the data was provided, any associated licensing, and where the data can be obtained from.	Planners and developers should use this appendix to understand what data has been used in the SFRA, whether it has since been updated, and where to access the latest data from.
Appendix B	Sets out the methodology for the Sequential Test, including how each source of flood risk should be considered.	Planners should use this appendix to inform the application of the Sequential Test.
Appendix C	A site screening exercise has been completed on the potential sites which shows the percentage of the site which is at risk of fluvial, surface water and groundwater flooding.	Planners should use this appendix to inform the allocation of sites based on flood risk.

Section	Contents	How to use
Appendix D	Provides the flood risk mapping for the SFRA with an accompanying user guide detailing the information shown within the mapping.	Planners and developers should use these maps to identify key areas of flood risk from different sources.
Appendix E	This appendix provides a review of Southern Water's and Thames Water's Drainage Water Management Plans (DWMP).	Planners should use this appendix to inform the application of the Sequential Test.
Appendix F	This section details the methodology for the cumulative impact assessment.	Planners should use this appendix, in conjunction with Section 12, to help develop policy recommendations for the cumulative impact of development

2 Policy and strategy for flood risk management

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

2.1 Roles and responsibilities

There are different organisations in and around the district that have responsibilities for flood risk management, known as RMAs. These are listed in Table 2-1 with a summary of their responsibilities.

Further information on the roles and responsibilities of the RMAs is available in Annex A of the [National Flood and Coastal Erosion Risk Management Strategy \(FCERM\) \(gov.uk\)](#) for England. The [Local Government Association \(gov.uk\)](#) also provide further information on the roles and responsibilities for managing flood risk.

The [National flood risk standing advice for local planning authorities \(gov.uk\)](#) provides advice on when to consult the EA.

Table 2-1: Roles and responsibilities for RMAs.

Risk Management Authority	Strategic Level	Operational Level	Planning role
Environment Agency	Strategic overview for all sources of flooding, National Strategy, and general supervision	Main River (e.g., The River Darent, River Medway and River Eden) and reservoirs (Flood Risk Activity Permits (FRAPs), enforcement, and works)	Statutory consultee for certain development in Flood Zones 2 and 3 and all works within 20 metres of a main river.
Kent County Council as LLFA	Coordination of Local Flood Risk Management and maintaining a Local Flood Risk Management Strategy (LFRMS)	Surface water, groundwater, and ordinary watercourses (consenting, enforcement, and works)	Statutory consultee for major developments
Southern Water and Thames Water	Asset Management Plans, supported by Periodic Reviews (business cases), develop drainage and wastewater management plans (DWMPs)	Public sewers and some reservoirs	Non-statutory consultee

Risk Management Authority	Strategic Level	Operational Level	Planning role
Upper Medway Internal Drainage Board (IDB)	Water level/flood risk management within their Internal Drainage District	Permissive powers to undertake works to provide water level/flood risk management	Statutory consultee for developments within IDB areas
Highways Authorities - Highways England for motorways and trunk	Highway drainage policy and planning	Highway drainage	Statutory consultee regarding highways design standards and adoptions

2.1.1 Riparian ownership

Land and property owners are responsible for the maintenance of watercourses either on or next to their properties, called Riparian Owners. Riparian Owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/banks, controlling invasive species, and allowing the flow of water to pass without obstruction. More information can be found on the Government website in the EA publication '[Owning a watercourse](http://gov.uk)' (gov.uk).

When it comes to undertaking works to reduce flood risk, the EA, and Kent County Council as LLFA do have permissive powers, but limited resources must be prioritised and targeted to where they can have the greatest effect. Permissive powers mean that RMAs are permitted to undertake works on watercourses but are not obliged.

2.2 Key legislation for flood and water management in the district

2.2.1 Flood Risk Regulations (2009)

The Flood Risk Regulations (FRRs) 2009 translated the European Union (EU) Floods Directive into UK law setting the requirement for Member States to complete an assessment of flood risk, known in England as a Preliminary Flood Risk Assessment (PFRA). This information was then used to identify areas where there is a significant risk of flooding (Flood Risk Areas), where States had to undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans (FRMPs). This cycle was repeated on a six-yearly basis.

As of 1 January 2024, the Retained EU Law (Reform and Revocation) Bill automatically repealed any Retained EU Law (REUL) not otherwise preserved or replaced in UK law before the end of 2023, including the FRRs 2009 which transposed the EU Floods Directive into legislation. This is because much of the FRRs duplicated existing domestic legislation, namely the Flood and Water Management Act 2010.

The Government expects to see continued implementation of the Flood Risk Management Plans 2021-2027, with funding for this still in place over the six-year period.

2.2.2 Flood and Water Management Act (2010)

The [Flood and Water Management Act \(2010\) \(gov.uk\)](#) was passed in April 2010 following the recommendations made within the Pitt Review (2009) following flooding in 2007. It aims to create a simpler and more effective means of managing both flood risk and coastal erosion, establishing the lead role for Local Authorities, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

2.2.3 Water Framework Directive (2000)

The European Water Framework Directive (WFD) (2000) was transposed into English Law by the Water Environment Regulations (2017) (gov.uk). The WFD aims to deliver improvements across Europe in the management of water quality and water resources. This is enforced through a series of plans called River Basin Management Plans (RBMPs). The district falls within the [Thames RBMP](#).

2.2.4 Environmental permitting

The [Environmental Permitting Regulations \(2018\) \(gov.uk\)](#) 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. This includes flood risk activities, for example:

- On or within 8 metres of a main river.
- On or within 8 metres of a non-tidal flood defence structure or culvert.
- Involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert; and
- In a floodplain more than 8 metres from the riverbank, culvert or flood defence structure and you do not already have Planning Permission.

Environmental permits may also be required from the EA to discharge runoff, trade effluent or sewage into a main river. They may also be required in relation to groundwater activities, where there may be a risk of groundwater contamination.

An Ordinary Watercourse consent may be required where work is carried out which could affect the flow of water within a watercourse which is not main river. These should be acquired from [Kent County Council](#).

2.2.5 Byelaws

Land Drainage Byelaws outline legal obligations and responsibilities when undertaking works on or close to a watercourse, for the purpose of preventing flooding, or mitigating any damage caused by flooding. The Upper Medway IDB operates in the south of Sevenoaks District surrounding the River Eden, River Medway and associated watercourses. Mapping

displaying the IDD and wider watershed catchment of the Upper Medway IDB is available [online](#).

Under the [Land Drainage Act \(1991\)](#), Internal Drainage Boards were also given the power to implement their own Byelaws. These Byelaws have effect on any activity within the Internal Drainage Board District that affect the flow of water and flood risk. The Byelaws are stated to be considered necessary for the following purposes:

- Securing the effectiveness of flood risk management work within the meaning of section 14A of the Land Drainage Act.
- Regulating the effects on the environment of a drainage system
- Securing the efficient working of the drainage system

Compliance with the relevant Byelaws and standards must be demonstrated by any developer planning works within the IDB's drainage district and watershed (or catchment) within the Local Plan area. The [Upper Medway IDB's Planning and Byelaw Strategy](#) was published in November 2023 and is due to for update in November 2024. The Upper Medway IDB's Byelaws which are most relevant to flood risk management include:

- Byelaw 3 (surface water)- Consent is required where a discharge of surface water is proposed to a watercourse within the IDD and within the wider watershed catchment. Any consent granted will likely be conditional, pending the payment of a Surface Water Development Contribution fee, calculated in line with the Board's charging policy (<https://medwayidb.co.uk/development/>).
- Byelaw 3 (foul water) - Consent is required where a discharge of treated foul water is proposed to a watercourse within the IDD.
- Byelaw 4 (and Section 23 of the Land Drainage Act 1991) - Consent is required where works are proposed to alter the flow of a Board Maintained or a riparian watercourse within the IDD. This includes culverting, realignment, erection of dams, sluices etc. Outside of the IDD the LLFA is the consenting authority.
- Byelaws 10 and 17 - Consent is required for all works within 8 metres of the edge of Board Maintained drainage and flood risk management infrastructure.

2.2.6 Additional legislation

Additional legislation relevant to development and flood risk in the district include:

- [Town and Country Planning Act \(1990\) \(gov.uk\)](#), [Water Industry Act \(1991\) \(gov.uk\)](#), [Land Drainage Act \(1991\) \(gov.uk\)](#), [Environment Act \(1995\) \(gov.uk\)](#), which set out the regulations for development on land in England and Wales.
- The [Environment Act 2021 \(gov.uk\)](#) requires developers to provide Biodiversity Net Gain (BNG) and for LPAs to develop Local Nature Recovery Strategies (LNRS). Strategic site allocations in Local Plans which present opportunities for BNG or areas for habitat improvement/creation identified by the LNRS could have parallel opportunities to contribute to reduced flood risk from a range of sources.

- Other environmental legislation such as the [Habitats Directive \(1992\) \(gov.uk\)](#), [Environmental Impact Assessment Directive \(2014\) \(gov.uk\)](#), and [The Environmental Assessment of Plans and Programmes \(Amendment\) Regulations 2020 \(gov.uk\)](#) which apply as appropriate to strategic and site-specific developments to guard against environmental damage.
- The [Planning and Compulsory Purchase Act \(2004\) \(gov.uk\)](#) Section 19(1A) which requires LPAs to include in their Local Plans ‘policies designed to secure that the development and use of land in the local planning authority’s area contribute to the mitigation of, and adaptation to, climate change.’

2.3 Key national, regional, and local policy documents and strategies

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

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

The following sections provide further details on some of these documents and strategies.

Please note that the links to these documents may change over time and any requests for these documents should be directed toward the author.

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

Policy level	Document, lead author and date	Contextual information	Policy and measures	Development design requirements	Next update due
National	Flood and Coastal Management Strategy (EA) 2020 (gov.uk)	Yes	Yes	No	2026
National	National Planning Policy Framework updated in December 2024 (gov.uk)	Yes	Yes	Yes	-
National	Planning Practice Guidance (PPG): Flood risk and coastal change (gov.uk) updated in September 2025	Yes	Yes	Yes	-
National	Building Regulations Part H (MHCLG) 2010 (gov.uk)	Yes	No	Yes	-
Regional	River Medway Catchment Flood Management Plan (EA) 2010 (gov.uk) and North Kent Rivers Catchment Flood Management Plan (EA) 2009	Yes	Yes	No	-
Regional	Thames River Basin District River Management Plan (EA) 2022 (gov.uk)	Yes	Yes	No	2028
Regional	Thames River Basin District Flood Risk Management Plan (EA) 2022 (gov.uk)	Yes	Yes	No	-
Regional	Water Resources Management Plan 2024 (Southern Water)	Yes	No	No	-
Regional	Southern Water Drainage and Wastewater Management Plan (DWMP) 2023 (Southern Water) and Thames Water Drainage and Wastewater Management Plan 2023 (Thames Water)	Yes	No	No	-
Regional	Climate change guidance for development and flood risk (EA) last updated May 2022 (gov.uk)	Yes	No	Yes	-
Local	Kent County Council Preliminary Flood Risk Assessment (2011) (Kent County Council)	Yes	No	No	-

Policy level	Document, lead author and date	Contextual information	Policy and measures	Development design requirements	Next update due
Local	Kent Local Flood Risk Management Strategy 2024 - 2034 (Kent County Council)	Yes	Yes	No	2027
Local	Sevenoaks Stage 1 Surface Water Management Plan 2013 (Kent County Council)	Yes	Yes	Yes	-
Local	Water. People. Places. A guide for master planning sustainable drainage into development 2013	Yes	Yes	Yes	-
Local	Making it happen – Kent Design Guide (Chapter 2 - drainage systems) (Kent County Council)	Yes	Yes	Yes	-

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

The [National Flood and Coastal Erosion Risk Management Strategy for England \(gov.uk\)](#) provides the overarching framework for future action by all RMAs to tackle flooding and coastal erosion in England. The Strategy looks ahead to 2100, and the actions needed to address the challenge of climate change.

The Strategy has been split into three high level ambitions:

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

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a [Policy Statement for Flood and Coastal Erosion Risk Management \(gov.uk\)](#).

It can be expected that the implementation of the National Strategy will lead to the publication of new guidance and practice that is focused on resilience and adaptation over the coming years. It will be important to adjust the content of the SFRA so that changes in approach are captured in the delivery of the Local Plan.

2.3.2 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are high-level strategic plans providing an overview of flood risk across each river catchment. The EA use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

There are six pre-defined national policies provided in the CFMP guidance, and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to cover the full range of long-term flood risk management options that can be applied to different locations in the catchment.

The Local Plan area is covered by the [North Kent Rivers CFMP \(2009\)](#) and the [Medway CFMP \(2012\)](#).

2.3.3 Local Flood Risk Management Strategy

Local Flood Risk Management Strategies (LFRMS) set out how the LLFA will manage local flood risk i.e. surface water runoff, groundwater, and ordinary watercourses, for which they have a responsibility as LLFA and the work that other (RMAs) are doing to manage flood risk across the district.

The current [Kent County Council LFRMS 2024-2034 \(2024\)](#) sets out Kent County Council's priorities for managing local flood risk. The previous LFRMS identified 'focus areas' for flood risk management, which included the Medway Catchment (comprising the southernmost areas in Sevenoaks District surrounding the River Eden and River Medway). This area will continued to be focused on, as stated in the most recent LFRMS.

2.3.4 Local policy and guidance for SuDS

The 2024 NPPF states that: ‘Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal.’ (Paragraph 182) and ‘development should only be allowed in areas at risk of flooding where... it can be demonstrated that... c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate’ (Paragraph 181).

At the time of writing this SFRA, the following documents and policies are relevant to SuDS and surface water in the district. Hyperlinks are provided to external documents:

- [SuDS Manual \(C753\) \(ciria.org\)](#), published in 2007 and updated in 2015.
- [Defra National standards for sustainable drainage systems \(SuDS\) \(gov.uk\)](#), June 2025.
- [Building Regulations Part H \(MHCLG\) \(gov.uk\)](#), 2010.
- Kent County Council's [SuDS Guidance Documents](#)

Further information on SuDS requirements and design considerations can be found in Section 9.

2.3.5 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water in a particular area. They are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning, and future developments.

Kent County Council published the [Sevenoaks Stage 1 SWMP](#) in 2013.

2.3.6 Water Resources Management Plans (WRMPs)

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

WRMPs should set out how a water company intends to achieve a secure supply of water for their customers and a protected and enhanced environment. The [Southern Water WRMP](#) was published in 2024.

2.3.7 Drainage and Wastewater Management Plans (DWMPs)

Water and sewage companies must produce a Drainage and Wastewater Management Plan (DWMP), covering a minimum of 25 years, which looks at current and future capacity, pressures, and risks to their networks such as climate change and population growth. They detail how a company plans to work with RMAs and drainage asset owners to manage future pressures. The water and sewage companies for the district are Southern Water and Thames Water.

Both the [Southern Water DWMP](#) and [Thames Water DWMP](#) were published in May 2023. A review of these DWMPs has been completed as part of this SFRA and is available in Appendix E.

2.3.8 Neighbourhood plans

A neighbourhood plan is a document produced by a local community that sets out planning policies for their area and can be used to:

- Protect local green spaces;
- Encourage better designed places;
- Bring forward housing that meets local needs.

Neighbourhood planning groups can use the information in this SFRA to assess the risk of flooding to sites within their community.

Three neighbourhood plans have been completed for the district and can be found on the [Sevenoaks District Council website](#). These include, the Fawkham, Swanley and Sevenoaks Town Neighbourhood Plans.

2.3.9 Natural Flood Management (NFM) Plans

The Environment Agency has developed [Working with natural processes to reduce flood risk mapping](#) which displays opportunities for NFM. These maps are to be used as a guide and supplemented with local knowledge to provide a starting point for discussions about NFM. NFM aims to protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast. NFM should be used on a catchment wide scale and is the linking of blue and green infrastructure.

The maps identify NFM opportunities on different catchment scales:

- National River Basin Districts
- River Basin Districts showing Management Catchments
- Management Catchments showing Water Body Catchments
- Water Body Catchments

Discussions about NFM should be had with catchment stakeholders in combination with local knowledge.

3 Sequential and Exception Tests

This section summaries national planning policy for development and flood risk and the application of the Sequential and Exceptions Tests for both planners and developers.

3.1 National Planning Policy Framework and Guidance

The [NPPF \(December 2024\) \(gov.uk\)](#) sets out the Government's planning policies for England. It must be considered in the preparation of Local Plans and is a material consideration in planning decisions. The NPPF advises on how flood risk should be considered to guide the location of future development and FRA requirements. The NPPF states that:

“Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards” (Paragraph 171).

The [Flood Risk and Coastal Change PPG \(gov.uk\)](#), last updated September 2025, sets out how the policy should be implemented. Diagram 1 in the PPG (Paragraph: 007 Reference ID: 7-007-20220825) sets out how flood risk should be considered in the preparation of Local Plans.

3.2 The Sequential Test

Firstly, land at the lowest risk of flooding from all sources should be considered for development. A test is applied called the ‘Sequential Test’ to do this. Figure 3-1 summarises the Sequential Test.

The LPA will apply the Sequential Test to strategic allocations. For all other developments, evidence must be supplied to the LPA, with a planning application, that the development has passed the test if any proposed building, access and escape route, land-raising or other vulnerable element will be:

- In Flood Zone 2 or 3;
- In Flood Zone 1 and the SFRA shows it will be at increased risk of flooding during its lifetime; or
- Subject to sources of flooding other than rivers or sea,

The requirements for developers are set out in the [FRA Standing Advice \(gov.uk\)](#).

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

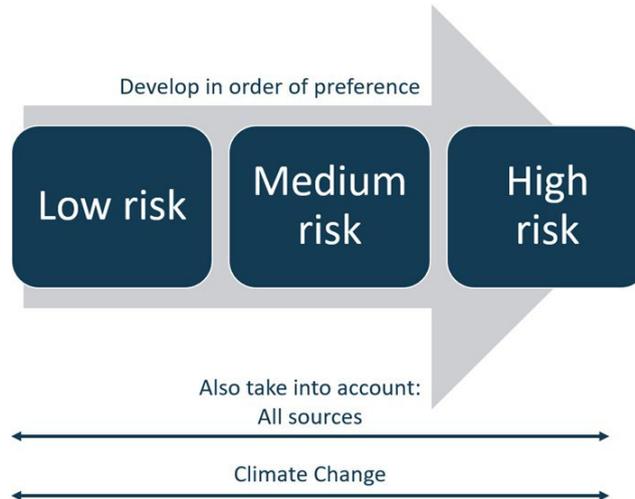


Figure 3-1: The Sequential Test.

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for. [Table 2 of the PPG \(gov.uk\)](#) (Paragraph: 079 Reference ID: 7-079-20220825) shows whether, having applied the Sequential Test first, the vulnerability of development is not compatible with a particular Flood Zone and where the Exception Test is required to determine the suitability of that vulnerability of development to the Flood Zone.

Figure 3-2 illustrates the Sequential Test as a process flow diagram using the information contained in this SFRA to assess potential development sites against areas of flood risk and development vulnerability compatibilities. This is a stepwise process, but a complex one, as several of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded.

In addition, the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. Appendix B addresses the use of flood risk information in the performance of the Sequential Test.

