

Sevenoaks Level 2 Strategic Flood Risk Assessment

January 2025

Prepared for:
Sevenoaks District Council

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Document Status

Issue date	7 th January 2025
Issued to	Carlyn Kan, Sevenoaks District Council
BIM reference	BIM-JBAU-XX-XX-RP-Z-0001-Sevenoaks_L2_SFRA
Revision	S3-P03

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Contract

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JBA Project Code	2023s1135

This report describes work commissioned by Sevenoaks District Council by an instruction dated 17th August 2023. The Client's representative for the contract was Carlyn Kan of Sevenoaks District Council. Grace Sheppard and Erica Godsland of JBA Consulting carried out this work.

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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 January and September in 2024, and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

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.

Acknowledgements

We would like to acknowledge Sevenoaks District Council, Kent County Council, the Environment Agency, Southern Water and Thames Water for their input into the SFRA.

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Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
AEP	Annual Exceedance Probability

AIMS	Asset Information Management System
BGS	British Geological Survey
CC	Climate Change
CFMP	Catchment Flood Management Plan
CIA	Cumulative Impact Assessment
DEFRA Affairs (formerly MAFF)	Department of the Environment, Food and Rural
EA	Environment Agency
FRA	Flood Risk Assessment
FRISM analysis software]	Flood Risk Metrics [JBA Consultings impact
GIS	Geographical Information System
ID	Identifier
KCC	Kent County Council
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
PPG	Planning Policy Guidance
SDC	Sevenoaks District Council
SFRA	Strategic Flood Risk Assessment
TUFLOW model)	Two-dimensional Unsteady FLOW (a hydraulic

Executive Summary

Introduction and Context

This Level 2 Strategic Flood Risk Assessment (SFRA) document was prepared with the purpose of providing part of the evidence base for the Local Plan for Sevenoaks District Council. It follows on from the Sevenoaks Level 1 SFRA produced in 2024, and should be read in conjunction.

The primary purpose of the Level 2 SFRA is to provide an appropriate understanding of the level of actual risk affecting development included in the Local Plan Review. The assessment takes into account all sources of flooding and considers other factors affecting flood risk such as residual risk. The information provided as part of the Level 2 SFRA enables Sevenoaks District Council to apply the exception test to sites in accordance with the National Planning Policy Framework.

SFRA Objectives

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

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

Level 2 SFRA Outputs

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

- An assessment of all sources of flooding including fluvial flooding, surface water flooding, groundwater flooding, and the potential increase in fluvial and surface water flood risk due to climate change.
- Reporting on conditions of flood defence infrastructure, where applicable.
- An assessment of existing flood warning and emergency planning procedures, including an assessment of safe access and egress during an extreme event.
- Advice and recommendations on the likely applicability of sustainable drainage systems for managing surface water runoff.
- Advice on whether the sites are likely to pass the second part of the Exception Test with regards to flood risk and on the requirements for a site-specific FRA.

Summary of the Level 2 SFRA

Sevenoaks District Council provided 28 sites for further assessment. These sites were screened against flood risk datasets to assess the potential viability and provide flood risk recommendations.

Summary tables were prepared for all 28 sites and multiple sources of flood risk were assessed. Maps of extent, depth and velocity of flooding as well as hazard mapping have been produced where modelled outputs were available. The Risk of Flooding from Surface Water (RoFSW) mapping has also been used as an indication of flood risk for smaller watercourses where detailed modelling does not exist.

Each table sets out the National Planning Policy Framework (NPPF) requirements for the site, as well as guidance for site-specific FRAs. A broadscale assessment of suitable SuDS options has been provided to give an indication of potential constraints to surface water drainage and where additional information may be required.

1 Introduction

1.1 Level 2 SFRA Study Area

Sevenoaks District covers an area of approximately 370km² in West Kent, southeast England, with an estimated population of 120,000¹. The district comprises of four town councils and 27 parish councils. The area encompasses urban areas including Sevenoaks, Edenbridge and Swanley, as well as rural villages and agricultural land.

Sevenoaks District contains a number of Environment Agency Main Rivers including the River Darent, River Eden and River Medway.

1.2 Purpose of the Strategic Flood Risk Assessment

Paragraph 171 of the National Planning Policy Framework (NPPF) states that strategic policies should be informed by a Strategic Flood Risk Assessment (SFRA) 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 (EA) and other relevant flood risk management authorities, such as Lead Local Flood Authorities (LLFAs).