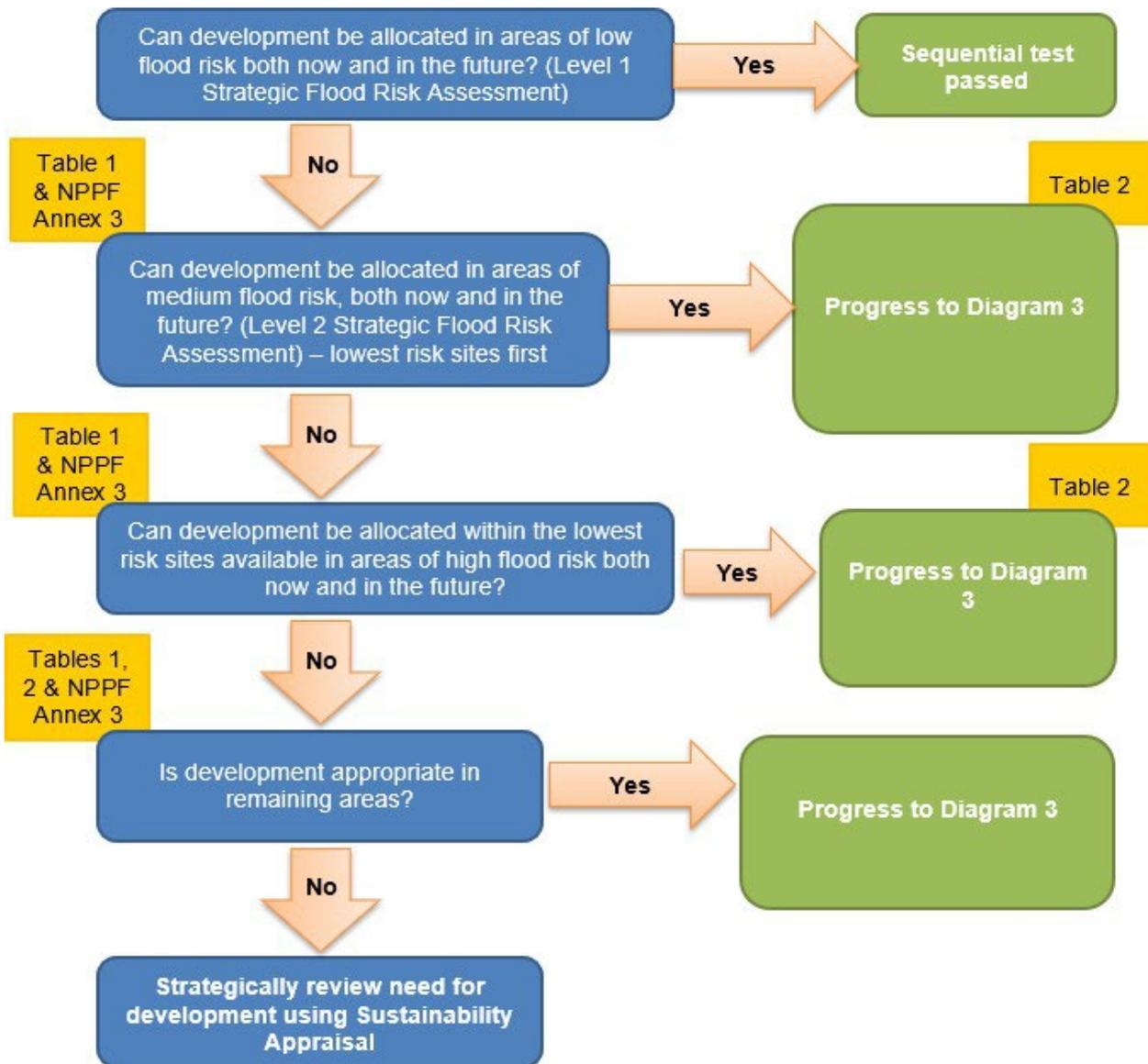


Diagram 2 of PPG: Flood Risk and Coastal Change (paragraph 026, Reference ID 7-026-20220825) Revised August 2022.

Figure 3-2: Application of the Sequential Test for plan preparation.

3.2.1 The risk-based approach

Paragraph 172 of the NPPF states that *"All plans should apply a sequential, risk-based approach to the location of development – taking into account **all sources of flood risk** and the **current and future impacts of climate change** – so as to avoid, where possible, flood risk to people and property"*.

Appropriate mapping should be prepared for the sequential test to enable logical comparison of the flood risk from different sources at alternative locations, both now and in the future, as this is fundamental to establishing a logical “risk sequence”.

Appendix B describes the implications of including different sources of flooding both now and in the future in the sequential test. It also highlights matters to be considered, including certain circumstances where the sequential test would not be required, and identifies a preferred approach.

3.3 The Exception Test

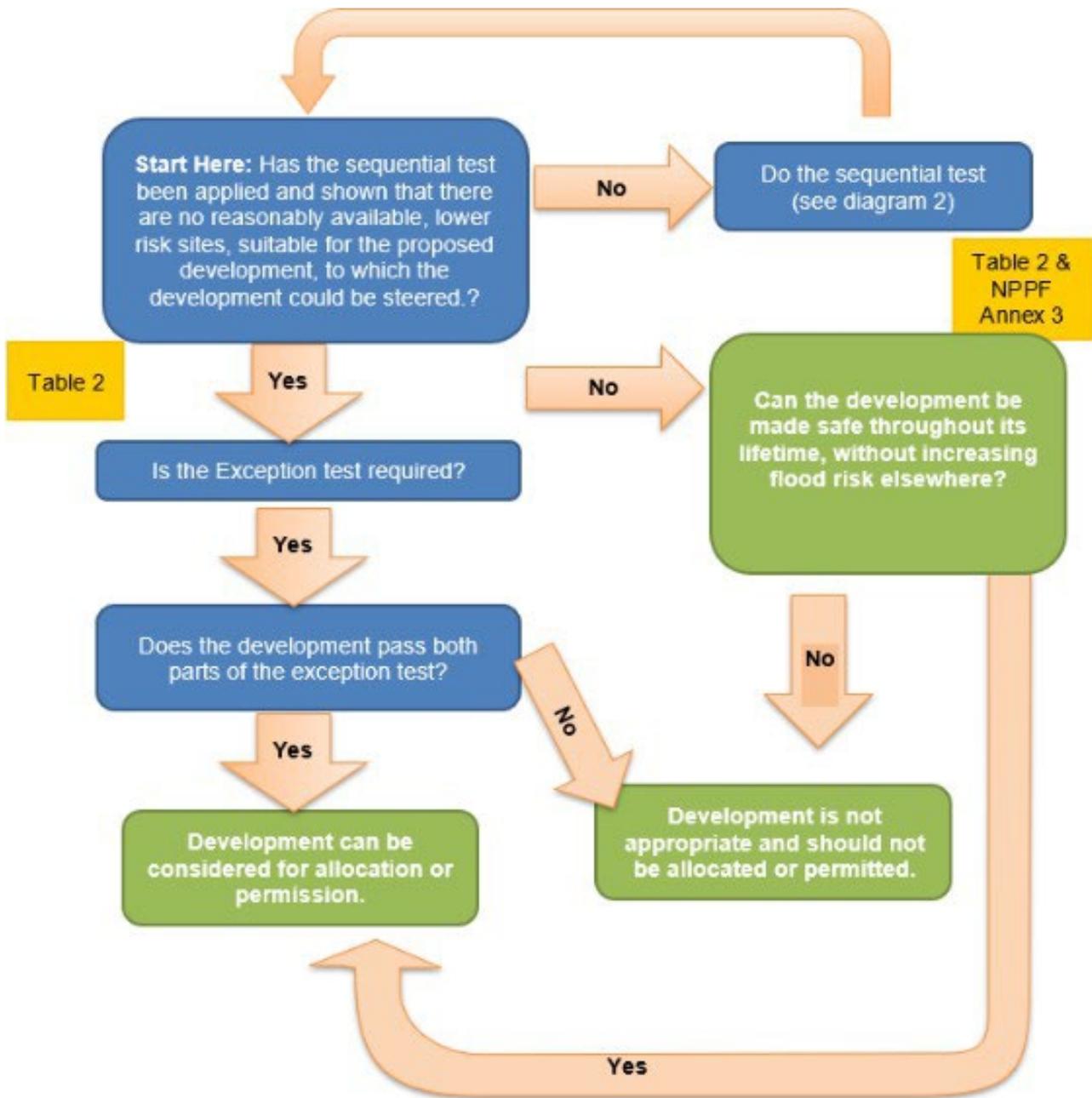
It will not always be possible for all new development to be located on land that is not at risk from flooding. To further inform whether land should be allocated, or planning permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required. [Diagram 3 of the PPG \(gov.uk\)](#) (Paragraph: 033 Reference ID: 7-033-20220825) summarises the Exception Test (Figure 3-3).

[Table 2 of the PPG \(gov.uk\)](#) sets out the requirements for the Exception Test but does not reflect the need to avoid flood risk from sources other than rivers and the sea. There is no guidance on how to consider other sources of flood risk. The Exception Test should only be applied, following the application of the Sequential Test, in the following instances:

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

While the Exception Test is not explicitly required for sites at risk from other sources of flooding, the LPA should follow a similar principle where sites are proposed that are at risk from other sources of flooding, carefully weighing up the wider benefits of development against the risk, ensuring that site users can be kept safe through the lifetime of the development and ensuring residual risk can be safely managed.

For sites proposed for allocation within the Local Plan, the LPA should use the information in this SFRA to inform the Exception Test. At the planning application stage, the developer must design the site such that it is appropriately flood resistant and resilient in line with the recommendations in national and local planning policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.



† Diagram 3 of PPG: Flood Risk and Coastal Change (paragraph 033, Reference ID 7-033-20220825) Revised August 2022.

Figure 3-3: Application of the Exception Test to plan preparation.

There are two parts to demonstrating a development passes the Exception Test that should be considered by the LPA when allocating development sites, and developers when required (see Section 3.4.2 for Exception Test requirements for individual planning applications).

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

The LPA will need to set out the criteria used to assess the Exception Test and provide clear advice to enable applicants to provide evidence to demonstrate that it has been

passed. If the application fails to prove this, the LPA should consider whether the use of planning conditions and/or planning obligations could allow it to pass the Exception Test. If this is not possible, this part of the Exception Test has failed, and planning permission should be refused.

Wider sustainability objectives should be considered, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, housing, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

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

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

In circumstances where the potential effects of proposed development are material a Level 2 SFRA is likely to be needed to inform the Exception Test for strategic allocations to provide evidence that the principle of development can be supported. At the planning application stage, a site-specific FRA will be needed. Both will need to consider the undefended and residual risk and how this will be managed over the lifetime of the development.

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

3.4.1 Applying the Sequential Test

The LPA are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers should consult with the LPA in the first instance before commencing on a site-specific FRA to determine the Sequential Test requirements for their site. Developers are required to apply the Sequential Test to all development sites, unless the site is:

- A strategic allocation and the test has already been carried out by the LPA as part of preparing the Local Plan, or
- A change of use (except to a caravan, camping or chalet site, or to a mobile home or park home site), or
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m²), or
- A development in fluvial Flood Zone 1.

It should also be noted that residential sub-divisions are exempted from the definition of minor development and therefore, by default, should also be subject to the Sequential Test.

In September 2025 Paragraph 027 of the PPG was updated so that it now states that "In applying paragraph 175 a proportionate approach should be taken. Where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development (therefore addressing the risks identified e.g. by Environment Agency flood risk mapping), without increasing flood risk elsewhere, then the sequential test need not be applied." Therefore, in cases where a site-specific Flood Risk Assessment shows a development at risk of surface water flooding can be made safe for its lifetime without increasing flood risk elsewhere then the surface water flood risk would not need to be considered within the Sequential Test.

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

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

The sources of information on reasonably available sites may include but is not restricted to:

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

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

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

3.4.2 Applying the Exception Test

Where a development proposal is in accordance with an allocation made in a Local Plan following the application of the Sequential and Exception Tests, the Exception Test will only be required to be repeated if:

- Elements of the development that were key to it satisfying the Exception Test at the plan-making stage (such as wider sustainability benefits to the community or measures to reduce flood risk overall) have changed or are not included in the proposed development; or
- The understanding of current or future flood risk has changed significantly.

For developments that have not been allocated in the Local Plan or where the Sequential Test was not applied at the development plan stage and new information becomes available that identifies a flood risk, developers must undertake the Sequential and Exception Tests and present this information to the LPA for approval. 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.

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

4 Understanding flood risk

This section explores what flood risk is, key sources of flooding in the district, and the factors that affect flooding including topography, soils, and geology.

This is a strategic summary of the risk in the district to inform the application of the Sequential and Exceptions Tests. Developers should use this section to scope out the flood risk issues they need to consider in greater detail in a site-specific FRA to support a planning application. Information in this section should not be used to inform flood risk at a property-level.

4.1 Defining flood risk

Section 3 (subsection 1) of the [Flood and Water Management Act 2010 \(FWMA\) \(gov.uk\)](#) defines the risk of a potentially harmful event (such as flooding) as ‘a risk in respect of an occurrence is assessed and expressed (as for insurance and scientific purposes) as a combination of the probability of the occurrence with its potential consequences.’

Figure 4-1 sets out this definition of risk.



Figure 4-1: Conceptual model depicting how risk can be defined.

4.1.1 Probability

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

4.1.2 Consequences

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

4.1.3 Source-Pathway-Receptor model

Flood risk can be assessed using the Source-Pathway-Receptor model (Figure 4-2) where:

- The source is the origin of the floodwater, principally rainfall.
- A pathway is a route or means by which a receptor can be affected by flooding, which includes rivers, drains, sewers, and overland flow.
- A receptor is something that can be adversely affected by flooding, which includes people, their property, and the environment.

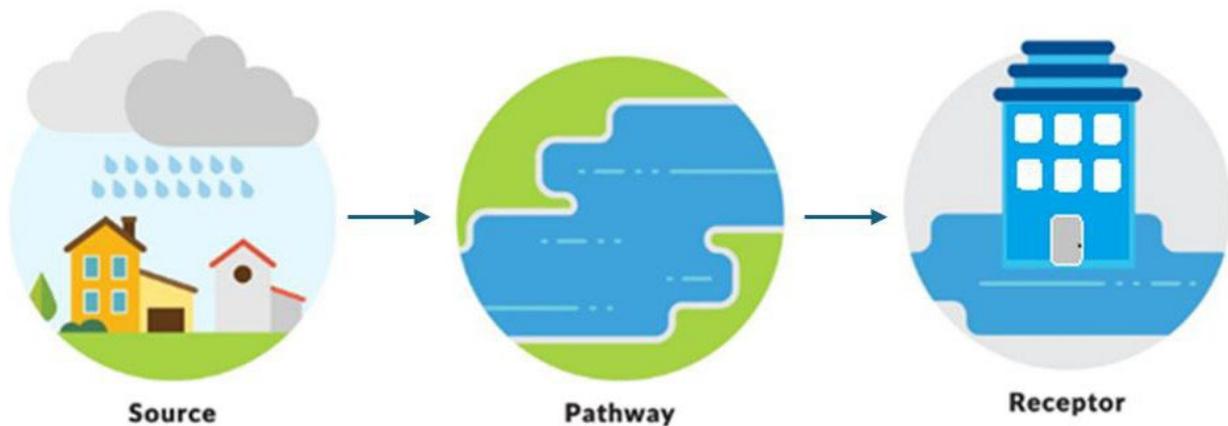


Figure 4-2: Source-Pathway-Receptor model.

This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. All these elements must be present for flood risk to arise. Having applied the Source-Pathway-Receptor model it is possible to mitigate the flood risk by addressing the source (often very difficult), blocking, or altering the pathway, or removing the receptor, e.g., steer development away.

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

4.2 Topography, geology, and soils

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

4.2.1 Topography

The [National LIDAR Programme \(gov.uk\)](http://gov.uk) provides elevation data at 1m spatial resolution for all of England.

Figure 4-3 displays the topography (elevation) of Sevenoaks District. The topography primarily comprises higher elevations and steeper slopes which form the North Downs in the northern section of the district and the High Weald in the southern area of the district. The highest elevations reach approximately 247 metres Above Ordnance Datum (mAOD) at The Chart near Weardale. Elevations decrease in a north and south-east direction due to the presence of several river valleys in the district. Elevations reach approximately 20mAOD near South Darent and Leigh, both of which are located in separate river valleys. There are three main watercourses within the district boundary; the River Darent which originates from higher elevations in the north, and the Rivers Eden and Medway which occupy the lower elevations in the south.

4.2.2 Geology

Sevenoaks District primarily consists of three main bedrock geologies (Figure 4-4); the Wealden Group, the Lower Greensand Group and the White Chalk Sub-group.

The Wealden Group is located in the southern section of the district (south of Chartwell) and consists of sandstone, mudstone and siltstone. Bands of the Lower Greensand Group and the Gault Formation and Upper Greensand Formation (undifferentiated) are located across the centre of the district between Chartwell and Kemsing, both of which consist of mudstone, sandstone and limestone. Due to the limestone composition and the greater permeability of the Greensand Group bedrock, central areas may be less responsive to rainfall compared to southern areas of the district.

North of Kemsing, the district is primarily underlain by White and Grey Chalk Subgroups (chalk) interspersed with small Thanet Sand Formation (sand, silt and clay), Thames Group and Lambeth Group (clay, silt, sand and gravel) deposits. The permeable chalk formations indicate that the majority of this area is likely to have a slower response to rainfall. However, areas of mixed geologies will exhibit different catchment responses depending on the local geology. For example, areas dominated by sand, silt and clay (e.g. Swanley) will have a quicker catchment response compared to areas dominated by chalk.

Superficial (at the surface) deposits in Sevenoaks District are located on the North Downs as well as the floodplains of the Rivers Eden, Medway and Darent (Figure 4-5). Clay-with-

Flints Formation (Diamicton) characterise the North Downs, whereas Alluvium (clay, silt and sand) and River Terrace Deposits (undifferentiated – sand and gravel) characterise the floodplains and areas surrounding the three main rivers in the district.

A map detailing the extents of this bedrock and further superficial geology across the district can be viewed online in the [British Geology Society Geology Viewer \(bgs.ac.uk\)](https://www.bgs.ac.uk/geology-viewer/).

The EA also provides mapping of different types of aquifers, the underground layers of water-bearing permeable rock from which groundwater can be extracted. Aquifers are designated as either principal or secondary aquifers. Principal aquifers are designated by the EA as strategically important rock units that have high permeability and water storage capacity.

The [EA's Magic Map Service](#) indicates that the north of the catchment is underlain by a Principal aquifer designation based on bedrock geology. There are areas in the south where a Secondary A bedrock aquifer is present, with a large central part of the study area underlain by an unproductive bedrock aquifer.

4.2.3 Soils

There are a variety of different soil types within Sevenoaks District, but they are generally classified as loamy and clayey soils. Specific soil types within Sevenoaks District include ([Land Information System, soilscape](#)):

- **Slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils** – surrounding the River Darent, River Eden and River Medway.
- **Slightly acid loamy and clayey soils with impeded drainage and slightly acid loamy and clayey soils with impeded drainage** – surrounding the North Downs.
- **Loamy and clayey soils of coastal flats with naturally high groundwater** – generally located in the centre of the district surrounding Sevenoaks and Swanley.
- **Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils** – located in the rural central parts of the District, such as Chiddingstone Causeway and Sevenoaks Weald.
- **Freely draining slightly acid loamy soils** – isolated patches to the east of the District near Plaxtol.
- **Loamy soils with naturally high groundwater** – to the south of the District surrounding Edenbridge.

The [British Geological Survey website \(bgs.ac.uk\)](https://www.bgs.ac.uk/) provides data on soils across the district.

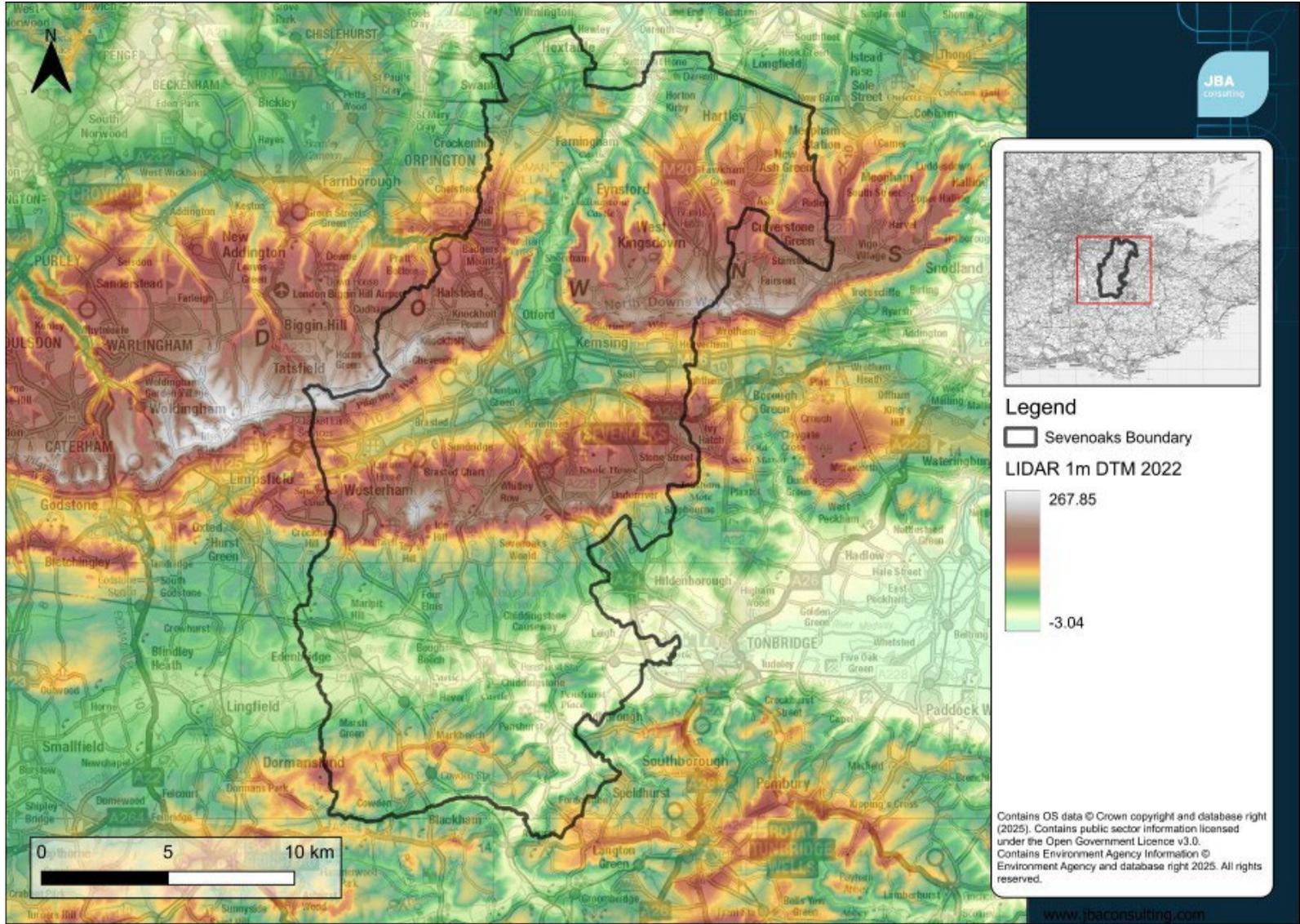


Figure 4-3: EA 1m LiDAR data showing the topography across the district.

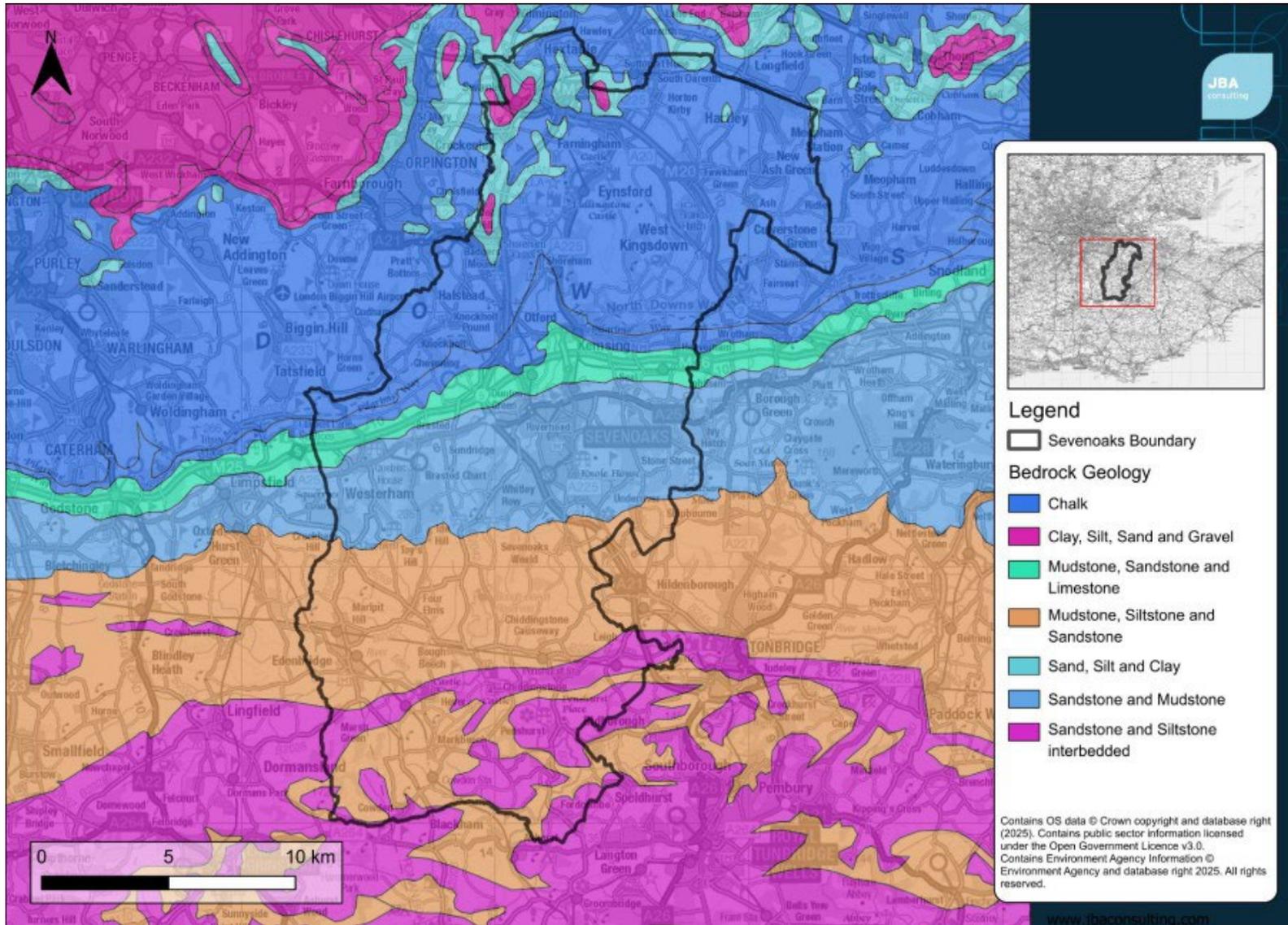


Figure 4-4: Bedrock geology across the Sevenoaks District.

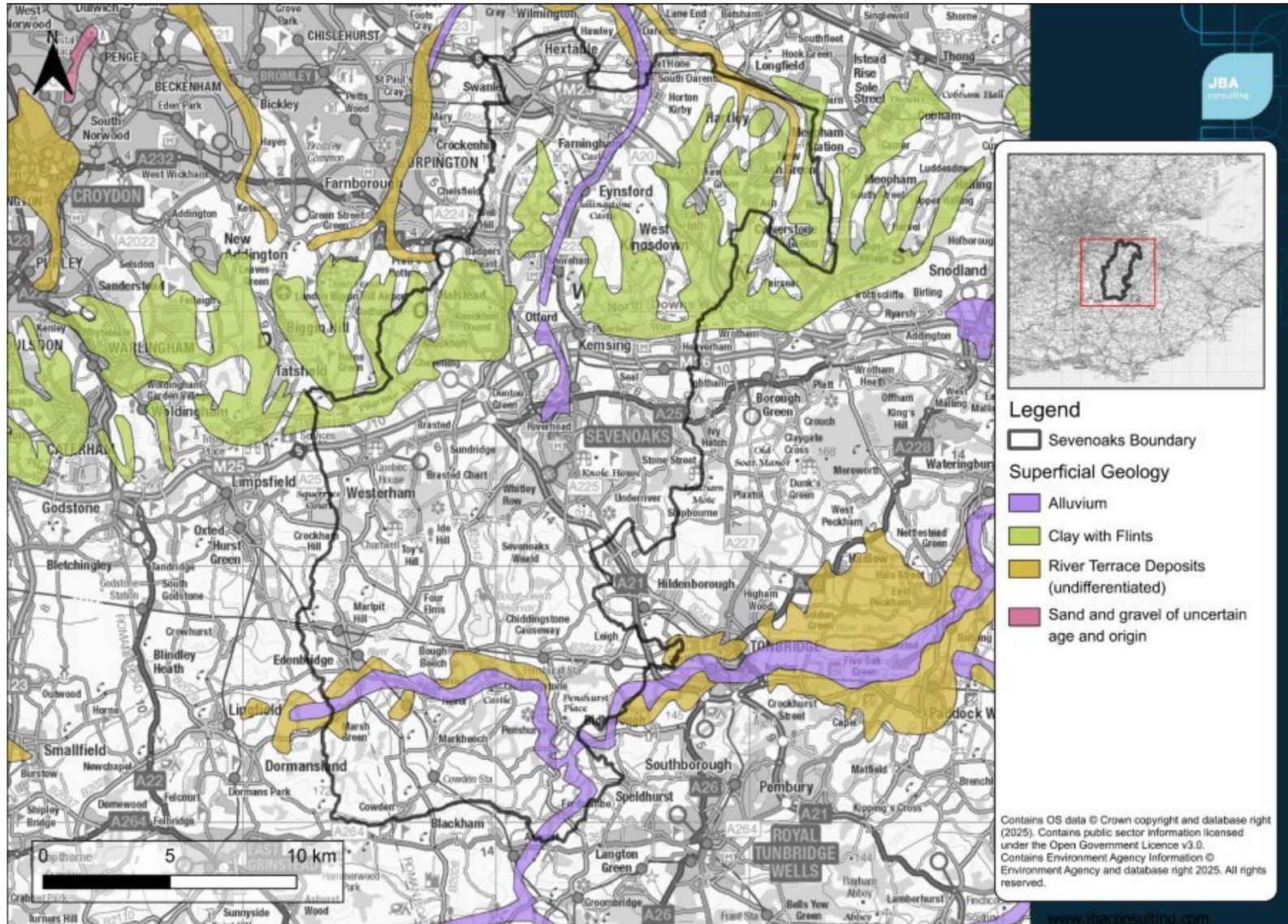


Figure 4-5: Superficial geology across the Sevenoaks District

4.3 Historical flooding

Sevenoaks District has a history of documented flood events with the main source being from ‘fluvial’ (river/ordinary watercourse) sources.

The events of 1958, 1960, 1968, 2000 and 2002/2003 caused widespread flooding across the district after heavy rainfall over a prolonged period. Since this time, significant flooding occurred within the district during Winter 2013/14, which included notable flooding from the River Medway.

Historic flood records provided by the Environment Agency, Sevenoaks District Council and Kent County Council identify the flood events known to have occurred between 1968 and 2025 (Figure 4-6).

The following historic flooding incidents are notable in Sevenoaks;

- Flooding during the winter of 2013/14;
- Ightham flooding – June 2016;
- Swanley flooding – June 2019.
- West Kingsdown – June 2019
- Swanley flooding – July and October 2021

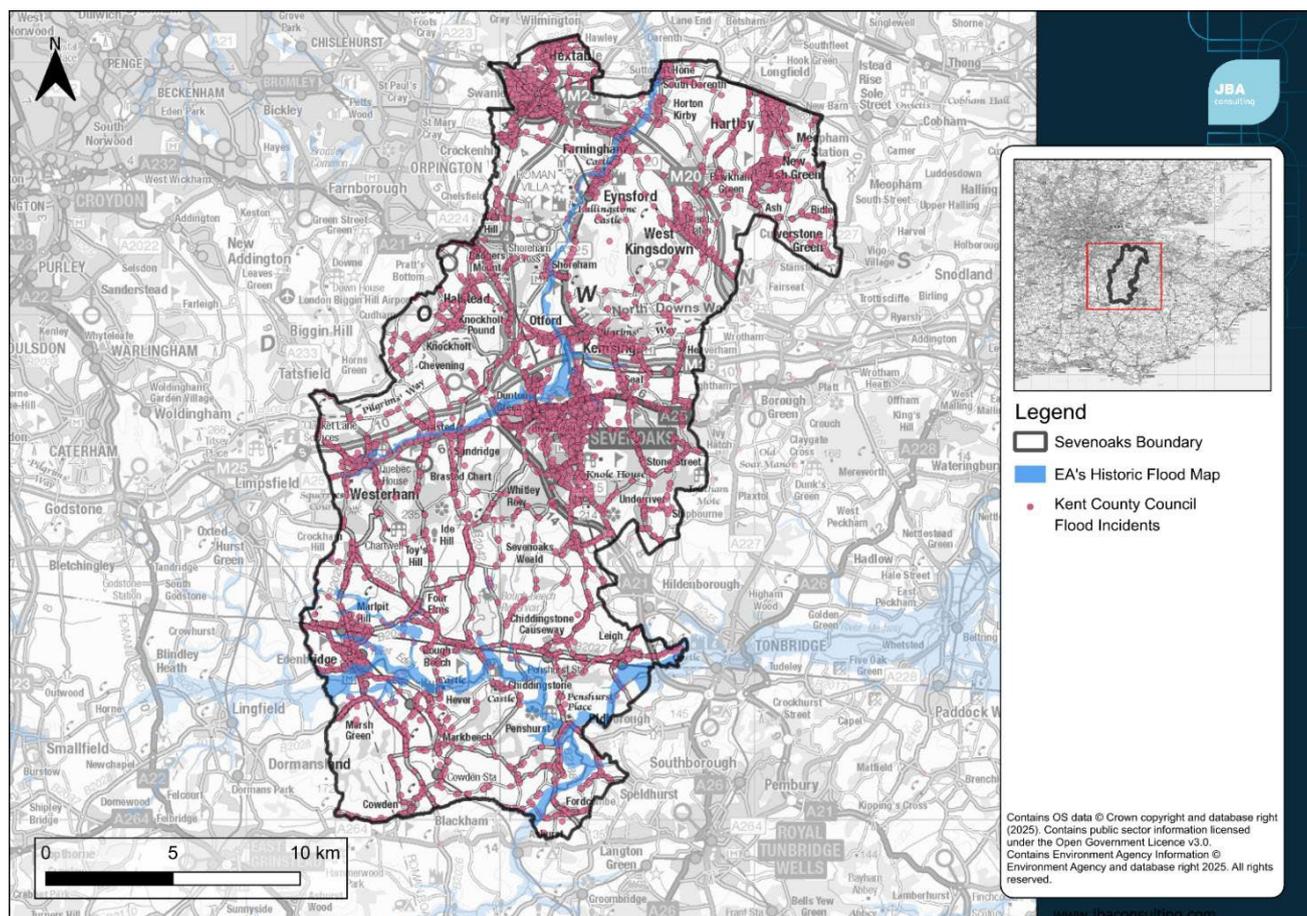


Figure 4-6: Historical flooding in the Sevenoaks District.

4.4 Fluvial flood risk

4.4.1 Flood Zones

Fluvial flood risk across the district is assessed based on Flood Zones. The definition of the Flood Zones is provided below. The Flood Zones do not consider defences, except when considering the functional floodplain (Flood Zone 3b). This is important for planning long term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones are:

- Flood Zone 1: Low risk: land having less than a 0.1% chance of flooding from rivers in any given year.
- Flood Zone 2: Medium risk: land having between a 1% and 0.1% chance of flooding from rivers in any given year.
- Flood Zone 3a: High risk: land having between a 3.3% and 1% chance of flooding from rivers in any given year.
- Flood Zone 3b: Functional Floodplain: land where water has to flow or be stored in times of flood (greater than a 3.3% chance of flooding from rivers in any given year with any existing flood risk management infrastructure operating effectively) Additionally this includes land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. [Annex 3 of the NPPF \(gov.uk\)](#) provides information on flood risk vulnerability.

Important note on Flood Zone information in this SFRA

Flood Zones 2, 3a and 3b have been compiled for Sevenoaks as part of this SFRA.

Flood Zones 2 and 3a are based on the Environment Agency's Flood Map for Planning (the latest flood maps, derived from the NaFRA2 study and which are available from DEFRA data services have been used). Flood Zone 3b comprises land where water from rivers or the sea has to flow or be stored in times of flood. The functional floodplain is defined as part of an SFRA and the methods used to define 3b in this SFRA are described below.

It should be noted that the EA Flood Zone 2 also incorporates accepted recorded flood outlines.

The EA Flood Zones do not cover all catchments or ordinary watercourses with areas <3km². As a result, whilst the EA Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from a smaller watercourse(s) not shown in the Flood Zones. Flood defences should be considered when delineating the functional floodplain.

Flood Zone 3b

Flood Zone 3b has been based on the 3.3% AEP defended extents from detailed modelling, where this is available. These are detailed in Table 4-1: Flood Risk hydraulic model used in the Level 1 SFRA . In areas not covered by detailed modelling, the Environment Agency's Flood Map for Planning 3.3% AEP defended flood risk extents - present day (taken from the latest NaFRA2 data from the DEFRA data services) has been used to define Flood Zone 3b.

A review of these datasets has noted that parts of the Risk of Flooding from Rivers and Sea (RoFRS) dataset appeared to be inaccurate due to the extent of flooding stopping mid-way down a channel. Where this has occurred, the extent of the previous Flood Map for Planning has been used to provide an indicative extent of flooding. It is believed the Environment Agency are in the process of identifying these areas on the national scale mapping and will be rectifying these errors. Once resolved, the national datasets should be used.

Table 4-1: Flood Risk hydraulic model used in the Level 1 SFRA

Model name	Year	Software (type)
Medway Model 1	2015	ISIS-TUFLOW
Darent and Cray Model	2018	Flood Modeller-TUFLOW

If existing development or infrastructure is shown in Flood Zone 3b, additional consideration should be given to whether the specific location is appropriate for designation as 'functional' with respect to the storage or flow of water in time of flood.

Present day Flood Zone mapping for the Local Plan area can be found in Appendix D1.

4.4.2 Summary of fluvial flood risk across the district

The main watercourses flowing through Sevenoaks District include the:

- River Darent
- River Eden
- River Medway
- Honeypot Stream
- Watercress Stream
- Hilden Brook

The two principal watercourses within the district are the River Darent, tributaries of which include the Honeypot Stream and the Watercress Stream, and the River Eden which is a major tributary of the River Medway. Tributaries of these watercourses include primarily smaller Ordinary Watercourses and unnamed drains. Mapping of the watercourses within the Sevenoaks area are included in Figure 4-7.

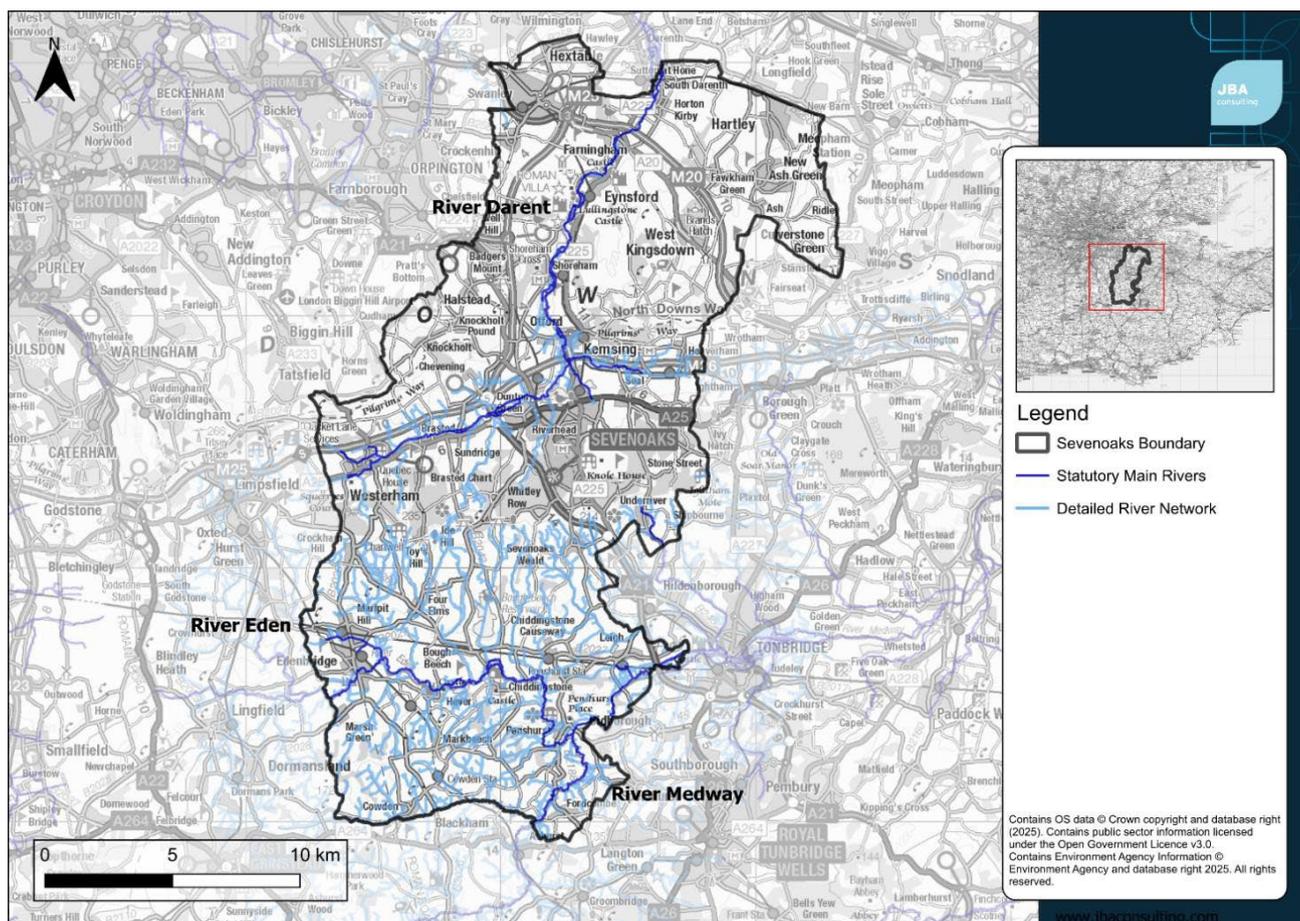


Figure 4-7: Watercourses in the Sevenoaks District.