The Planning Practice Guidance (PPG) (2022) advocates a staged approach to risk assessment and identifies two levels of SFRA:

- Level 1 SFRA: where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test. Level 1 is completed first to understand whether a Level 2 assessment is required.
- Level 2 SFRA: where land outside Flood Zones 2 and 3 cannot accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This SFRA report fulfils the requirements for a Level 2 assessment of strategic sites identified for potential allocation within the Sevenoaks District and has been prepared in accordance with the NPPF (2024) and PPG (2022).

This report should be read alongside the Sevenoaks Level 1 SFRA (2024) and builds upon the information presented within the Level 1 SFRA.

¹ Office for National Statistics (November 2021) Ward-level population estimates (Experimental Statistics) (Mid 2020)

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1.3 Local Plan

The [Core Strategy](#) (2011) and [Allocations and Development Management Plan](#) (ADMP 2015) make up the development plan for Sevenoaks District. The Core Strategy 'draws together the objectives of a wide range of plans, programmes and strategies and provides the overarching principles that will deliver the essential development needs of the District up to 2026'.

Sevenoaks District Council is currently preparing a new Local Plan for Sevenoaks District ([Plan 2040](#)). The Council consulted on a second Regulation 18 version of the emerging Local Plan which ended in January 2024.

1.4 Kent County Council Local Flood Risk Management Strategy (LFRMS) 2017-2023

The Flood and Water Management Act (2010) makes county and unitary authorities lead local flood authorities with a strategic overview role for local flooding in their area.

Therefore, Kent County Council as LLFA, has responsibility to deliver a Local Flood Risk Management Strategy, to set out how flood risk will be managed in the county.

The [Kent County Council LFRMS](#) highlights the main sources of flood risk in Kent and how this risk will be managed. The aims of the LFRMS are as follows:

- To improve the safety and wellbeing of residents in Kent, as well as the economy, through appropriate flood risk management;
- To ensure that people work together to understand and deliver appropriate flood risk management; and
- To contribute to sustainable development, regeneration, and land management in Kent through the promotion of sustainable flood risk management strategies.

1.5 Sevenoaks Stage 1 Surface Water Management Plan (SWMP) 2013

The [Sevenoaks Stage 1 SWMP](#) was undertaken by Kent County Council (Lead Local Flood Authority), to investigate the local flood risk in Sevenoaks as part of their strategic oversight of local flood risk management in Kent.

The SWMP highlights an action plan, identifying a range of recommended actions for the reduction of flood risk across the Sevenoaks District. This consists of a generic action plan, indicating options to be applied throughout all drainage areas, and a location specific action plan, highlighting actions for specific locations.

1.6 Catchment Management Plans (CMPs)

1.6.1 Medway Catchment Flood Management Plan 2009

The [Medway CFMP](#) identifies flood risk management policies to assist all key decision makers in the catchment. It is identified that the main source of flood risk in the Medway

The word JBA Consulting in a box with two rounded corners catchment area is from localised river flooding, concentrated in Edenbridge, Tonbridge and Maidstone.

A minority of sites assessed in this Level 2 SFRA are located within the Medway Management Catchment, with some sites near Edenbridge. The area of Edenbridge, within sub-area 2, falls under policy option 5 – areas of moderate to high flood risk where further action can be taken to reduce flood risk.

1.6.2 North Kent Rivers Catchment Flood Management Plan (CFMP) 2009

The [North Kent Rivers CFMP](#) identifies the main source of flood risk as localised river flooding along the Darent, Shuttle and Cray, as well as surface water flooding in urban areas.

The CFMP highlights the main flooding issues within the Sevenoaks District (sub area 2 - upper Darent and tributaries) to be high river flows in combination with other factors such as blocked culverts and bridges. The preferred policy option within this area is option 6, covering areas of low to moderate flood risk where action will be taken to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits. Proposed actions to this approach include: remodelling of the Darent valley with improved hydrology; encourage the take up of flood resilience measures by residents living within the floodplain; investigate surface water flooding risk: and seek opportunities to work with landowners to create wetland habitat.

1.7 SFRA Objectives

Objectives of this Level 2 SFRA are to:

- Assess the flood risk to potential development sites using the latest available flood risk data and climate change uplifts where available;
- Provide information and mapping to show flood risk from all sources for each site option;
- Provide recommendations for making each site safe from flooding throughout its lifetime where the Exception Test is required;
- Consider, as far as practically possible, the most recent policy and legislation in NPPF, PPG and LLFA SuDS guidance.