There is widespread fluvial flooding recorded historically within the district (particularly along the floodplains of the River Darent, Eden and Medway, particular areas (e.g. roads) of the district susceptible to fluvial flooding have not been identified specifically as they are so numerous. A general overview of fluvial flooding in the district is outlined below.

The River Darent (an Environment Agency Main River) flows northwards from Westerham, through Sevenoaks, and eventually into the River Thames approximately 6km north of Sevenoaks District. According to SFRA flood zones mapping, the urban areas at risk of fluvial flooding from the River Darent (and tributaries including the River Guzzlebrook) include:

- Westerham
- Northern Sevenoaks (including Dunton Green and Bat and Ball)
- Otford
- Eynsford
- Farningham
- Horton Kirby.

The River Eden flows from west to east in the southern half of Sevenoaks District, reaching its confluence with the River Medway at Penshurst (both are Environment Agency main rivers). According to SFRA Flood Zones mapping, the urban areas at risk of fluvial flooding from the Rivers Eden and Medway include Edenbridge, Penshurst and Leigh.

The impacts of climate change on fluvial flooding are discussed in Section 5.2.

4.4.3 Ordinary Watercourses

The Sevenoaks SWMP states that ordinary watercourses have also repeatedly flooded in the district. For example, a tributary of the River Eden northeast of Marlpit Hill and southwest of Four Elms reportedly flooded in 1958 and 1960, and properties have been recorded to be affected in the past along Coppings Road and Hartfield Road, within Kippington and throughout Sevenoaks. These incidents have occurred due to the known issues with unmaintained watercourses and riparian owners not being aware of their duty responsibilities. Issues include blocked trash screens and culverts, and high water levels within the channels reducing discharge from highway drainage.

In addition to flood risk shown by the flood risk mapping, there are a number of small watercourses and field drains which may pose a risk to development. Generalised Flood Zone mapping (where more detailed modelling investigations are not available) is only available for watercourses with catchments greater than 3km². Therefore, whilst these smaller watercourses may not be shown as having flood risk in the Flood Map for Planning dataset (fluvial flood zones), it does not mean that there is no flood risk associated with them. As part of a site-specific flood risk assessment, it will be necessary to assess the flood risk from these smaller watercourses.

It should be noted that defences are present within the district which act to reduce flooding. This may be particularly important when considering the functional floodplain (Flood Zone 3b) for development proposals. Further details on defences in Sevenoaks District are presented in Section 6.

The delineation of the fluvial Flood Zones and the areas of Sevenoaks District which are within fluvial Zones are shown in Appendix D1.

An important consideration when assessing fluvial flood risk is the probability of a failure of river defence occurring or being exceeded. Risk of defence failure is reduced by the positive actions of the defence owners in maintaining the defences, but there remains a residual risk of breach or exceedance by an event that is greater than the design capacity. The necessity for assessment of the 'residual' risk of defence failure (e.g. breach) should be considered on a site by site basis. The Reduction in Risk of Flooding from Rivers and Sea due to Defences dataset can be used to identify areas of residual risk.

4.5 Surface water flood risk

Flooding from surface water runoff (or 'pluvial' flooding) is usually caused by intense rainfall that may only last a few hours. Flooding usually occurs when rainfall fails to infiltrate to the ground or enter the drainage system. Ponding generally occurs at low points in the topography. The likelihood of flooding is dependent not only on the rate of runoff but also saturation of the receiving soils, the groundwater levels, and the condition of the surface water drainage system (i.e., surface water sewers, highway authority drains and gullies, open channels, Ordinary Watercourses and SuDS). Surface water flooding problems are

inextricably linked to issues of poor drainage, or drainage blockage by debris, and sewer flooding.

The [EA's Risk of Flooding from Surface Water mapping \(RoFSW\) \(gov.uk\)](#) has been used to assess surface water risk within this SFRA and was updated in January 2025 with outputs from NaFRA2. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the EA, and any potential developers to focus their management of surface water flood risk.

The RoFSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water. The RoFSW should not be used to understand flood risk for individual properties but is suitable for high level assessments such as SFRA for local authorities.

4.5.1 Summary of surface water flood risk across the district

The historical records of flooding are well dispersed throughout the district. However, clusters of recorded flood events are located around Edenbridge and Sevenoaks. The Sevenoaks SWMP states that for the most part surface water flooding could be attributed to heavy rainfall overloading carriageways and drains/gullies. Surface water flooding is particularly common north-west of Knole Park in Sevenoaks.

Information provided by members of the public indicate areas around Westerham have flooded as a result of surface water flooding following heavy rainfall in winters 2019, 2020 and 2023.

There are other instances of surface water flooding that have been caused by blocked drains/gullies or high levels within receiving watercourses impeding free discharge from surface water drains and gullies.

The Environment Agency's RoFSW mapping for the 3.3% AEP, 1% AEP and 0.1% AEP return periods within Sevenoaks District predominantly follow the routes of watercourses or dry valleys with some isolated areas of ponding located in low lying areas. The mapping also identifies some constrained surface water flow paths within the District's urban areas, including Sevenoaks, Swanley, Edenbridge and Kemsing. Mapping of the RoFSW throughout the district is provided in Appendix D2.

The impacts of climate change on surface water flooding are discussed in Section 5.

4.6 Sewer flood risk

Sewer flooding occurs when intense rainfall/river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels. Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Design and Construction Guidance (formerly Sewers for Adoption) means that new surface water sewers have been designed to have capacity for a 3.3% AEP rainfall event, although until recently this did not apply to smaller private systems. This means that sewers can be overwhelmed in larger rainfall and flood events.

New developments should not cause additional pressures on existing sewers due to the requirements to maintain greenfield runoff rates. However, increases in rainfall as a result of climate change can lead to existing sewers becoming overloaded, although this can be reduced through the use of well-designed SuDS to reduce surface water runoff.

Southern Water and Thames Water are the water and sewerage companies responsible for the management of the sewerage networks across the district.

Sewer Incident Report Form (SIRF) data was provided by Southern Water and is displayed in Table 4-2. This database records incidents of flooding relating to public foul, combined or surface water sewers and displays properties that both internal and external flooding. The database covers reported incidents of sewer flooding up to 2021.

Table 4-2: SIRF data from Southern Water

Year	Number of incidents
2011	6
2012	11
2013	10
2014	7
2015	1
2016	1
2017	1
2018	1
2019	3
2020	3
2021	6
Sum	49

4.7 Groundwater flood risk

In general, less is known about groundwater flooding than other sources of flooding 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.

- Perched aquifers underlain by impermeable geology, particularly in low lying areas.

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 shows the likelihood of groundwater emergence posing a risk to both surface and subsurface assets, based on predicted groundwater levels during a 1% AEP event. This divides groundwater emergence into five categories (Table 4-3).

Table 4-3: JBA Groundwater Emergence Map category descriptions.

Category	Potential risk
Groundwater levels are either at or very near (within 0.025m of) the ground surface.	Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
Groundwater levels are between 0.025m and 0.5m below the ground surface.	Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
Groundwater levels are between 0.5m and 5m below the ground surface.	There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
Groundwater levels are at least 5m below the ground surface.	Flooding from groundwater is not likely.
No risk.	This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

It should be noted that this dataset only identifies areas likely to be at risk of groundwater emergence and does not allow prediction of the likelihood of groundwater flooding or quantification of the volumes of groundwater that might be expected to emerge in a given area.

4.7.1 Summary of groundwater emergence risk across the district

JBA Groundwater emergence mapping across the district shows that the majority of the study area (mainly in the southern and central areas), is at 'negligible risk' of groundwater emergence. Groundwater flooding in many northern parts of the Sevenoaks District is deemed 'not likely'. Areas along the Main Rivers in the district, including the River Eden and River Darent, are at greater risk of groundwater emergence.

This JBA Groundwater Emergence map is shown in Appendix D5.

4.8 Residual risk

Residual risk comes in two main forms (PPG: Flood Risk and Coastal Change Paragraph: 041):

- Residual risk from flood risk management infrastructure.
- Residual risk to a development once any site-specific flood mitigation measures are taken into account.

Examples of residual flood risk from flood risk management infrastructure include:

- A breach of a raised flood defence, blockage of a surface water conveyance system or failure of a pumped drainage system;
- Failure of a reservoir; and
- A flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot accommodate.

This SFRA does not assess the probability of failure. However, in accordance with the NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

Examples of residual flood risk to a development include:

- The depth of internal flooding predicted after any raising of land or floor levels;
- The flood hazard to which people would be exposed on access or escape routes after they have been raised; and
- A failure of flood forecasting or flood warning and the risks associated with people not receiving warnings or acting upon them.

4.8.1 Reservoir flood risk

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the [Reservoirs Act 1975 \(gov.uk\)](https://www.gov.uk/government/legislation/1975) and are on a register held by the EA. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

Reservoirs have a designated "risk category" set by the potential damage and loss of life in circumstances where there is a breach or an extreme flood event. Reservoirs designated as high risk are subject to increased inspection and maintenance requirements. However, this designation does not mean they are at a high risk of flooding. Allocation of new development downstream of an existing reservoir could potentially change the risk category and result in a legal requirement to improve the structural and hydraulic capacity of the dam. As the cost of implementing such works can be substantial, consideration should be given to whether it would be more appropriate to place development in alternative locations not associated with such risk.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is very different from other forms of flooding; it may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The EA hold mapping showing what might happen if reservoirs fail. Developers and planners should check the [Long-Term Risk of Flooding \(gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441222/long-term_risk_of_flooding.pdf) before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping.

The EA provide two flooding scenarios for the reservoir flood maps: a 'dry-day' and a 'wet-day'. The 'dry day' scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The 'wet day' scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood. It should be noted that these datasets give no indication of the likelihood or probability of reservoir flooding. The EA maps represent a credible worst-case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

4.8.1.1 Summary of reservoir flood risk across the district

The current mapping shows that there are 6 reservoirs located within the Sevenoaks district and a further 7 reservoirs located outside the district which pose a risk within the study area (detailed in Table 4-4). The reservoir locations are shown in Figure 4-8. The reservoir flood mapping for both the "dry day" and "wet day" scenarios is shown in Appendix D6.

During a "wet day" breach scenario, the areas of Sevenoaks District fringing the tributaries of the River Darent, River Eden and River Medway are at risk of reservoir flooding. Similar flooding is predicted during the "dry day" scenario; however, flood extents are slightly smaller.

Table 4-4: Reservoirs with flood extents that impact the district.

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact district in 'dry day' scenario?
Bay Pond	535315, 151564	Surrey Wildlife Trust	High	Surrey County Council	No
Bough Beech	549300, 147800	Sutton and East Surrey Water PLC	High	Kent County Council	Yes
Buckhurst Park Lake	549700, 134900	Trustees of the Buckhurst Park Settlement	Not High	East Sussex County Council	Yes
Coombe Bank Lake	547800, 155800	Lynxtrade UK Limited	High	Kent County Council	Yes
Farningham Hill No.2	553500, 167345	Thames Water Limited	High	Kent County Council	Yes
Hedgecourt Lake	535500, 140300	Crawley Mariners Yacht Club Ltd	High	Surrey County Council	Yes
Hever Castle Lake	548400, 145400	Hever Castle Ltd	Not High	Kent County Council	Yes
Knockholt No.2	546665, 158382	Thames Water Limited	High	Kent County Council	Yes
Leigh Barrier (Medway) Flood Storage Area	555629, 145755	Environment Agency	High	Kent County Council	Yes
Leigh Place Pond	536000, 150900	Mr and Mrs M McGhee	High	Surrey County Council	No
Main Lake, Eridge	556500, 135000	Broadoak Fishing	High	East Sussex	Yes

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact district in 'dry day' scenario?
Park		Club		County Council	
Weirwood	540600, 135300	Southern Water Services Ltd	High	East Sussex County Council	Yes
Wiremill Lake	536800, 141700	Wiremill Waterski Club	High	Surrey County Council	Yes

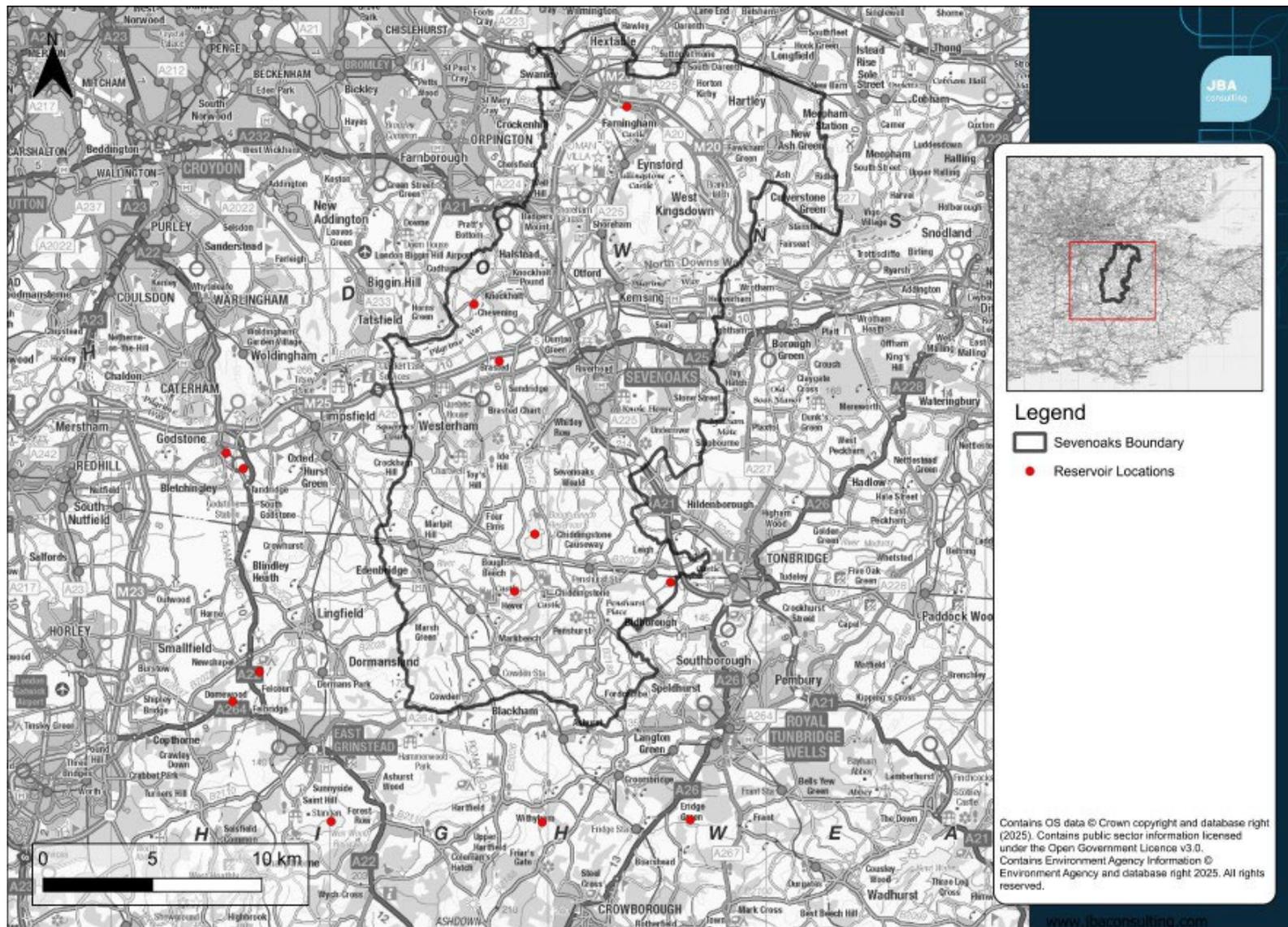


Figure 4-8: Reservoirs with flood extents that impact the district.

5 Impact of climate change

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

5.1 Climate change guidance

The [Climate Change Act 2008 \(legislation.gov.uk\)](https://legislation.gov.uk) creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050. This was updated in June 2019 under the [Climate Change Act 2008 \(2050 Target Amendment\) Order \(legislation.gov.uk\)](https://legislation.gov.uk) to a 100% reduction (or net zero) by 2050.

In 2018, the Met Office published new [UK Climate Projections \(UKCP18\) \(gov.uk\)](https://gov.uk). The EA used these projections to update their guidance on climate change allowances for new developments for river flow (July 2021) and rainfall intensity (May 2022). This includes information on how these allowances should be included in both SFRA and FRA. 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 management catchments for the district are shown in Figure 5-1.

Developers should check [Flood risk assessments: climate change allowances \(gov.uk\)](https://gov.uk) for the most recent guidance before undertaking a detailed FRA.

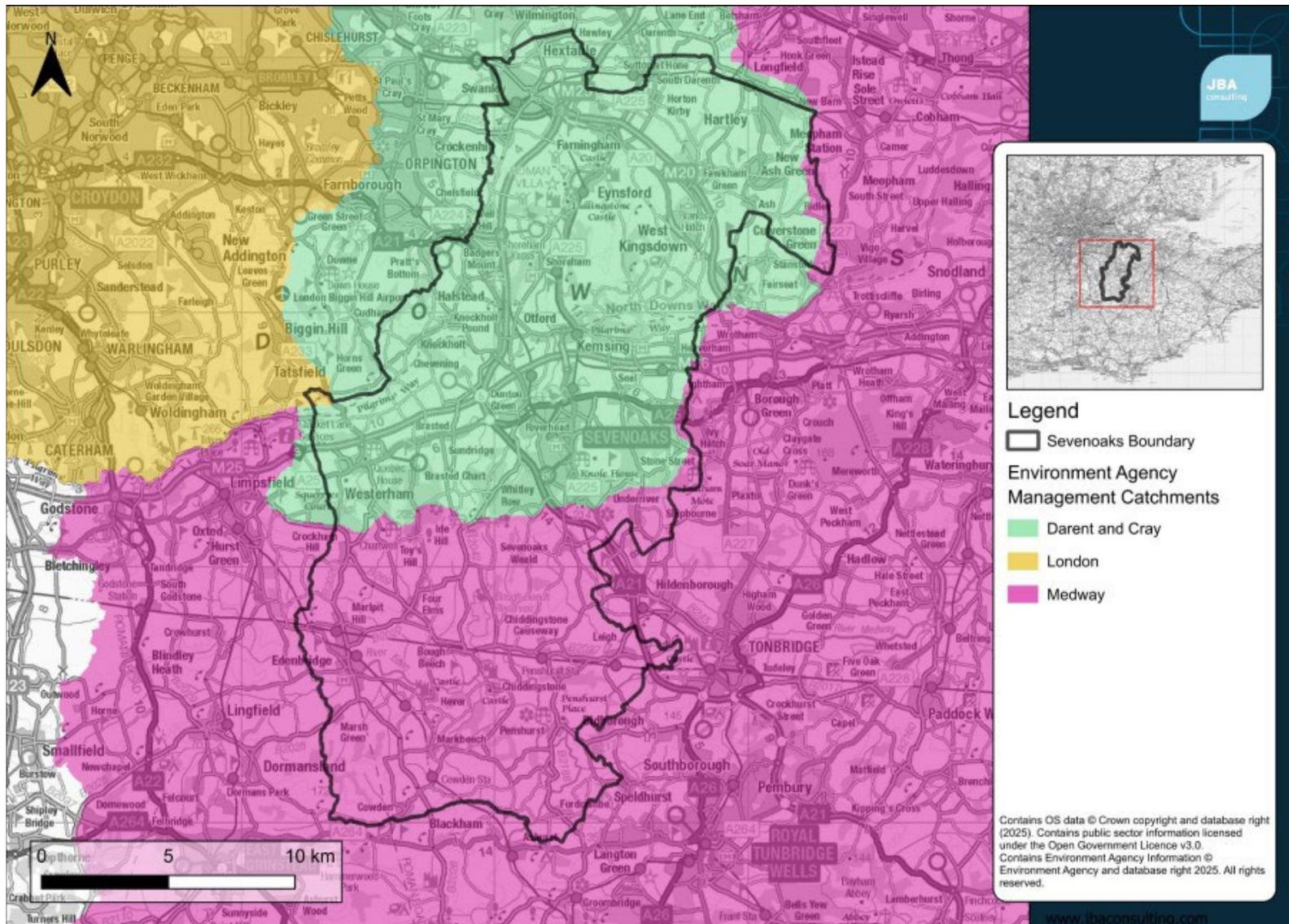


Figure 5-1: Management Catchments (assigned by the EA) across the district.