1.8 Consultation

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

- Environment Agency
- Kent County Council (as Lead Local Flood Authority)
- Southern Water
- South East Water

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- Thames Water

1.9 How to use this Report

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA.	For general information and context.
2. The Planning Framework and Planning Policy for Flood Risk Management	Provides an overview of both national and existing Local Plan policy on flood risk management. This includes the application of the Sequential Approach and Sequential/Exception Test process. Provides guidance for the Council and Developers on the application of the Sequential and Exception Test at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
3. Level 2 Strategic Flood Risk Assessment	Highlights the data used within the Level 2 assessment including Flood Zones, fluvial and surface water data, groundwater, historic flooding etc.	For information on the data sources used within the Level 2 assessment.
4. Level 2 Site Assessments	Details the approach taken to the site screening and scoping exercise and highlights the key points from the 28 Level 2 site sheets.	Developers and planners should use this section to provide an overview of the 28 sites and their requirements for development.
5. Summary	Summarises the results and conclusions of the Level 2 assessment and makes recommendations for planning policy and development.	Developers and planners should use this section to provide an overview of the Level 2 assessment.
Appendices A - Site Assessment Summary Tables B – Medway Hydraulic Modelling Report	Detailed assessment of the risk to specific sites identified by Sevenoaks District Council and likely actions required to bring the site forward under the Sequential/Exception Tests.	Developers and planners should use this section to provide an overview of the risk to specific sites.

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Section	Contents	How to use
C - Darent and Cray Hydraulic Modelling Report		
D - Sites not taken forwards for a Level 2 assessment		

Hyperlinks to external guidance documents/websites are provided throughout the SFRA.

2 The Planning Framework and Planning Policy for Flood Risk Management

The Flood Risk Management roles and responsibilities for different organisations and relevant legislation, policy and strategy are detailed within the Sevenoaks District Council Level 1 Strategic Flood Risk Assessment (July 2024).

This contains detail on:

- Flood risk policy and strategy
- Roles and responsibilities for Flood Risk Management in Sevenoaks
- Relevant legislation
- Relevant Flood Risk Policy and Strategy Documents
- Key legislation for flood and water management
- Key national, regional and local policy documents and strategies

2.1 National Planning Policy Framework Guidance

The Revised [National Planning Policy Framework](#) (NPPF) was updated in December 2024. The NPPF sets out Government's planning policies for England and how these are expected to be applied. The Framework is based on core principles of sustainability and forms the national policy framework in England, also accompanied by a number of Planning Practice Guidance (PPG) notes. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions.

2.1.1 Planning Practice Guidance (PPG)

An updated version of the PPG guidance was published in August 2022. This advises on 'how to take account of and address the risks associated with flooding and coastal change in the planning process'. The guidance outlines the steps required when preparing strategic policies. Further details regarding the PPG can be found in the Level 1 SFRA.

2.1.2 The Sequential Test

The Sequential Test aims to ensure that areas at lower risk of flooding are prioritised for development over areas at a higher risk of flooding. This means areas at a medium or high risk of flooding from any source, now or in the future, should be avoided for development where possible.

2.1.3 The Exception Test

It may not always be possible for all new development to be allocated on land that is not at risk from flooding. To further inform whether land should be allocated, or planning permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required.

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The Exception Test should only be applied following the application of the Sequential Test. It applies in the following instances, where it is not possible for development to be located in areas with a lower risk of flooding:

- More vulnerable development in Flood Zone 3a;
- 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); and/or
- Locations where surface, groundwater, sewer or reservoir flood risk materially affect the safety of proposed development or where development proposals potentially affect existing land or property.

For information on what types of development constitute more vulnerable, essential infrastructure and highly vulnerable refer to [Annex 3 of the NPPF](#).

The information included in this Level 2 SFRA will provide sufficient information to inform the application of the Exception Test.

For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that 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.

For developments that have not been allocated in the Local Plan, developers must undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 2 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.

3 Level 2 Strategic Flood Risk Assessment

This section highlights all the datasets used in the Level 2 SFRA to assess the local plan sites against flood risk.

3.1 Historic Flooding

The Environment Agency's 'Recorded Flood Outlines' dataset has been used to understand whether historic flooding has been recorded at the sites. This dataset takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding.

Sevenoaks District Council's Flood Incident Database has also been reviewed. As specified in the Level 1 SFRA, there is a history of documented flood events within the district, with the main source recorded as fluvial flooding.

It is important to note that the absence of historic flood records does not mean that an area has never flooded, only that records are not held. For previously undeveloped sites, it is likely that historic flooding incidents may have gone unreported due to a lack of site use or interest. In addition, it is also possible that flooding mechanisms have changed since the date of a recorded flooding incident, making it more or less likely for flooding to occur on site.