5.2 Peak river flows

Climate change is expected to increase the frequency, extent and impact of flooding, reflected in peak river flows. Wetter winters and more intense rainfall may increase fluvial flooding and surface water runoff and there may be increased storm intensity in summer. Rising river levels may also increase flood risk.

The [peak river flow allowances \(gov.uk\)](#) provided in the guidance show the anticipated changes to peak flow for the management catchment within which the subject watercourse is located. The range of allowances are based on percentiles which describe the proportion of possible scenarios that fall below an allowance level:

- The central allowance is based on the 50th percentile (exceeded by 50% of the projections in the range).
- The higher central allowance is based on the 70th percentile (exceeded by 30% of the projections in the range).
- The upper end allowance is based on the 95th percentile (exceeded by 5% of the projections in the range).

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

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

The time period used in the assessment depends upon the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years, whilst the lifetime of a non-residential development depends upon the characteristics of that development, but a period of at least 75 years is likely to form a starting point for assessment. Further information on what is considered to be the lifetime of development is provided in the [PPG \(gov.uk\)](#).

5.2.1 Peak river flow allowances

The Sevenoaks District is located across the 'Darent and Cray' and 'Medway' Management Catchments for peak river flow allowances. A small area of the Sevenoaks District is located within the London River Basin Management Catchment.

Table 5-1 and Table 5-2 display the peak river flow allowances that apply to the Darent and Cray Management Catchment and Medway Management Catchment respectively for fluvial flood risk.

Table 5-1: Peak river flow allowances for the Darent & Cray 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 2125)
Upper end	21%	23%	41%
Higher Central	11%	8%	18%
Central	6%	3%	10%

Table 5-2: Peak river flow allowances for the Medway 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 2125)
Upper end	29%	37%	62%
Higher Central	19%	21%	37%
Central	14%	15%	27%

5.2.2 Which peak river flow allowance to use?

The EA guidance states that both the central and higher central allowances should be assessed in SFRA.

The Flood Zone and [flood risk vulnerability classification \(gov.uk\)](https://www.gov.uk/guidance/flood-risk-vulnerability-classification) should be considered when deciding which allowances apply to the development or the plan. Specific guidance for which climate change allowance estimates should be applied can be found in the [EA climate change guidance \(gov.uk\)](https://www.gov.uk/guidance/ea-climate-change-guidance).

5.2.3 Representation of fluvial climate change within the Level 1 SFRA

Climate change scenarios have been run for relevant fluvial models for the 3.3%, 1% and 0.1% AEP events in line with the PPG requirements to assess high, medium and low risk both now and in the future.

The Environment Agency climate change guidance shows that for watercourses in the Medway management that the 27% and 37% allowances should be considered. For the Darent and Cray Management Catchment, 10% and 18% should be considered. As part of this SFRA, the models were run with these uplifts. Table 5-3 summarises which datasets have been used to determine future flood risk within the Sevenoaks District.

Table 5-3: Summary of modelling datasets used to inform climate change.

Climate change datasets	
Medway Model 1	Fluvial 3.3%, 1% and 0.1% AEP + Central and Higher Central CC
Darent and Cray model	Fluvial 3.3%, 1% and 0.1% AEP + Central and Higher Central CC

In areas not covered by detailed modelling, the Environment Agency's Risk of Flooding from Rivers and Sea without Defences-Climate Change Extents (Rivers and sea without defences) datasets (taken from the latest NaFRA2 data from DEFRA data services) have been used to derive the extent of flooding for the 1% and 0.1% AEP events. For the 3.3% AEP event, the Environment Agency's Risk of Flooding from Rivers and Sea with Defences-Climate Change Extents (Rivers and Sea with defences) dataset has been used to derive the extent of flooding. This has been applied as the 2080's Central climate change uplifts for fluvial flood risk.

5.2.4 Implications of climate change for fluvial risk across the district

Across the Sevenoaks District, the main areas at risk of fluvial flooding with the application of climate change include areas along the Main Rivers, such as land along the River Medway and River Eden in the south of the district, as well as areas along the River Darent in the north.

Mapping showing the impact of climate change on fluvial risk can be found in Appendix D3.

5.3 Peak rainfall intensities

Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This increased rainfall intensity will affect land and urban drainage systems, resulting in surface water flooding, due to the increased volume of water entering the systems. The EA have developed a [peak rainfall allowances map \(gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/612222/peak_rainfall_allowances_map.pdf) which shows anticipated changes in peak rainfall intensity which can be used for site-scale applications (like urban drainage design) and surface water flood mapping in small catchments (<5km²).

The guidance suggests that direct rainfall modelling may not be suited to larger (>5km²) catchments with rural land use. In these instances, the guidance states that the fluvial flood risk affected by climate change should be assessed using uplifts from peak river flow allowances (Section 5.2).

5.3.1 Peak rainfall intensity allowances for the district

The district is located within the 'Darent and Cray' and 'Medway' Management Catchments for peak rainfall allowances. Table 5-4 and Table 5-5 shows the peak rainfall allowances that apply to the district.

Table 5-4: Peak rainfall intensity allowances for small and urban catchments for the Darent & Cray Management Catchment.

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35%	45%	35%	40%
Central	20%	20%	20%	25%

Table 5-5: Peak rainfall intensity allowances for small and urban catchments for the Medway Management Catchment

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35%	45%	35%	40%
Central	20%	20%	20%	20%

5.3.2 Which peak rainfall intensity allowance to use?

Rainfall intensity climate change uplifts should be applied to both the 3.3% and 1% AEP events. The recommended epoch and use of either the central or upper end allowances should be based on the design lifetime of the proposed development. Further details are provided within the [EA climate change guidance \(gov.uk\)](https://www.gov.uk/guidance/ea-climate-change-guidance). For FRAs and SFRA's the upper end allowance should be used. The EA guidance recommends that the upper end allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch (2061 to 2125), unless the allowance for the 2050's epoch (2022 to 2060) is higher, in which case this should be used. This is appropriate for development with a lifetime beyond 2100. For development with a shorter lifetime the central allowance can be used.

5.3.3 Representation of surface water climate change within the Level 1 SFRA

For this SFRA, the following climate change uplifts have been applied to the Environment Agency Risk of Flooding from Surface Water dataset:

- 3.3% AEP 2070s upper end climate change allowance – 35% uplift
- 1% AEP 2050s upper end climate change allowance – 45% uplift

5.3.4 Implications of climate change for surface water risk across the district

Surface water flooding with the application of climate change reflects the topographic low spots, with flow paths and pooling predicted across the district. The mapping also identifies

some constrained surface water flow paths within the district’s urban areas, including Sevenoaks, Swanley, Edenbridge and Kemsing.

Mapping showing the impact of climate change on surface water risk can be found in Appendix D4.

5.4 Groundwater

The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows, is much more uncertain than other types of flooding. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months. The effect of climate change on groundwater levels for sites in areas where groundwater is known to be an issue should be considered at the planning application stage.

5.5 Adapting to climate change

PPG: Climate Change (gov.uk) Paragraph 003 (Reference ID: 6-003-20140612) contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Paragraph 005 (Reference ID: 6-005-20140306) also provides considerations for the LPA on dealing with the uncertainty of climate risks and accounting for climate change in a realistic way within developments.

6 Flood risk infrastructure

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

6.1 Asset management

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

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

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

6.2 Standards of Protection

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

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

It should be noted that the EA's on-going hydraulic modelling programme may revise flood risk datasets and, therefore, the SoP offered by flood defences in the area may differ from those discussed in this report.

6.3 Maintenance

Different authorities have responsibilities relating to maintenance of flood risk assets, set out in Table 6-1. It is important that the authorities work in partnership to maintain flood risk assets and manage flood risk across the district.

Table 6-1: Flood risk asset maintenance responsibilities based on the FWMA (2010).

Authority	Asset maintenance responsibilities
EA	Permissive powers to maintain and improve main rivers, ultimate responsibility for maintaining watercourses rests with the landowner.
Local Authorities	Permissive powers to maintain and improve ordinary watercourses, ultimate responsibility for maintaining watercourses rests with the landowner.
LLFA	Permissive powers, limited resources are prioritised and targeted to where they can have the greatest effect
Highways Authorities	Duty to maintain public roads, making sure they are safe, passable, and the impacts of severe weather have been considered. Responsible for maintaining sections of watercourses where they are crossed by highways.
Water Companies	Duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g., where there is frequent sewer flooding.
Riparian Owners	Responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/banks, controlling invasive species, and allowing the flow of water to pass without obstruction.

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

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

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the EA for condition is provided in Table 6-2.

Table 6-2: Grading system used by the EA to assess flood defence condition.

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

Source: Condition Assessment Manual – EA 2006

6.4 Major flood risk management assets in the district

The EA retired the Flood Map for Planning ‘Areas Benefiting from Defences’ (ABD) dataset in December 2022. This dataset will no longer be available on online mapping. Instead, a developer can enter an address into the [EA Flood Map for Planning \(gov.uk\)](https://www.gov.uk/guidance/ea-flood-map-for-planning) to get information about their specific site and request FRA data for planning (also known as Product 4).

The EA ‘AIMS’ (Asset Information Management System) flood defence dataset gives further information on flood defence assets within the district. Table 6-3 details the locations which benefit from formal flood defences within the ‘AIMS’ dataset. Developers should refer to the AIMS Spatial Flood Defences dataset ([gov.uk](https://www.gov.uk/guidance/aims-spatial-flood-defences)) for further information on specific flood defences. The EA ‘AIMS’ dataset is shown in Appendix D7.

6.4.1 Raised defences

6.4.1.1 Edenbridge

Within Edenbridge, raised flood defences are set back from the channel of the River Eden to protect certain areas from river flooding. Several raised embankments and a wall are located on either side of the River Eden, notably adjacent to the gardens properties on Cobbetts Way, Mont St Aignan Way, Hever Road and Church Street. The wall has a condition grade of ‘Good’ while raised embankments have a condition grade of ‘Fair’.

6.4.1.2 Brasted

There are a number of raised flood defences within Brasted located along the banks of the River Darent. The defences in the area consist predominantly of walls and high ground on either side of the channel. The defences are privately owned, but the Environment Agency and private owners maintain different sections of the defences. Responsibilities for maintaining particular lengths of the defences should be confirmed with the Environment Agency.

It should be noted that several man-made flood defences in the area have been categorised as ‘high ground’ defences and as such, further investigation may be required to

accurately establish the type of defence in these locations. The condition grade of walls and high ground assets typically varies between ‘Good’ and ‘Fair’.

It should be noted that the minimum standard of protection of 50% AEP (1 in 2-year flood event) is provided by a section of ‘high ground’ along the northern bank of the River Darent adjacent to the track leading north.

6.4.2 Leigh Flood Storage Area

The Leigh Flood Storage Area (FSA), constructed in 1982, is the only FSA present within the district, it is an online storage reservoir on the River Medway constructed to reduce the risk of flooding in Tonbridge in the neighbouring borough. Under normal flow conditions, the FSA is empty. However, during times of increased flows, the FSA attenuates flows from the Upper Medway catchment (River Medway and River Eden) and aims to reduce the flow passing downstream through Tonbridge and beyond. The FSA consists of an impounding embankment with an outflow through three radial gates. It is operated to limit forward flows but has a maximum impounding level of 28.05m AOD. If that level is likely to be exceeded, then alternative operation of the FSA is considered by the Environment Agency. The majority of the area impounded by the embankment falls within Sevenoaks District and primarily consists of the agricultural land located south-east of Leigh. When the FSA is impounding to 28.05m AOD, the extent of the FSA extends upstream beyond the confluence of the River Medway and River Eden.

Assigning a single standard of protection for the FSA is not possible as the inflows to the FSA, volume of water stored and reduced outflows (leading to reductions in flooding) vary on an event-by-event basis. The FSA has been regulated under the Reservoirs Act 1975 (now under the Flood and Water Management Act 2010) and has a condition grade of 1 (Very Good). The Environment Agency released a [policy paper](#) on the Leigh Flood Storage Area in December 2022.

The Kent County Council Flood Risk to Communities – Tonbridge and Malling (March 2016) report has stated that prior to the floods that occurred over the winter of 2013/2014, the Leigh FSA was planned to have work carried out by the Environment Agency to extend the life to 2035. Since the event, a partnership has formed between the EA, KCC, Tonbridge and Malling Borough Council and Medway Economic Partnership (previously part of the South East Local Enterprise Partnership) to bring forward plans to increase the capacity of the Leigh FSA. The proposals were progressed in two phases, the first phase involving the volume capacity enhancement of the Leigh storage facility by approximately 24% and the second phase involving the construction of an embankment and other works at Hildenborough.

As of Summer 2025, 2 of the 3 gates has been installed on the Leigh FSA, along with works to raise the embankment at Leigh pumping station and Cattle Arch bridge. The works on the second phase of the project have also started in Hildenborough, which include pumping station, de-silting the river around the pumping station and the structures and raising the embankment that currently protects the railway line between Leigh and Tonbridge. It is anticipated that all work will be complete in 2026, however, until the works

and scheme are fully implemented and operational, the potential effect on flood risk will not be included in the Strategic Flood Risk Assessment.

Table 6-3: Locations shown in the EA 'AIMS' data set.

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
River Darent	Brasted	Wall	100	N/A	3	3	Unknown
River Darent	South Darent	Wall	5	N/A	N/A	N/A	Unknown
River Darent	South Darent	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Shoreham	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Shoreham	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Westerham	Wall	5	N/A	3	3	Unknown
River Darent	Westerham	Wall	5	N/A	3	3	Unknown
Cross Dyke	Westerham	Wall	2	N/A	N/A	N/A	Private individual, Company or Charity
Cross Dyke	Westerham	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Westerham	Wall	5	N/A	3	3	Unknown
River Eden	Edenbridge	Wall	30	N/A	3	3	Unknown
River Eden	Edenbridge	Wall	N/A	N/A	3	3	Private individual, Company or Charity
River Darent	Westerham	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Westerham	Wall	5	N/A	3	2	Unknown
River Darent	Brasted	Wall	100	N/A	3	4	Unknown

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
River Darent	Brasted	Wall	100	N/A	3	3	Unknown
River Darent	Brasted	Wall	100	N/A	3	3	Unknown
River Darent	Chipstead	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Brasted	Wall	100	N/A	3	2	Unknown
River Darent	Brasted	Wall	5	N/A	3	2	Unknown
River Darent	Chipstead	Wall	5	N/A	3	3	Unknown
River Darent	Brasted	Wall	100	N/A	3	3	Unknown
River Darent	Chipstead	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Chipstead	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Brasted	Wall	5	N/A	N/A	N/A	Unknown
Unknown	Westerham	Wall	5	N/A	N/A	N/A	Unknown
Unknown	Westerham	Wall	5	N/A	N/A	N/A	Unknown
Unknown	Westerham	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Longford	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Chipstead	Wall	5	N/A	N/A	N/A	Unknown
River Darent	Brasted	Wall	100	N/A	3	2	Unknown
River Darent	Brasted	Wall	100	N/A	3	3	Unknown
River Darent	Brasted	Wall	100	N/A	3	2	Unknown
River Darent	Brasted	Wall	100	N/A	3	2	Unknown
N/A	Leigh	Flood Gate	N/A	N/A	3	2	Environment Agency

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
N/A	Leigh	Flood Gate	N/A	N/A	3	2	Environment Agency
River Darent	Westerham	Engineered High Ground	N/A	N/A	N/A	N/A	Private individual, Company or Charity
River Darent	Farningham	Engineered High Ground	N/A	N/A	N/A	N/A	Unknown

6.5 Existing and future flood alleviation schemes

6.5.1 Upper Westerham Flood Alleviation Scheme

The Upper Westerham Flood Alleviation Scheme reduced the risk of fluvial flooding to properties and the section of the A25 highway between Squerryes Court and Long Pond. The scheme increased conveyance in the main channel of the river, pavement/kerbs were lowered to road level to enable overflow from blocked gullies to drain into watercourses and re-align the culvert beneath Squerryes Drive reducing the flood risk to the surrounding dwellings. In order to maintain the structural integrity of the A25 highway, essential works took place on the left bank of the River Darent.

6.6 Other defence works

The Environment Agency's Flood and Coastal Erosion Management (FCERM) capital investment programme outlines how government investment will be managed to reduce risk and coastal erosion in England. The full programme lists all FCERM projects that are planned to take place between April 2021 and March 2027 across the UK.

There are currently no Environment Agency capital programmes planned for the Sevenoaks area.

7 Flood risk management requirements for developers

This section provides guidance on site-specific FRAs and other principles for managing flood risk in new development.

7.1 Early consultation with statutory and non-statutory consultees

Developers should consult with the EA, the LLFA and the relevant sewerage undertaker at an early stage to discuss flood risk, including requirements for site-specific FRAs, detailed hydraulic modelling and foul and surface water drainage assessment and design. It should be noted that some of these consultees may need to charge for data and/or advice requested by developers or landowners.

7.2 Site-specific FRAs

7.2.1 What is a site-specific FRA?

A site-specific FRA is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site and should accompany a planning application where required (see Section 7.2.2). It is recommended that the assessment is undertaken by a suitably qualified person. The assessment should demonstrate how flood risk will be managed now and over the development's lifetime, taking both climate change and the vulnerability of users into account.

The developer should check whether they are required to apply the Sequential Test prior to commencing with a site-specific FRA.

The objectives of a site-specific FRA are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with these effects and risks are adequate and appropriate.
- The nature of residual risk and whether this can be safely managed.
- The evidence, if necessary, for the LPA to apply the Sequential Test.
- The evidence, if applicable, to show whether the development will be safe and pass the Exception Test.

7.2.2 When is an FRA required?

As set out in [Flood risk assessments: applying for planning permission \(gov.uk\)](#), a site-specific FRA is required for all development (including minor development and changes of use) proposed:

- within Flood Zones 2, 3a, or 3b;
- within Flood Zone 1 with a site area of 1 hectare or more;
- within Flood Zone 1 and the flood map for planning shows it is at increased risk of flooding from rivers or sea during its lifetime;
- with Flood Zone 1 and the flood map for planning shows it is at risk of flooding from surface water;
- in areas with critical drainage problems;
- within Flood Zone 1 where the LPA's strategic flood risk assessment (SFRA) shows it will be at increased risk of flooding during its lifetime; or
- that increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea.

7.2.3 What level of detail is needed in a site-specific FRA?

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature, and location of the development. The SFRA can be used by developers as a starting point to identify the initial flood risk to a site however a pre-application consultation is key to define the scope of the FRA and identify data requirements, making sure that latest available datasets are used.

7.2.4 Guidance for FRAs

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the EA and the LLFA. Guidance and advice for developers on the preparation of site-specific FRAs is available from the following websites with hyperlinks provided:

- [Standing Advice on Flood Risk \(gov.uk\)](#)
- [Flood Risk Assessment for Planning Applications \(gov.uk\)](#); and
- [Site-specific Flood Risk Assessment: Checklist \(gov.uk\)](#)

Guidance should be sought from the EA and the Council at the earliest possible stage, and opportunities should be taken to incorporate environmental enhancements and reduce flooding from all sources both to and from the site through development proposals. Developers should seek to go beyond managing the flood risk and support opportunities to reduce the causes and impacts of flooding, whilst enhancing and conserving the natural environment. [PPG: Flood risk and coastal change \(gov.uk\)](#) Paragraphs 062 - 067 provide further information. Potential strategic solutions to consider are detailed in Section 12.

7.3 Emergency planning

Safe access and escape routes from the site should be provided. The developer should seek to incorporate an emergency plan and a safe refuge point if the development site has been identified to be at risk of flooding. The local authority and Emergency Services should be consulted when designing an emergency plan. For further details on emergency planning, see Section 10.

8 Principles for site design and master planning

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

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land uses away from high-risk areas to higher ground and lower flood risk areas, while more flood-compatible development (e.g., vehicular parking, recreational space) can be located in higher risk areas. Higher risk areas can also be retained and enhanced as natural green space. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning. The nature of risk to water quality also needs to be considered and mitigated to ensure that accumulated hydrocarbons and other vehicle-related pollutants are not released to the aquatic environment.

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

8.1 Modification of ground levels

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

Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (for it to fill and drain by gravity). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). [Appendix A3 of the CIRIA Publication C624 \(ciria.org\)](#) provides guidance on how to address floodplain compensation.

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

Any proposal for modification of ground levels within areas of flood risk will need to be discussed at an early stage with the EA and its impacts assessed as part of a detailed FRA.

8.2 Raised floor levels

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

Developers should refer to the [Preparing a flood risk assessment: standing advice \(gov.uk\)](#) for the latest guidance on FFLs but generally the EA advises the minimum finished floor levels should be set 600mm above the 1% AEP fluvial plus climate change peak flood level (the design flood event), where the appropriate climate change allowances have been used. An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA. Lowering existing FFLs below the existing levels within the 1% AEP plus climate change floodplain would not be acceptable and should be discouraged. New development offers opportunities to improve the resilience of buildings.

Building design and raised floor levels is the only way to fully reduce groundwater flood risk, through ensuring FFLs are raised above predicted groundwater levels considering known groundwater issues.

Allocating the ground floor of a building for less vulnerable, non-residential, or non-habitable residential use is an effective way of raising living space above flood levels. Single-storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach of flood defences). This risk can be reduced by use of multiple-storey construction and raised areas that provide a point of refuge. However, access and escape routes may still be an issue, particularly when flood duration covers many days.

Similarly, the use of basements should be avoided in areas of flood risk. Habitable uses of basements within Flood Zone 3 and areas at high risk of surface water flooding should not be permitted, whilst basement dwellings (classed as 'highly vulnerable') in Flood Zone 2 will be required to pass the Exception Test.

Where the ground level of a site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at an increased risk of sewer surcharge. It is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer. Alternatively, mitigation measures may need to be incorporated into the proposals to protect against sewer surcharge.

8.3 Development and raised defences

8.3.1 Undefended and residual risk

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

Where development is located behind, or in an area benefitting from defences, both the undefended risk and residual risk of flooding must be considered by the developer and demonstrated that they can be safely managed. The assessment of the risk should consider:

- Improvements required to the level of protection afforded by existing defences for future development.
- The future commitment to maintain the current standard of protection of any existing defences.
- Any disparities between the proposed level of commitment to maintain the current standard of protection and the level of protection required to support future development.
- The effects of climate change on the future SoP afforded by the defences and the associated maintenance and upgrade commitments required.
- Any land required to be safeguarded for affordable future flood risk management measures.

8.3.2 Breach assessment

The assessment of the residual risk from a breach event should consider an assessment of the hazards that might be present from flood flows from a breach event, considering depth and flow velocities, so that the safety of people and structural stability of properties and infrastructure can be appropriately considered.

Considerations should 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 various ways of assessing breaches using hydraulic modelling. EA LIT56413 Breach of Defences Guidance (2021) provides some guidance for breach assessment. It is recommended that the EA is 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.

8.3.3 Overtopping assessment

The assessment of the residual risk from overtopping of defences should consider the risk which is based on the relative heights of property or defence, the distance from the defence level, and the height of water above the crest level of the defence. The [Defra and EA Flood Risks to People guidance document \(gov.uk\)](#) provides standard flood hazard ratings based on the distance from the defence and the level of overtopping. Overtopping modelling or assessments should be undertaken for any sites located next to defences or perched ponds/reservoirs, accounting for climate change.

8.3.4 Developer contributions

In some cases, and following the application of the Sequential Test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both the proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS).

8.4 Buffer strips

The provision of a buffer strip allows additional capacity to accommodate climate change and means access to the watercourse, structures and defences is maintained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology, and having to construct engineered riverbank protection. A buffer strip of 8m is required from any main river. Where flood defences are present, these distances should be taken from the landward toe of the defence.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult. [Flood Risk Activity Permits \(gov.uk\)](https://www.gov.uk/guidance/flood-risk-activity-permits) from the EA are likely to be required for development in these areas alongside any planning permission. There should be no built development within these distances from main rivers/flood defences (where present).

8.5 Property Flood Resilience (PFR)

PFR includes a range of measures that can be installed around the perimeter of a building to reduce the risk of internal flooding. PFR can also be used within a building, to minimise the damage done if internal flooding still occurs. PFR aims to help households and businesses reduce the damage caused by flooding, helping to speed up recovery and reoccupation.

PFR encompasses two main elements:

- Resistance - Resistance measures are installed around the perimeter of a building. These measures aim to reduce the amount of water entering the building, reducing the damage caused internally. Examples include flood doors/barriers, automatic airbricks, and non-return valves.
- Resilient Adaptation (Recoverability) - Adaptions made within a property, which aim to reduce the damage caused if internal flooding still occurs.

The consideration of resistance measures and resilient adaptation should not be used to justify development in inappropriate locations. However, having applied planning policy there may be some instances where development is permitted in high flood risk areas where application of resistance and resilience measures may be required.

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

Further information and guidance on best practice can be found in the following locations:

- Department for Communities and Local Government [Improving the Flood Performance of New Buildings: Flood Resilient Construction \(gov.uk\)](#)
- [CIRIA Property Flood Resilience Code of Practice \(ciria.org\)](#)
- [EA Flood resilience construction of new buildings \(gov.uk\)](#)

9 Surface water management and SuDS

9.1 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are management practices which enable surface water to be drained in a more sustainable manner and to mimic the local natural drainage. The inclusion of SuDS within developments is an opportunity to enhance ecological and amenity value, and promote green infrastructure, incorporating above ground features into the development landscape strategy.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the pre-application or master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by the Council. This will assist with the delivery of well designed, appropriate, and effective SuDS. Applicants are also encouraged to engage with Thames Water and Southern Water to discuss their surface water proposals, especially where adoption is proposed.

9.2 Sources of SuDS guidance

9.2.1 C753 CIRIA SuDS Manual (2015)

[The C753 CIRIA SuDS Manual \(2015\) \(ciria.sharefile.com\)](http://ciria.sharefile.com) provides guidance on planning, design, construction, and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

9.2.2 National standards for SuDS

Previously SuDS guidance was developed to sit alongside the PPG and provide non-statutory standards as to the expected design and performance for SuDS.

As of June 2025, the [Defra National standards for sustainable drainage systems \(SuDS\) \(gov.uk\)](http://gov.uk) were brought in to comply with principles laid out in Section 9.4. Whilst remaining as a non-statutory specification, these now form a material consideration for LPAs when assessing planning applications. These standards aim to reflect and reinforce good practice and use of SuDS as detailed in Section 9.4, reflecting the four pillars of SuDS design.

The national standards contains two sets of standards. The first type (Standard 1) is known as the hierarchy standard and gives criteria for the prioritisation of final runoff destinations. The other standards (Standards 2-7) detail the minimum requirements of design criteria that surface water drainage systems should satisfy alongside how they are to be appropriately built, maintained, and operated.

9.2.3 Design and Construction Guidance (DCG)

The [Design and Construction Guidance \(DCG\) \(water.org.uk\)](http://water.org.uk), part of a new Codes for Adoption covering the adoption of new water and wastewater infrastructure by water companies, contains details of the water sector's approach to the adoption of SuDS.

9.2.4 Local SuDS guidance

9.2.4.1 Water. People. Places

The South East Seven is a collaboration of upper tier authorities that has produced a regional guide ([Water, People, Places](#)) for master planning sustainable drainage in developments. The Southern Lead Local Flood Authorities (including KCC) expect this guide to be used during initial planning and design process for all types of development in accordance with the National Planning Policy Framework (NPPF) and the Flood and Water Management Act (2010).

The guidance identifies specific site characteristics and constraints that can limit the effectiveness of SuDS including (but not limited to) existing flood conditions, runoff characteristics, high groundwater levels and Groundwater Source Protection Zones (GSPZ), topography, soil type, geology, contaminated land, existing infrastructure, land ownership, ecology and space constraints.

9.2.4.2 Kent County Council's Drainage and Planning Policy (adopted December 2019)

[KCC's Drainage and Planning Policy](#) sets out the requirements for sustainable drainage and how drainage strategies and surface water management provisions will be reviewed for SuDS schemes specific to Kent.

The policy provides the following requirements for developments on greenfield and previously developed sites:

- For developments on greenfield sites peak runoff rates from the 1 in 1-year (100% AEP) to the 1 in 100-year (1% AEP) rainfall events should be limited to the peak greenfield runoff rates for the same events.
- For developments on brownfield sites, the peak runoff rate must be as close as reasonably practicable to the greenfield runoff rate but should never exceed the existing rate of discharge prior to redevelopment. Unless it can be demonstrated to be reasonably impracticable, a 50% reduction in the peak runoff rate is expected.
- The drainage system must be designed to operate without flooding on any part of the site during any rainfall event up to (and including) a 1 in 30-year (3.3% AEP) rainfall event.
- The drainage system must also be designed to operate without flooding in any building up to (and including) a 1 in 100-year (1% AEP) plus climate change rainfall event, without exacerbating off-site flood risk.

- Exceedance flows that cannot be managed within the drainage system must be managed via exceedance flow routes that minimise the risks to people and property.
- Attenuation storage volumes provided by drainage areas must half empty within 24 hours to enable runoff from subsequent storms to be received. If the time taken to drain from full to empty exceeds 24 hours long duration events should be assessed to ensure drainage is not negatively impacted by inundation.

9.2.4.3 Kent County Council: Sustainable drainage – making it happen guidance

A [guidance document](#) which supports the both the KCC Drainage and Planning Policy statement and the Non-Statutory Technical Standards for Sustainable Drainage. The guidance consists of technical appendices advising on the construction and design of SuDS features. This should be used to assist in the preparation of drainage design for any new development in Kent. It sets out the procedures relating to the design and subsequent adoption of surface water drainage systems and sets out requirements that KCC may have both as a Highway Authority and LLFA.

9.2.4.4 Southern Water: Outline Guidance SuDS and Source Protection Zones

Southern Water have produced [guidance](#) which includes a hierarchy for water being considered for discharge into the companies network. It also includes recommendations for the implementation of SuDS.

[Guidance](#) is also provided for sustainable drainage in source protection zones. Southern Water will review each proposed SuDS design on a case-by-case basis, and the outcome of their review will be based on the hydrogeological sensitivity of the area and the treatment proposed prior to discharge. Southern Water recommend that a full hydrogeological risk assessment inform the design of all SuDS proposed in an SPZ1 and SPZ2.

9.3 Roles of the LLFA and LPA

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

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

In their respective roles as LLFA and LPA, KCC and SDC should:

- Promote the use of SuDS for the management of run off;

- Ensure their policies and decisions on applications support and compliment the building regulations on sustainable rainwater drainage, giving priority to infiltration over watercourses and then sewer conveyance;
- Incorporate favourable policies within development plans;
- Adopt policies for incorporating SuDS requirements into the Local Plan; and
- Encourage developers to utilise SuDS whenever practical, if necessary, through the use of appropriate planning conditions.

9.3.1 Schedule 3 of the Flood and Water Management Act (2010)

Currently the implementation of SuDS is driven through planning policy. Schedule 3 of the FWMA 2010 will provide a framework for the approval and adoption of drainage systems, a SuDS Approving Body (SAB) within Unitary and County Councils, and national standards on the design, construction, operation, and maintenance of SuDS for the lifetime of the development. Timescales for enactment of Schedule 3 by the Government are unknown.

9.4 Considerations for SuDS design

9.4.1 Four pillars of SuDS design

SuDS are designed to maximise the opportunities and benefits that can be secured from surface water management practices. SuDS design should consider the four pillars of SuDS (Figure 9-1): water quantity, water quality, amenity, and biodiversity.

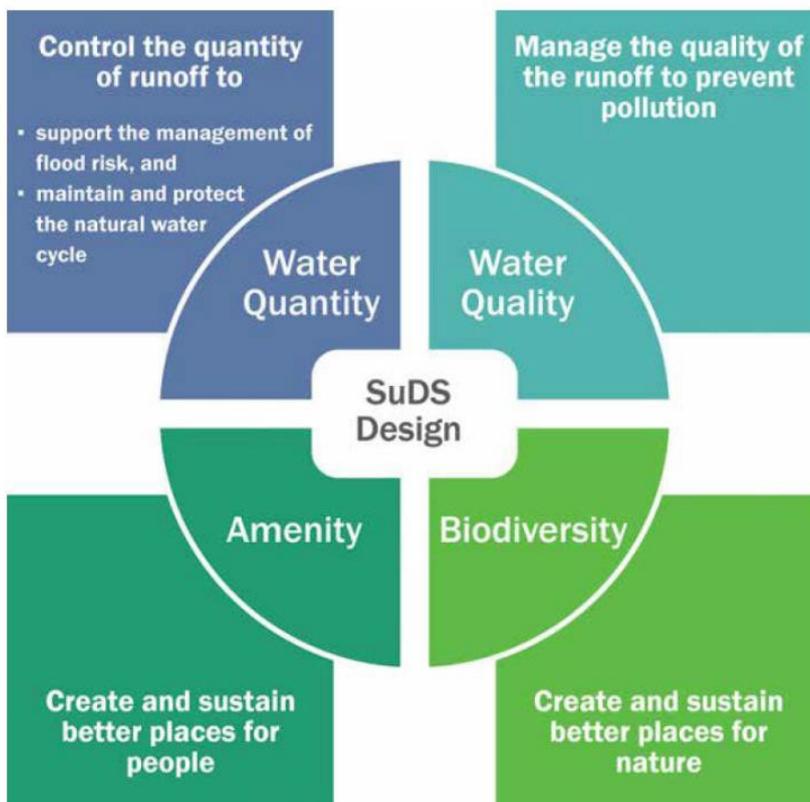


Figure 9-1: Four pillars of SuDS design (The SuDS Manual C753, 2015).

Given the flexible nature of SuDS, they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces, for example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures.

It is a requirement that 'applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity' (NPPF Paragraph 182).

It is important that SuDS are maintained for the lifetime for the development so that features can function as designed. Consideration should be given to enhancing SuDS to achieve biodiversity net gain.

9.4.2 Types of SuDS System

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage. Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds and wetlands. Many of which do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the EA and the Construction Industry Research and Information Association (CIRIA) e.g. [the CIRIA SuDS Manual C753](#) (2015).

9.4.3 SuDS management train

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 9-2).

The number of treatment stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater.

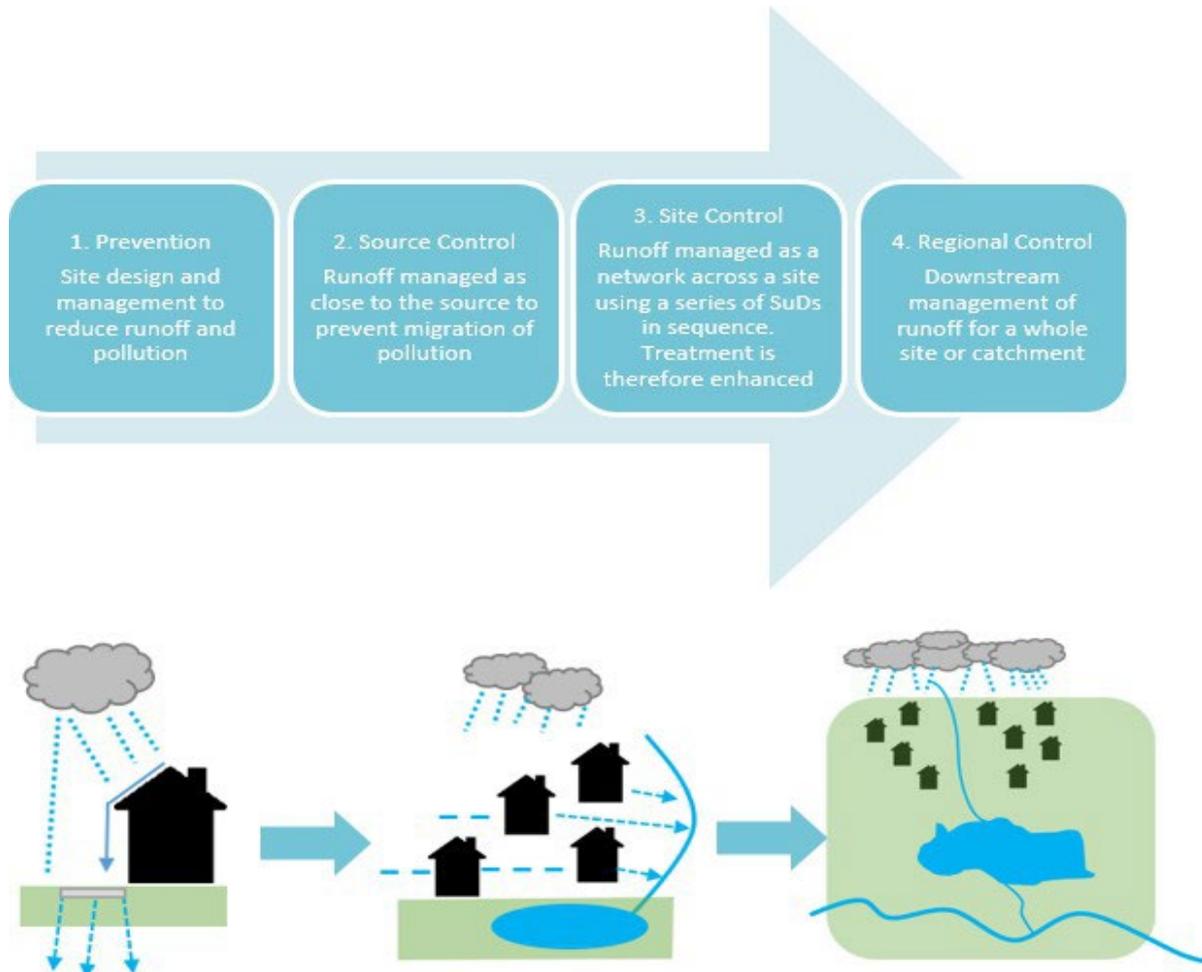


Figure 9-2: SuDS Management Train.

9.4.4 SuDS considerations

The design of a SuDS system will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline and detailed stages of SuDS design. Table 9-1 details some possible constraints and how they may be overcome.

Drainage from new development sites or redeveloped sites should be designed in line with the drainage hierarchy ([PPG: Flood Risk and Coastal Change Paragraph: 056 Reference ID: 7-056-20220825](#)) which initially promotes the use of infiltration prior to considering alternative drainage. For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is low enough to receive surface run-off waters. Most types of SuDS will be suitable in areas with permeable bedrock including features such as soakaways and infiltration basins. In areas with more impermeable geology, off-site discharge in accordance with the drainage hierarchy may be required to discharge surface water runoff from the site. In some cases, above-ground features such as attenuation

ponds may be practical with a managed outlet or discharge point. Infiltration should be considered with caution within areas of possible subsidence or sinkholes.