3.2 SFRA flood zones

As part of the Level 1 SFRA, existing fluvial modelling was incorporated into the SFRA Flood Zone 3b dataset. The Medway model was then re-run with additional climate change allowances. At the time of writing, this is considered more up-to-date than the Flood Map for Planning, however over time the online Flood Map for Planning is likely to be updated more often than the SFRA.

It is important to note that the Flood Map for Planning does not identify the functional floodplain (Flood Zone 3b) and the SFRA Flood Zones will remain the best available data for identifying this. In locations where there is no detailed modelling available, as part of the Level 1 SFRA, a precautionary approach was adopted by considering the maximum extent of Flood Zone 3a as an 'indicative' Flood Zone 3b. In these locations, detailed modelling will be required to identify the extent of the functional floodplain.

The Flood Map for Planning does not include allowances for climate change, therefore if detailed fluvial modelling was not available the Risk of Flooding from Surface Water plus Climate Change dataset has been assessed.

In places where no detailed modelling is available, Flood Zones are based off national scale generalised mapping prepared by the Environment Agency in 2011. This is the 'best available data' at the time this SFRA was prepared, although may not provide a comprehensive understanding of flood risk. As a result, detailed hydraulic modelling work may be required to inform development at certain locations, where appropriate. This

The word JBA Consulting in a box with two rounded corners modelling is likely to be superseded by the National Flood Risk Assessment 2 (NaFRA 2) evidence assessment which is currently being undertaken by the Environment Agency.

Further details on the Flood Zones can be found within the Level 1 Strategic Flood Risk Assessment.

3.3 Flood defences

For sites where existing flood defences provide a reduction in the flood risk to the site, it is important to understand the standard of protection these structures and measures provide. It is also necessary to understand how this level of protection changes over time, considering the implications of climate change.

If flood defences are required to protect a development site, evidence will be required to show that the new development does not adversely impact and increase flood risk to other areas, for example that there is no net loss in floodplain storage in circumstances where this is a material consideration. It will need to be established that these defences can be appropriately managed and maintained during the lifetime of the development. In some cases, it will be a requirement to demonstrate that there is an appropriate level of commitment to the maintenance of the standard of protection afforded by existing defences, where reliance is placed on the standard they provide.

Current flood defence information has been taken from the Environment Agency's Asset Information Management System (AIMS) Spatial Defences dataset. This dataset includes all flood defences currently owned, managed or inspected by the Environment Agency and includes information pertaining to their current condition and standard of protection.

3.4 Flooding from rivers

Fluvial flooding is notable throughout the district, particularly along the River Darent, River Medway and River Eden. A number of smaller watercourses (tributaries of these main rivers) and field drains located within the district also have the potential to pose significant flood risk to development.

3.4.1 Impacts of climate change on fluvial flood risk

Climate change is expected to increase the peak flows of rivers, meaning that flows which were previously thought to be extreme will now be considered far more possible. Areas benefitting from flood defences will find the standard of protection changes over time with overtopping of defences more likely unless they are upgraded.

Peak river flow climate change allowances developed by the Environment Agency are divided into a series of Management Catchments. Two catchments fall within the Sevenoaks District: the Medway Management Catchment, which covers a small southern part of the district, encompassing the area of Edenbridge, and the Darent and Cray Management Catchment, which covers the remaining areas north of Edenbridge, including Sevenoaks and Swanley. The details of the two Management Catchments are shown below in Table 3-1 and Table 3-2.

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Table 3-1 Medway Management Catchment peak river flow climate change allowances

Allowance category	Total potential change anticipated for '2020s' (2015-2039)	Total potential change anticipated for '2050s' (2040-2069)	Total potential change anticipated for '2080s' (2061-2115)
Upper	29%	37%	62%
Higher	19%	21%	37%
Central	14%	15%	27%

Table 3-2 Darent and Cray Management Catchment peak river flow climate change allowances

Allowance category	Total potential change anticipated for '2020s' (2015-2039)	Total potential change anticipated for '2050s' (2040-2069)	Total potential change anticipated for '2080s' (2061-2115)
Upper	21%	23%	41%
Higher	11%	8%	18%
Central	6%	3%	10%

3.4.2 River Medway Fluvial Modelling

The River Medway Flood Risk Modelling was developed by JBA Consulting in 2013. The detailed mapping models were largely based on the previous 1D ISIS models and developed into ISIS-TUFLOW models.

The model extends from Blindley Heath on the Eden Brook, the railway crossing at Crowhurst on the River Eden and from downstream of Weir Wood Reservoir, Forest Row on the River Medway. The model terminated at the Leigh Flood Storage area.

3.4.3 River Darent and River Cray Fluvial Modelling

The 2019 River Darent and Cray fluvial modelling study involved updating previous fluvial models (linked 1D-2D Flood Modeller TUFLOW) within the catchment.

The model study area covers the north of Sevenoaks, towards Dartford and the upper reaches of the catchment.

Many of the sites to be assessed as part of this SFRA are located within the Darent and Cray model catchment, however few are located outside of this management catchment.

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3.5 Flooding from the sea

The Sevenoaks District Council is not tidally influenced and is therefore not at risk of flooding from the sea.

3.6 Surface water flooding

Mapping of surface water flood risk in Sevenoaks District has been taken from the Environment Agency's Risk of Flooding from Surface Water (RoFSW) mapping. Surface water flood risk is subdivided into the following four categories:

- **High:** An area has a chance of flooding greater than 3.3% AEP (1 in 30-year) each year.
- **Medium:** An area has a chance of flooding between 1% AEP (1 in 100-year) and 3.3% AEP (1 in 30-year) each year.
- **Low:** An area has a chance of flooding between 0.1% AEP (1 in 1,000-year) and 1% AEP (1 in 100-year) each year.
- **Very Low:** An area has a chance of flooding of less than 0.1% AEP (1 in 1,000-year) each year.

The results should be used for high-level assessments. If a particular site is indicated in the Environment Agency mapping to be at risk from surface water flooding, a more detailed assessment should be required to illustrate the flood risk more accurately at a site-specific scale. Such an assessment should use the RoFSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

Detailed modelling based on site survey will be necessary where there is a significant risk of surface water flooding. It is the intention that the Environment Agency will prepare updated and improved surface water mapping while updating the National Flood Risk Assessment (NaFRA). At the time of writing, it is anticipated that this data will be available in 2025 and at that time it is recommended that the surface water risk assessment is reviewed. It is not anticipated that the updated mapping will fundamentally change the locations identified to be at risk from surface water flooding, but the improved analysis techniques will reduce some of the uncertainties associated with the assessment.

3.6.1 Impact of climate change on surface water flooding

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 potential impacts of surface water plus climate change will likely need to be considered at site-specific assessment stage.

Peak rainfall climate change allowances developed by the Environment Agency are divided into the same Management Catchments as peak river flows. The details of the two Management Catchments (Medway and Darent and Cray) are shown below in Table 3-3 and Table 3-4.

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 For more information on which climate change allowances should be used please refer to the Level 1 SFRA. As Risk of Flooding from Surface Water data with a 35% and 45% climate change uplift was already available for the 3.3% and 1% AEPs respectively these have been used as the best available data as part of this Level 2 SFRA.

Table 3-3 Medway Management Catchment peak rainfall climate change allowances

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

Table 3-4 Darent and Cray Management Catchment peak rainfall climate change allowances

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

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3.7 Groundwater flooding

In comparison to fluvial flooding, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Groundwater level monitoring records are available for areas on Major Aquifers; however, for lower lying valley areas, which can be susceptible to groundwater flooding caused by a high-water table in mudstones, clays, and superficial alluvial deposits, very few records are available. Additionally, there is an increased risk of groundwater flooding where long reaches of watercourse are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas.

To assess groundwater flooding emergence within Sevenoaks District, the Groundwater Flood Data 5m Resolution (JBA licensed product) has been provided by JBA. The Groundwater Flood Data shows areas of potential groundwater emergence during a 1% AEP flood event, and highlights areas where there is sufficient evidence to suggest that flooding may occur. This data cannot form part of the Sequential Test as it is not directly comparable to other datasets (e.g. Flood Zones), and therefore cannot categorise an area as high, medium or low risk on its own. The map should be interpreted as an initial indicative tool to assess groundwater flood risk at preliminary stages of planning/site allocation. Where mapping indicates a risk of groundwater flooding a detailed assessment should be undertaken to confirm the risk to the site as part of any planning application, which may require ground investigations.

The Groundwater Flood data categorises into 5 different classes, with a detailed description of the classes in Table 3-5 below. For more information, please refer to the Level 1 SFRA and the Level 2 site assessments.