A site-specific infiltration test will need to be conducted early on as part of the design of the development in order to determine the impact of groundwater levels on the effectiveness of the drainage system. Groundwater monitoring is also encouraged and may be required in some locations.

Where sites lie within or close to Groundwater Source Protection Zones (GSPZs) (Section 9.5.2) or aquifers (Section 4.2.2), further restrictions may be applicable, and guidance should be sought from the LLFA and the EA.

Table 9-1: Example SuDS design constraints and possible solutions

Constraints	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable line or clay to prevent the egress of water into the feature. Additional, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow pumped systems can be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.

Constraints	Solution
Open space in floodplain zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Facts such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	The LPA should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for on-going maintenance over the development's lifetime.

9.5 Other surface water considerations

9.5.1 Groundwater Vulnerability Zones

The 2015 EA published groundwater vulnerability maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological, and soil properties within a one-kilometre grid square.

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

9.5.2 Groundwater Source Protection Zones (GSPZ)

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

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

Online mapping shows that much of the north of the district is covered by zone 3, while zone 2 covers parts of Sevenoaks Town, Swanley Village and Eynsford. Zone 1 covers small areas around Sevenoaks, Eynsford and Farningham. Figure 9-3 shows the locations of GSPZs within the Sevenoaks District.

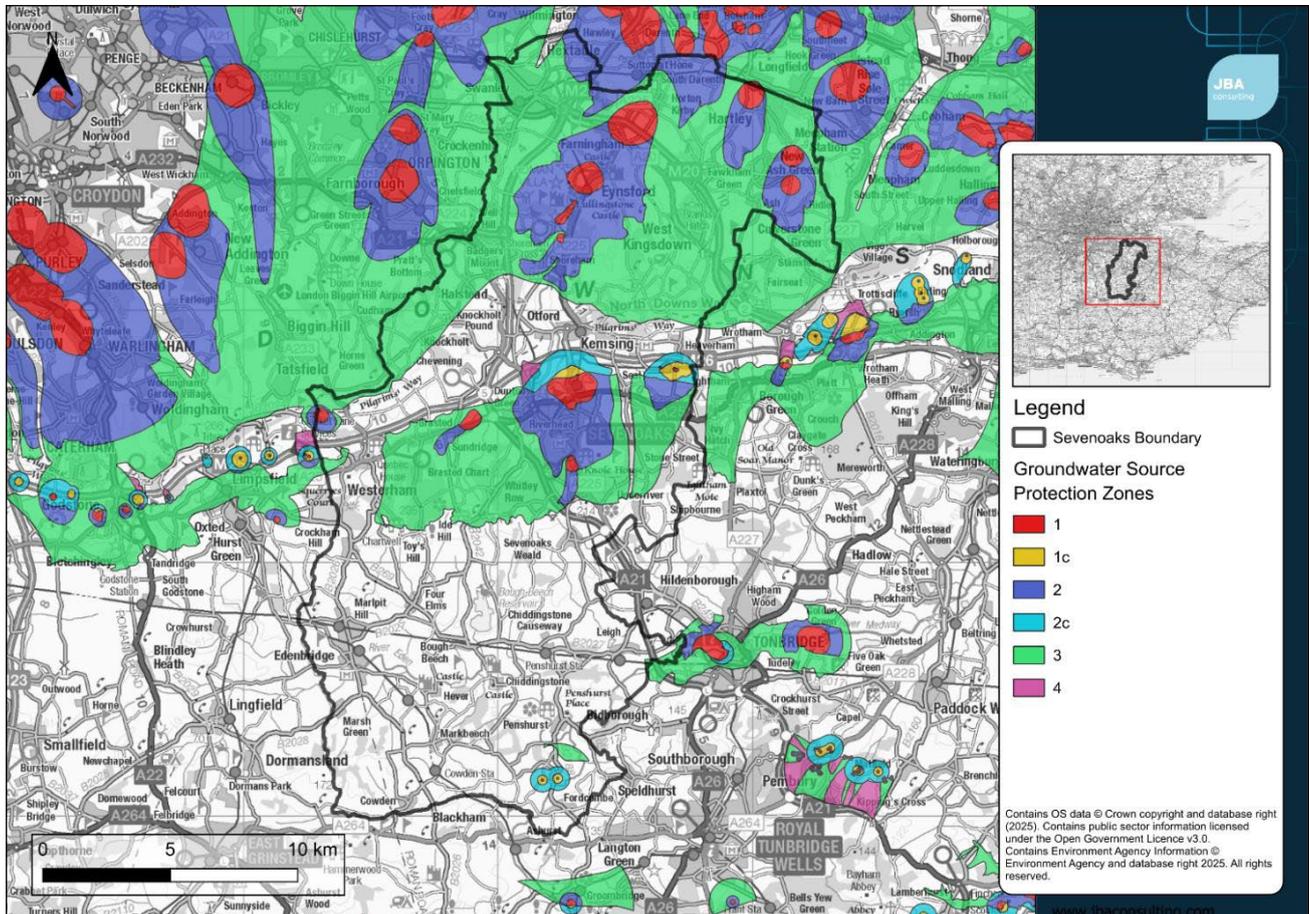


Figure 9-3: Groundwater Source Protection Zones in the Local Plan area.

Where a site is located in a GSPZ used for public water supply, applicants should engage with Southern Water and Thames Water to understand any concerns and any necessary mitigating measures to manage the risk of development to public water supply.

9.5.3 Nitrate Vulnerable Zones

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

NVZs can be viewed on the [EA's interactive mapping \(data.gov.uk\)](https://data.gov.uk).

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

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

- Drains into water that should not be identified as polluted.

The locations of the NVZs in the Local Plan Review area are shown in Figure 9-4.

Figure 9-4: Nitrate Vulnerability Zones in the Local Plan area.

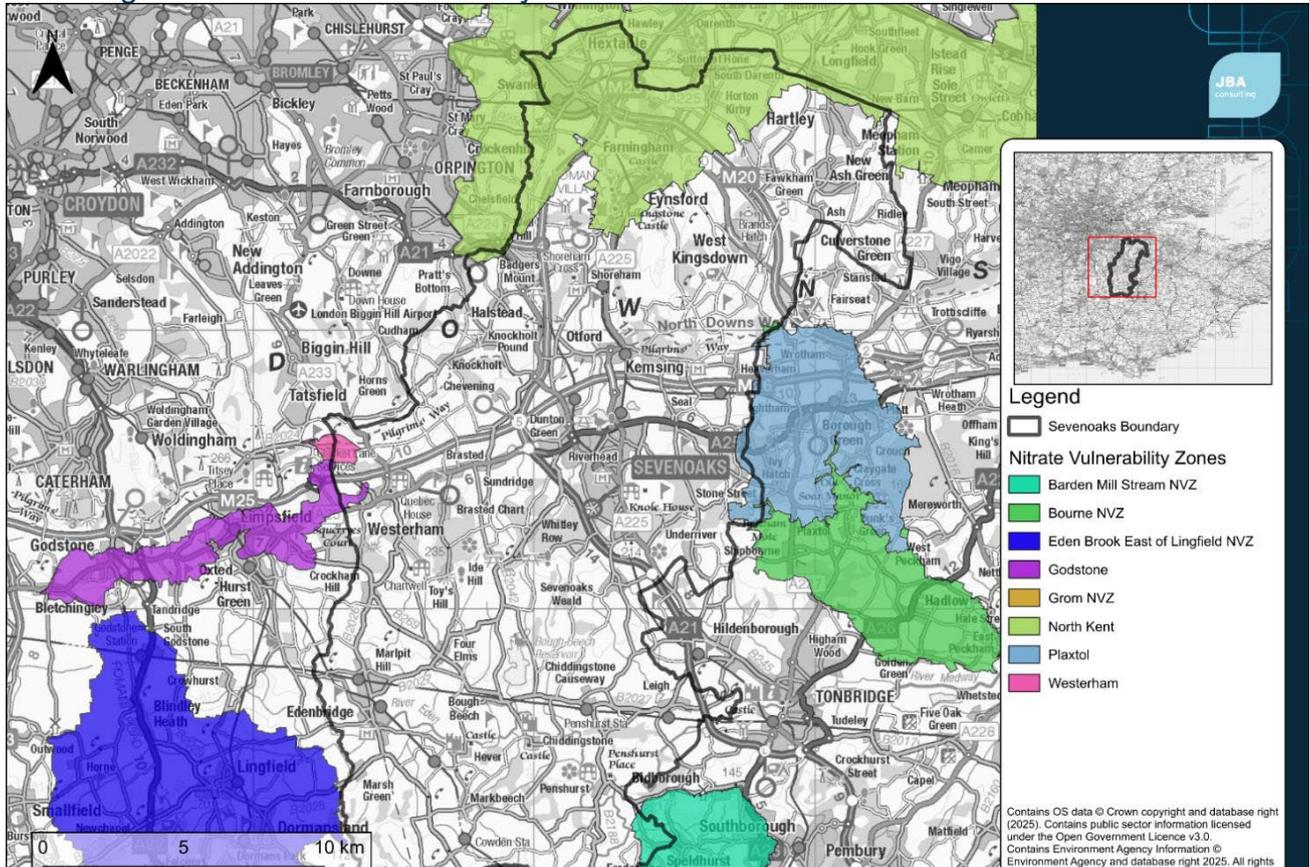


Figure 9-4: Nitrate Vulnerability Zones in the Local Plan area.

9.5.4 Critical Drainage Areas

Local Authorities can also choose to designate Critical Drainage Areas (CDAs) within their authority area; however, there are no CDAs currently designated within the district.

10 Flood warning and emergency planning

10.1 NPPF requirements

The NPPF [Flood Risk Vulnerability and Flood Zone "incompatibility" table](#) seek to avoid inappropriate development in areas at risk from all sources of flooding. It is essential that any development which will be required to remain operational during a flood event is located in the lowest flood risk zones to ensure that, in an emergency, operations are not impacted upon by flood water, or that such infrastructure is resistant to the effects of flooding such that it remains serviceable/operational during 'upper end' events, as defined in the [Environment Agency's Climate Change allowances](#).

The outputs of this SFRA should be compared and reviewed against any emergency plans and continuity arrangements. This includes the nominated rest and reception centres (and prospective ones), so that evacuees are outside of the high-risk Flood Zones and will be safe during a flood event.

10.2 Emergency planning

The Civil Contingencies Act 2004 lists Local Authorities, the EA and emergency services as Category 1 responders, responsible for reducing, controlling, and mitigating the effects of emergencies in both response and recovery phases.

The 2024 NPPF (Paragraph 181) requires site-level FRAs to demonstrate that "any residual risk can be safely managed; and safe access and escape routes are included where appropriate, as part of an agreed emergency plan."

In accordance with the NPPF, SFRAs, PFRAs and SWMPs can be used in the preparation and execution of a flood emergency plan as they can indicate areas that may be at risk of flooding. These can be provided as part of an FRA or as a separate document. Decisions regarding whether an Emergency Plan is required sits with the LPA, with advice from their Emergency Planning Teams, the EA and LLFA.

According to the PPG flood risk and coastal change guidance, an emergency plan is needed wherever emergency flood response is an important component of making a development safe; this includes the free movement of people during a 'design flood' and potential evacuation during an extreme flood.

Emergency plans are essential for any site with transient occupancy in areas at risk of flooding, such as holiday accommodation, hotels, caravan, and camping sites (PPG: Flood risk and coastal change paragraph 043).

Emergency Plans should consider:

- The type of flood risk present, and the extent to which advance warning can be given in a flood event.
- The number of people that would require evacuation from the area potentially at risk.

- The vulnerability of site occupants.
- The impact of the flooding on essential services e.g., electricity, gas, telecommunications, water supply and sewerage.
- Safe access and escape routes for users and emergency services (Section 10.2.1).

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

- [The National Planning Policy Guidance \(gov.uk\)](#)
- [2004 Civil Contingencies Act \(legislation.gov.uk\)](#)
- [Defra \(2014\) National Flood Emergency Framework for England \(gov.uk\)](#)
- [FloodRe \(floodre.co.uk\)](#)
- The EA and Defra's [Standing Advice for FRAs \(gov.uk\)](#)
- EA's ['How to plan ahead for flooding' \(gov.uk\)](#)
- [Sign up for Flood Warnings with the EA \(gov.uk\)](#)
- [The National Flood Forum \(nationalfloodforum.org.uk\)](#)
- ['Prepare for flooding' \(gov.uk\)](#)
- [ADEPT Flood Risk Plans for new development \(adeptnet.org.uk\)](#)
- [Environment Agency \(2012\) Flooding – minimising the risk, flood plan guidance for communities and groups](#)
- [Environment Agency Personal flood plans \(2017\)](#)

10.2.1 Safe access and escape routes

Safe access and escape routes will need to be demonstrated during the design flood event. Access requirements are set out in the [PPG: Flood Risk and Coastal Change \(gov.uk\)](#) Paragraph: 047 Reference ID: 7-047-20220825.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the LLFA, and the EA. Site and plot specific velocity and depth of flows should be assessed against standard hazard criteria to ensure safe access and escape routes can be achieved.

10.3 Local arrangements for managing flood risk

[Kent County Council's Kent Resilience Forum \(KRF\)](#) is one of a number of Local Resilience Forums (LRFs) that have been set up across England. The overall aim of an LRF is to ensure that the various agencies and organisations plan and subsequently work together so that responses to emergencies are coordinated appropriately. The KRF is made up of a number of different agencies and organisations that work together across a range of areas including planning for emergencies.

[Kent County Council's Flooding and drainage](#) page provides information on how to report flooding, as well as how to receive help after a flood.

Kent County Council's LFRMS sets out strategies for managing local flood risk within the county between 2024 and 2034.

10.3.1 Kent County Council Flood Response Plan

The Kent County Council Flood Response Plan (October 2023) sets out the principles that govern the Kent County Council's response to a significant flooding event within their local authority administrative area. The Plan was produced to meet the requirements of the Civil Contingencies Act 2004 (updated 2023), and is built upon the existence and maintenance by Category 1 and 2 Responders of their own plans for response to flooding.

Category 1 Responders for Sevenoaks are:

- Kent County Council
- Sevenoaks District Council
- Kent Police
- Kent Fire and Rescue Service
- South East Coast Ambulance Service
- Environment Agency

The Category 2 Responders for Sevenoaks are utility and transport providers, such as Southern Water, Thames Water, Network Rail etc.

The response plan provides information on Kent County Council's actions, roles, and responsibility in response to a flood emergency in their administrative area.

10.4 Flood alerts and flood warnings

The EA is the lead organisation for providing warnings of river flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zones 2 and 3. The EA [Sign up for Flood Warnings \(gov.uk\)](https://www.gov.uk/sign-up-for-flood-warnings) page provides information on how to sign up for these warnings.

There are currently 4 Flood Alert Areas (FAA) and 7 Flood Warning Areas (FWAs) covering the district.

Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that 'flooding is possible', and therefore FAAs usually cover the majority of main river reaches.

Flood Warnings are issued to designated FWAs (i.e., properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that 'flooding is expected'.

The FAAs and FWAs are included in Appendix D8.

11 Cumulative Impact Assessment

11.1 Introduction

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume from any source, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. Similarly, the effect of the loss of surface water flow paths/exceedance paths from sewers, surface water ponding and infiltration can also give rise to cumulative effects and potentially exacerbate flood risk. There are also risks of development causing modified flow regimes from sites creating an alignment in peak flows in downstream watercourses and resulting in greater flood risk as a result of the development.

All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments comply with the latest guidance and legislation relating to flood risk and sustainable drainage, and appropriate consideration is given to flow paths and storage proposals should normally not increase flood risk downstream.

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

There is currently no national guidance available for assessing the cumulative impacts of development. The CIA provide a relative assessment of the catchments within Sevenoaks and are not comparable across other boroughs/districts.

11.1.1 Approach and methodology

The approach is based on providing an assessment of catchments where the allocation of more than one site could result in effects that increase the flood risk to third parties. At a strategic level this involves comparison of catchments, to assess the quantum of proposed development and the sensitivity of the catchment to changes in flood risk. Historic flooding incidents are also included in the assessment, as these are an indicator of the actual sensitivity of locations within a catchment to flood events.

The methodology deploys a range of metrics to assess the potential cumulative impacts, which provide a balance between predicted and observed flooding data recorded by Kent County Council and the Environment Agency. In addition, it was considered important to identify those catchments where an increase in flows (as a result of development) would potentially have the greatest impact upon downstream flood risk.

11.1.2 Datasets

Catchments

The WFD river catchments defined in the River Basin Management Plans and LIDAR data were used to divide Sevenoaks District's boundary and surrounding local authorities into manageable areas on which to base a cumulative impact assessment. The surrounding local authorities and LPAs included in the CIA are:

- London Borough of Bexley
- London Borough of Bromley
- Dartford
- Gravesham
- Mid Sussex
- Tandridge
- Tonbridge and Malling
- Tunbridge Wells
- Wealden

The catchments used in this CIA are displayed in Figure 11-1.

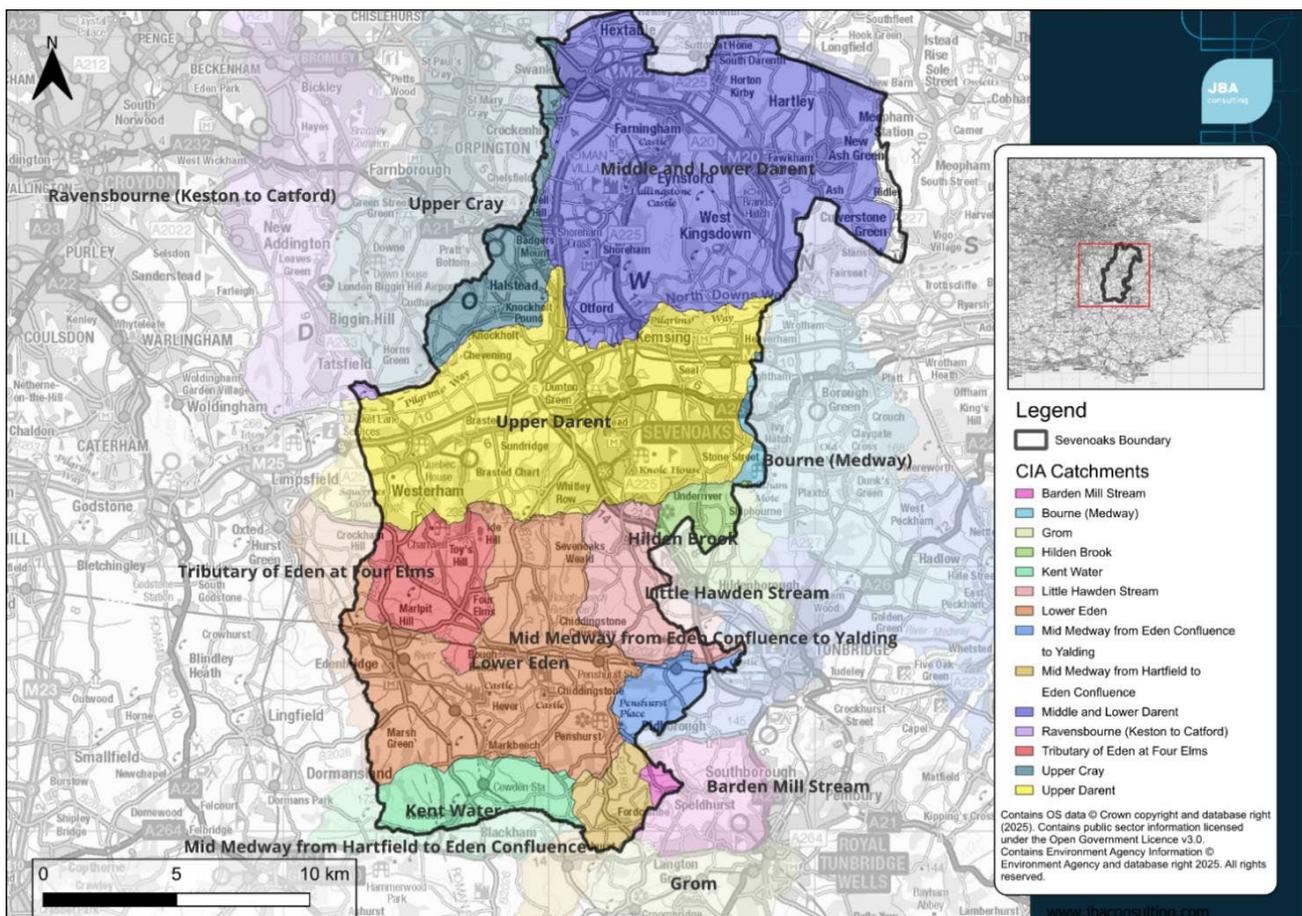


Figure 11-1: Catchments within the Cumulative Impact Assessment.