Table 3-5: JBA Groundwater Flood data classifications

Risk Class	Depth range	Description
0 - Low risk	>5m	The zone is deemed as a having negligible risk from groundwater flooding due to the nature or local geological deposits
1	At least 5m	Flooding from groundwater is unlikely
2	Between 5m and 0.5m	Risk of flooding to subsurface assets but surface manifestation is unlikely
3	Between 0.5m and 0.0025m	Risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge locally<0.0
4	<0.025m	Risk of groundwater flooding to surface and subsurface assets. Groundwater may emerge at significant rates and gas the capacity to flow overland and/or pond within any topographic low spots.

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3.7.1 Impact of climate change on groundwater flooding

The impact of climate change is more uncertain for groundwater flooding associated with rivers and land catchments and those watercourses where groundwater has a large influence on winter flood flows. Changes in frequency and intensity of groundwater flooding due to climate change would depend on the flooding mechanism and geological characteristics.

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.

3.8 Reservoirs

The risk of inundation as a result of reservoir breach or failure of a number of reservoirs within the area has been identified from the Environment Agency's Reservoir Flood Extents dataset.

The Environment Agency Reservoir Flood Extents data consists of flood extents for two scenarios; a "dry-day" and "wet-day". The dry day scenario shows flood extents in the event that reservoirs were to fail and release the water they hold when local rivers are at normal levels. The wet day scenario shows flood extents in the event that reservoirs were to fail and release the water they hold when local rivers are in flood.

Flood extents are not included for smaller reservoirs or for reservoirs commissioned after the reservoir modelling programme began in October 2016. Note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975.

Five sites were assessed to be at residual risk of flooding from reservoirs included in the Environment Agency mapping.

3.9 Sewer Flooding

3.9.1 Data used to inform sewer flooding

Southern Water's and Thames Water's published DWMPs were assessed and any events within the same postcode location were identified for each site. Developers should contact Southern Water and Thames Water for further information on the risk of sewer flooding to the sites.

3.10 Residual risk

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

Residual risk from breaches to flood defences, whilst rare, needs to be considered in Flood Risk Assessments. Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the

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Ten of the sites taken forwards to Level 2 were identified as defended.

3.11 Depth, velocity and hazard to people

The Level 2 assessment seeks to map the probable depth and velocity of flooding as well as the hazard to people during the defended fluvial 1% AEP plus climate change flood event. This assessment is made to help inform the Exception Test.

Where detailed model outputs were available, the 1% AEP plus climate change depth, velocity and hazard data has been used. This data is only present where models have a 2D element, representing the floodplain in detail.

In the absence of detailed hydraulic models, the Risk of Flooding from Rivers and Sea dataset has been used, as well as the Risk of Flooding from Surface Water datasets. The depth, hazard, and velocity of the 1% AEP surface water flood event has also been mapped and considered in this assessment.

Hazard to people has been calculated using the below formula, as suggested in Defra's [FD2321/TR2 "Flood Risk to People"](#). The different hazard categories are shown in Table 3-6. Developers should also test the impact of climate change depths, velocities, and hazard on the site, as part of the site-specific Flood Risk Assessment.

Table 3-6: Defra FD2321/TR2 Flood Risks to People classifications

Description of Flood Hazard Rating	Flood Hazard Rating	Classification Explanation
Very Low Hazard	< 0.75	Flood zone with shallow flowing water or deep standing water.
Danger for some (i.e. children)	0.75 - 1.25	Danger: Flood Zone with deep or fast flowing water.
Danger for most	1.25 - 2.00	Danger: Flood Zone with deep fast flowing water.
Danger for all	> 2.00	Extreme danger: Flood Zone with deep fast flowing water.

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

3.12 Duration and onset of flooding

The duration and onset of flooding affecting a site depends on a number of factors, such as:

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- The position of the site within a river / surface water catchment, with those at the top of a catchment likely to flood sooner than those lower down. The duration of flooding tends to be longer for areas in lower catchments.
- Upstream reservoirs in these catchments will provide some online flood storage that reduce the flood risk downstream and delays the onset of flooding. At the confluence of the larger watercourses and smaller tributaries, there may be different timings of peak flows, for example smaller tributaries would peak much earlier than the larger catchments. Tributaries with small catchment areas will respond faster and result in flashier storm hydrographs than those of a larger Main River.
- The principal source of flooding: where this is surface water, depending on the intensity and location of the rainfall, flooding could be experienced within 30 minutes of the heavy rainfall event e.g. a thunderstorm. Typically, the duration of flooding for areas at risk of surface water flooding or from flash flooding from small watercourses is short (hours rather than days).
- The preceding weather conditions prior to the flooding: wet weather lasting several weeks will lead to saturated ground. Rivers respond much quicker to rainfall in these conditions.
- Whether a site is defended, noting that if the defences were to fail, a site could be affected by very fast flowing and hazardous water within 15 minutes of a breach developing (depending on the size of the breach and the location of the site in relation to the breach), causing danger to life.
- Catchment geology, for example chalk catchments take longer to respond than typical clay catchments.