Current developed area

OS Open Zoomstack data buildings layer was used to assess the current developed area in each catchment.

Proposed level of growth

To understand areas of Sevenoaks District boundary that are likely to experience the greatest pressure for future growth, all potential future development sites received for consideration have been analysed. The sites allocated through the Local Plans of neighbouring authorities have also been taken into account within the proposed level of growth for each catchment.

This allowed the calculation of the overall increase in development from the existing scenario to identify catchments likely to be under the greatest pressure from development. The context for this being that in circumstances where the proportion of proposed new development is greater, then it is more likely to give rise to cumulative effects.

It should be noted that it was assumed that all sites will be developed, and that the entire site footprint would be developed.

Historic Flood Risk

A historic flood risk score was derived for each catchment within the study area using the total area of 'buildings' from the OS Open Zoomstack data within the Environment Agency's historic flood map extent for each catchment.

Properties sensitive to increased flood risk

It is important to understand which catchments are most sensitive to increases in flood flows which may theoretically be caused by new development. Predicted flood risk was assessed using the following datasets:

- Total number properties within the merged 1% AEP surface water flooding extent and Flood Zone 3a for each catchment.
- Total number properties within the merged 0.1% AEP surface water flooding extent and Flood Zone 2 for each catchment.

The difference in the number properties at risk in these two datasets has then been used as an indicator to identify which catchments are more sensitive to increases in flood flows.

11.1.3 Ranking of catchments

To identify which catchments are more sensitive to cumulative impacts, each catchment was given a ranking for each of the three metrics (proposed level of growth, historic flood risk and properties sensitive to growth). These rankings were then combined to give an overall ranking which was divided into three categories - high, medium, and low according to how sensitive each catchment is to cumulative impacts relative to one another.

11.2 Results

Mapping showing the result of the Cumulative Impact Assessment is shown in Figure 11-2.

The CIA has identified the following catchments as high risk:

- Lower Eden
- Mid Medway from Eden Confluence to Yalding
- Middle and Lower Darent
- Upper Darent

Specific recommendations for catchments identified as high risk, alongside broadscale recommendations applicable across the whole district, are set out in Section 13.1.6.

The full CIA can be found in Appendix F.

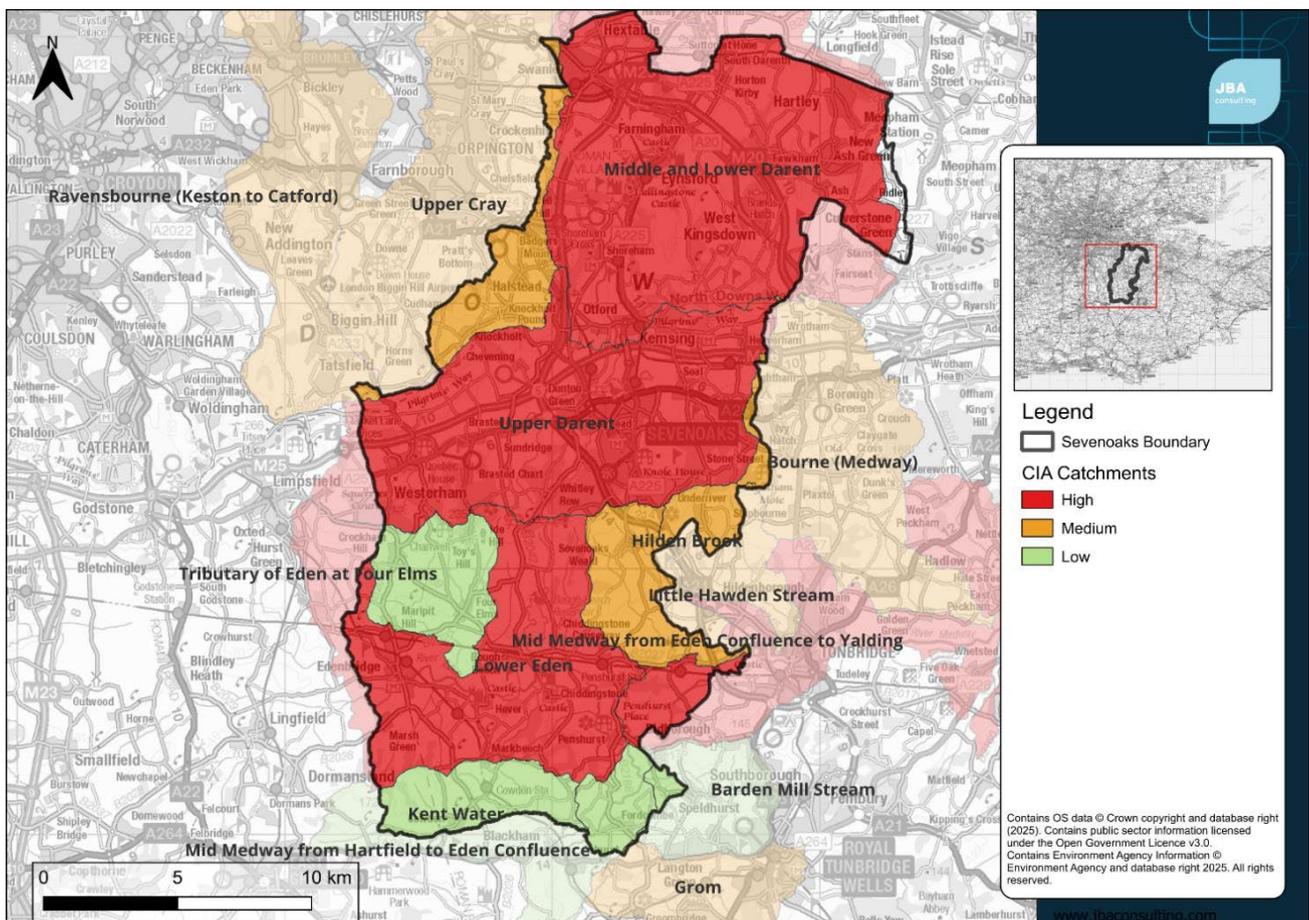


Figure 11-2: Result of the Cumulative Impact Assessment.

12 Strategic flood risk solutions

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the district. Section 11 considers the cumulative impacts of development across the district and the catchments which are most sensitive to these impacts, and as such where strategic flood risk solutions may be most beneficial.

Where possible developments should seek to help reduce flood risk in the wider area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies.

It is important that the ability to deliver strategic solutions in the future is not compromised by the location of proposed development. When assessing the extent and location of proposed development, consideration should be given to the requirement to secure land for flood risk management measures that provide wider benefits.

12.1 Partnership working

Flood risk to an area or development can often be attributed to multiple different sources, including fluvial, surface water and/or groundwater, which can become intertwined. Where complex flood risk issues are highlighted, it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

12.1.1 Catchment Based Approach

The [Catchment Based Approach \(CaBA\) \(catchmentbasedapproach.org\)](http://catchmentbasedapproach.org) was introduced by the Government to establish catchment partnerships throughout England to jointly deliver improved water quality and reduce flood risk, directly supporting achievement of many of the targets set out within the Government's 25-year Environment Plan. CaBA partnerships are actively working in all 100+ river catchments across England and cross-border with Wales.

[The South East Rivers Trust \(SERT\)](#) co-hosts catchment partnerships for the Darent and Cray (with North West Kent Countryside Partnership) and the River Medway (with Medway Valley and Kent High Weald Countryside Partnerships).

The Catchment Based Approach to managing our rivers brings together businesses, local authorities, regulators, water companies, community groups and environmental organisations – such as SERT and their co-hosts.

The SERT catchment partnerships aim to improve a river's natural function not only to help wildlife thrive but to make them spaces where people can enjoy as amenity spaces.

12.1.2 Middle Medway Strategy

The Middle Medway Strategy (MMS) was completed in August 2005 and investigated flood risk management options for the Middle Medway catchment through modelling, economic

and strategic environment assessment. The strategy was intended to guide those involved in flood defence and planning to present a business case to justify future works and investment in flood risk management. The MMS was revised in 2010 to set out updated strategic options to manage flood risk from the River Medway, the River Beult and the River Teise. The options outlined included enlarging the capacity of the Leigh FSA from 5.5 million cubic metres to 8.8 million cubic metres to improve the standard of protection for properties along the fluvial River Medway and within Tonbridge in the neighbouring authority.

Along with increasing the FSA in the Medway Catchment, the River Medway CFMP noted that other outcomes of the MMS should be implemented, such as producing feasibility studies for further storage options at upstream locations to benefit locations on or around the confluence of the Medway and its tributaries. A number of options have been considered to reduce flood risk to Edenbridge, none have been proved to be technically feasible. Therefore, the main option is to continue with maintenance of existing assets.

12.2 Biodiversity Net Gain

Biodiversity Net Gain (BNG) is a strategy to develop land and contribute to the recovery of nature. It is making sure the habitat for wildlife is in a better state than it was before development. BNG has been applicable since November 2023 for developments in the Town and Country Planning Act 1990, unless exempt, and has been applicable to small sites since April 2024. Further information is available on the [Government BNG webpage \(gov.uk\)](https://www.gov.uk/government/bng). Strategic flood risk solutions can help developments achieve BNG requirements.

12.3 Natural Flood Management

12.3.1 Introduction to NFM

Development can provide opportunities to work with natural processes to help reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. This is known as Natural Flood Management (NFM), a process whereby action is taken to mitigate flood risk by protecting, restoring and emulating natural processes. This approach aims to reduce flow volumes and delay the arrival of peak flood flow downstream.

Techniques and measures, which could be applied in the district include:

- Creation of offline storage areas.
- Re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river).
- Targeted woodland planting.
- Reconnection and restoration of functional floodplains (Section 12.4).
- Restoration of rivers and removal of redundant structures, i.e. weirs and sluices no longer used or needed (Section 12.5).
- Installation or retainment of large woody material in river channels.
- Improvements in management of soil and land use.

- Creation of rural and urban SuDS.

To maximise the benefits of NFM, it is important that land which is likely to be needed for NFM is protected by safeguarding land for future flood risk management infrastructure. This is particularly important for infrastructure that reduces the risk of flooding to large amounts of existing development, or where options for managing risk in other ways are limited to achieve multiple benefits for flood risk and the environment.

It is important to recognise the value of maintenance or restoration of natural riparian zones, such as grasslands, which protect the soils from erosion and 'natural' meadows which can tolerate flood inundation. The use of green infrastructure throughout river corridors can also play a vital role in enhancing the river environment as well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

12.3.2 Working with natural processes

The EA published their updated evidence base in February 2025 for [Working with natural processes to reduce flood risk 2024 \(gov.uk\)](#) to support the implementation of NFM, with maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them.

The Southeast Rivers Trust are currently working on the [Upper River Darent Restoration](#) project, which aims to bring a large section of the River Darent in its upper reaches back to life. So far, two weirs along the River Darent have been removed, including one located in Brasted. In addition to no longer impeding the passage of fish, the removal of the weir has resulted in the uniform and sluggish flow upstream being transformed into a river with numerous flow types with increased energy, which will provide great habitat for resident brown trout.

Furthermore, working closely with SES Water, Catchment Sensitive Farming (CSF) and The Farming and Wildlife Advisory Group (FWAG), the Southeast Rivers Trust is running the [River Eden water quality project](#). This project aims to better understand how farmers manage their land, gather their views to shape future work in the catchment to prevent run-off of pesticides and nutrients, and offer guidance and support on farming practices for healthy rivers and to improve wildlife.

12.3.3 Ongoing NFM schemes

There are no ongoing NFM schemes in the study area.

Websites that provide further information about ongoing NFM schemes and community works include [The Flood Hub \(thefloodhub.co.uk\)](#) and the [Rivers Trust NFM National Map \(theriverstrust.hub.arcgis.com\)](#).

12.4 Catchment and floodplain restoration

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

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

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffering areas around watercourses to provide an opportunity to restore parts of the floodplain.
- Removing redundant structures to reconnect the river and the floodplain.
- Applying the sequential approach to avoid new development within the floodplain.

12.5 Structure removal and/or modification (e.g. weirs)

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

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

In the case of weirs, whilst weir removal should be investigated in the first instance, in some cases it may be necessary to modify a weir rather than remove it. For example, by lowering the weir crest level or adding a fish pass. This will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

Developers should open up existing culverts where possible and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

12.6 Bank stabilisation

Bank erosion should be avoided, and landowners are encouraged to avoid using machinery and vehicles close to or within the watercourse unless in the circumstances where machinery and vehicles are required for watercourse maintenance such as desilting. Care should be taken not to destabilise the banks.

There are several techniques that can be employed to restrict the erosion of the banks of a watercourse. In an area where bankside erosion is particularly bad and/or vegetation is

unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spiling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils. Other approaches include the planting of brash or small trees, large wood, large trees and root wads.

12.7 Green infrastructure

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

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

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

13 Summary, recommendations, and next steps

13.1 Recommendations from SFRA findings

13.1.1 Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFA for surface water management. The future enactment of Schedule 3 of the FWMA means that there will be mandatory standards for delivery and adoption of SuDS in new developments, however, this has not yet been enacted.

Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications. SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure, and the enhancement of historical features.

SuDS must be designed appropriately for the area. Large parts of the district are underlain by a combination of mudstone and sandstone geology, which is likely to have variable permeability. Infiltration testing must be undertaken to determine whether infiltration rates are suitable for the use of infiltration SuDS. Where sites lie within or close to GSPZs or aquifers, there may be restrictions on infiltration SuDS and guidance should be sought from the LLFA and the EA.

Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase. Applicants will need to demonstrate a holistic and co-ordinated approach to both foul and surface water drainage and the management of flood risk.

SuDS should be designed based on the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.

SuDS should be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

13.1.2 Residual risk

Residual risk is the risk that remains after mitigation measures are considered. All residual risks to a site should be considered during the planning stage as part of site-specific FRAs.

There is a significant presence of natural high ground assets within the district, with flood walls also located along the River Darent and River Eden. Any development in areas protected by these flood defences should consider the residual risk of overtopping or breach of these defences.

Other residual risks that may be applicable to development sites within the district include potential breaches or overtopping of the reservoirs, and blockages or failure of infrastructure, such as culverts.

13.1.3 Safe access and escape routes

Safe access and escape routes will need to be demonstrated at all development sites.

If raised access routes are required, an assessment must be made to check this will not displace floodwater elsewhere.

Emergency vehicular access should be possible during times of flood. If at risk, then an assessment should be made to detail the flood duration, depth, velocity, and flood hazard rating in the 1% AEP plus climate change flood event, in line with FD2320.

Where development is located behind, or in an area benefitting from defences, consideration should be given to the potential safety of the development, FFLs and for safe access and escape routes in the event of rapid inundation of water due to a defence breach with little warning.

13.1.4 River restoration and habitat improvement

Developments should be used as an opportunity to enhance the existing river corridor. Natural drainage features should be maintained, and opportunities identified for river restoration/enhancement to make space for water.

Opportunities should be identified to maintain and enhance permeable surfaces and greenspaces to help reduce surface water runoff whilst promoting other benefits, including biodiversity and wellbeing.

There should be no built development within 8m from the top of a watercourse or main river for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

Culverting of open watercourses should be avoided except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide (C689) and to restrict development over culverts.

[Countryside Stewardship schemes \(gov.uk\)](https://www.gov.uk/government/collections/countryside-stewardship-schemes) should be promoted to help prevent soil loss and reduce runoff from agricultural land whilst also providing biodiversity and habitat improvements.

13.1.5 Emergency planning and flood awareness

Improved emergency planning and flood awareness provide an opportunity to mitigate against flood risk. The following recommendations should be considered:

- The Council should work with emergency planning colleagues through the Kent Local Resilience Forum to identify areas at highest risk and locate most

vulnerable receptors. For major developments, robust emergency (evacuation) plans should be produced and implemented.

- Increased flood awareness and sign-up to the [EA Flood Warnings \(gov.uk\)](https://www.gov.uk/east-of-england-flood-warnings) should be promoted across the district.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.

13.1.6 Recommendations from the CIA

The cumulative impact of development should be considered at the planning application and development design stages and the appropriate mitigation measures undertaken to ensure flood risk is not exacerbated, and in many cases the development should be used to improve the flood risk to the surrounding area.

13.1.7 Broadscale recommendations

The broadscale cumulative impact assessment for Sevenoaks has highlighted the potential for development to have a cumulative impact on flood risk. Catchments have been identified as high, medium or low risk.

New development can potentially increase flood risk and thus the need for incremental action and betterment in flood risk terms across all of Sevenoaks is appropriate.

The following policy recommendations therefore apply to all catchments within the study area:

- SDC should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the District to other local authorities in order to minimise cross boundary issues of cumulative impacts from development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance and management on all development sites.
- Where appropriate, the opportunity for Natural Flood Management in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should be opposed, and day-lighting existing culverts promoted through new developments.
- Where applicable, development proposals should undertake a site-specific Flood Risk Assessment. Site-specific FRAs should explore opportunities to provide wider community flood risk benefit through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.

- LPAs should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features.

13.1.7.1 Recommendations for developments in high-risk catchments

- LLFAs and LPAs should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features. [The Working with Natural Processes mapping shows](#) there are opportunities for floodplain reconnection, riparian woodland and additional floodplain woodland in high risk catchments. The mapping also indicates locations where there are potential for runoff attenuation features to reduce flows. These areas should all be safeguarded.
- The LPA should explore the potential for development in High-Risk catchments to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.
- Within any FRAs consideration should be given to the potential cumulative effects of all proposed development and how this affects sensitive receptors.
- The LLFA and LPA should consult with Local Non-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk.

13.2 Requirements for a Level 2 SFRA

Following the application of the Sequential Test, where sites cannot be appropriately accommodated in low-risk areas, the Council will apply the NPPF's Exception Test. In these circumstances, a Level 2 SFRA may be required, to assess in more detail the nature and implications of the flood characteristics.

As part of this Level 1 SFRA, an initial site screening exercise using site boundaries and flood risk data has been undertaken for the Council to help inform the application of the Sequential Test and subsequent potential requirement for a Level 2 SFRA. This indicates that:

- 11 sites are within Flood Zone 3b
- 14 sites are within Flood Zone 3a
- 19 sites are within Flood Zone 2

13.3 SFRA report recommendations

13.3.1 Updates to SFRA

SFRAs are high-level strategic documents and, as such, do not go into detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation.

Over time, new information will become available to inform planning decisions. When using the SFRA to prepare FRAs it is important to check that the most up to date information is used.

The EA regularly reviews its hydrology, hydraulic modelling, and flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

The EA published the new national flood risk mapping (NaFRA2) in early 2025 but further updates and additional datasets are expected later in 2026.

Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by RMAs.

Appendices

A Data Sources used in this SFRA

B Guide for using available flood risk data in applying the Sequential Test

C Site Screening

D Mapping

D.1 SFRA Flood Zones

D.2 RoFSW Extents

D.3 Climate Change Flood Zones

D.4 RoFSW + Climate Change Extents

D.5 JBA Groundwater Flood Risk

D.6 Reservoir Flood Risk

D.7 Flood Defences

D.8 FWA's & FAA's

E Southern Water and Thames Water DWMP review

F Cumulative Impact Assessment



Our Offices

- Bristol
- Coleshill
- Cork
- Doncaster
- Dublin
- Edinburgh
- Exeter
- Glasgow
- Haywards Heath
- Leeds
- Limerick
- Newcastle
- Newport
- Peterborough
- Portsmouth
- Saltaire
- Skipton
- Tadcaster
- Thirsk
- Wallingford
- Warrington



Registered Office

1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0) 1756 799919
info@jbaconsulting.com
www.jbaconsulting.com

Follow us on

Jeremy Benn
Associates Limited
Registered in
England
3246693

JBA Group Ltd is
certified to
ISO 9001:2015
ISO 14001:2015
ISO 27001:2022
ISO 45001:2018