It is recommended that a site-specific Flood Risk Assessment refines this information, based on more detailed modelling work where necessary.

It is not always possible to extract information on the duration and onset of flooding from detailed modelling, and information is not available where there is no detailed modelling available. Where sites are at risk of flooding, the duration and onset of flooding should be assessed within an emergency response plan.

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3.13 SuDS suitability

The hydraulic and geological characteristics of each site have been assessed to determine constraints relating to surface water management. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments.

The assessment is based on catchment characteristics, British Geological Survey (BGS) mapping. LIDAR data was used as a basis for determining the topography and average slopes across each development site. Other datasets were used to determine factors such as potential water quality and flood constraints, including:

- Historic landfill sites
- Groundwater Source Protection Zones
- Nitrate Vulnerable Zones
- Detailed River Networks
- Risk of Flooding from Surface Water mapping
- Flood Map for Planning

SuDS in the Sevenoaks District should be designed in accordance with [Kent County Council's SuDS Guidance](#).

The Surface Water Management roles and responsibilities for different organisations and relevant legislation, policy and strategy are detailed within the Sevenoaks Level 1 Strategic Flood Risk Assessment (Section 9) (July 2024).

This contains detail on:

- Role of the LLFA and Local Planning Authority in surface water management
- Sustainable Drainage Systems (SuDS)
- Sources of SuDS guidance
- Other surface water considerations: Groundwater Vulnerability Zones; Groundwater Source Protection Zones; Nitrate Vulnerable Zones

3.14 Emergency Planning

3.14.1 Data used to Inform Emergency Planning

Flood Warning and Flood Alert Areas are detailed in the Environment Agency's GIS Datasets. Flood Alert Areas inform the Environment Agency when there is flooding first in the catchment, irrespective of properties, hence this coverage tends to apply to whole watercourses or stretch of coastline. Flood Warning Areas are derived from the extreme flood outline (0.1% AEP event), focussed on communities, properties and/or infrastructure. Areas covered by this would receive a Flood Warning in advance of flooding.

Modelled depth, velocity and hazard data can be used to understand safe access and egress around each site.

For more information about Flood Warning and Alert areas please refer to the Level 1 SFRA report.

4 Level 2 Site Assessments

4.1 Approach taken to the site screening and scoping exercise

JBA Consulting have recently undertaken the Level 1 Strategic Flood Risk Assessment (SFRA) for Sevenoaks District Council. Following this work, a number of sites have been identified by Sevenoaks District Council as potentially requiring a Level 2 SFRA.

In order to provide guidance on which of these sites should be taken forward to a Level 2 SFRA, JBA Consulting have undertaken a Level 2 scoping exercise.

This section outlines how sites were screened against flood risk datasets to determine which sites were taken forwards for a Level 2 assessment.

4.2 Site Screening

Sevenoaks District Council provided 55 sites for assessment as part of the Level 2 SFRA. These sites were screened against a suite of available flood risk information and spatial data to provide a summary of risk to each site, including:

- The proportion of the site within Flood Zones or fluvial modelling data (including an allowance for climate change) derived from the Level 1 SFRA.
- Whether the site is shown to be at risk from surface water flooding in the Risk of Flooding from Surface Water (RoFSW) dataset including an allowance for climate change.
- The proportion of the site in the reservoir 'wet' and 'dry' day extents.

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

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

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

The Flood Zones are not provided for specific sites or land where the catchment of the watercourse falls below 3km². For this reason, the Flood Zones are not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. The

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4.3 Sites taken forward to a Level 2 assessment

A spreadsheet was formulated taking into account the 55 sites assessing their flood risk from fluvial and surface water flooding extents. Sites were taken forwards if greater than 10% of the site area was within the following flood extents:

- Surface water 1% Annual Exceedance Probability (AEP) +45% climate change
- Flood Zone 2 as a proxy for climate change
- 1% AEP Fluvial central allowance from detailed modelling

The reservoir and historical flood risk were also considered for each site, along with location within flood warnings/alerts, defences and previous hydraulic models. Access and egress were then also assessed for each site, identifying depths locally above and below 300mm within the surface water plus climate change flooding extent.

Out of the 55 sites, 28 sites were identified as potentially needing a Level 2 assessment.

Consideration was also given to each site to identify any site-specific information; for example, where detailed modelling is needed, or if the RoFSW dataset can be used to assess flood risk.

Following a discussion with Sevenoaks District Council, six sites were then removed as they were no longer required. The boundaries of several sites were also amended.

Therefore, out of the 55 sites provided by Sevenoaks District Council, 28 sites have been identified to be carried forward to a Level 2 assessment. These 28 sites are summarised below in and site summary sheets provided in Appendix A.

Table 4-1 Site Summary Table Summaries

Site Name	Key points/constraints
Otford Depot	<p>Access and Egress is likely possible to the east of the site along the A225 during the 1% AEP plus climate change event, with floods depths less than 0.3m.</p> <p>13% located within the fluvial flood risk during the 0.1% AEP extent, whilst remaining flood free in smaller AEPs.</p> <p>1% located within surface water flood risk during the 1% AEP extent and 3% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone, and is partially shown to be at risk of 'Wet Day' reservoir flooding.</p> <p>The site has not been identified to be located within a historic landfill site or Nitrate Vulnerable Zone.</p> <p>The site is not at risk of tidal or sewer flooding.</p>

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Site Name	Key points/constraints
	<p>A small area to the west of the site is shown to be located within the River Darent from Westerham to Dartford (064WAF7Darent) and Westerham to Sevenoaks (064WAF7Westerham) Flood Alert and Flood Warning Areas respectively.</p>
<p>Land at Upper Hockenden Farm</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Hockenden Lane to the south of the site as this road is unaffected by flooding.</p> <p>6% located within surface water flood risk during the 1% AEP extent and 12% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone and Nitrate Vulnerable Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site or flood warning/alert area.</p>
<p>Bus Garage, Kingdom Hall</p>	<p>Access and egress are available during the 0.1% AEP and 1% AEP plus 45% climate change events via London Road (B2173) as flood depths remain shallow (<300mm).</p> <p>2% located within surface water flood risk during the 1% AEP extent and 13% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone and a Nitrate Vulnerable Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site or flood warning/alert area.</p>
<p>New Ash Green village centre</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Ash Road as flood depths remain shallow (<300mm).</p> <p>6% located within surface water flood risk during the 1% AEP extent and 10% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or nitrate vulnerable zone.</p>
<p>Abacus Furniture Farm Road Garages</p>	<p>Access and egress are likely to be possible within the 1% AEP plus 45% climate change event, as flood depths are <300mm along Greatness Lane, Mill Lane and Farm Road.</p>

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Site Name	Key points/constraints
Greatness Lane Flats, Mill Lane	<p>37% located within surface water flood risk during the 1% AEP extent and 58% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
Pounsley House, Pounsley Road, Dunton Green, Sevenoaks	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Pounsley Road as flood depths remain shallow (<300mm).</p> <p>16% located within surface water flood risk during the 1% AEP extent and 21% within 1% AEP plus 45% climate change.</p> <p>18% located within the fluvial flood risk during the 1% AEP extent and 18% within 1% AEP plus 37% climate change, using the Darent and Cray Modelling (Appendix C).</p> <p>The site is not at risk of tidal or sewer flooding.</p> <p>The southern half of the site is at risk of 'wet day' reservoir flooding.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, Nitrate Vulnerable Zone or flood warning/alert area.</p> <p>The site is located within the River Darent from Westerham to Sevenoaks (064FWF7Westerham) Flood Warning Area and the River Darent from Westerham to Dartford (064WAF7Darent) Flood Alert Area.</p>
Land on the east side of London Road, West Kingsdown	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the A20 to the west of the site as this road is unaffected by flooding.</p> <p>1% located within surface water flood risk during the 1% AEP extent and 36% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
Land west of Ashcombe Drive	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Hilders Lane to the far north of</p>

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Site Name	Key points/constraints
and Meadow Lane, Edenbridge	<p>the site, and Ashcombe Drive to the northeast as these roads are unaffected by flooding.</p> <p>4% located within surface water flood risk during the 1% AEP extent and 5% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone, flood warning/alert or Nitrate Vulnerable Zone.</p>
Land at Lullingstone Avenue (Formerly Land at Archer Way, Swanley)	<p>Access and egress to the site is provided via Lullingstone Avenue west towards Swanley Lane (B258). RoFSW mapping indicates that this access and egress route is affected during the 1% AEP plus climate change surface water event. It is therefore recommended access and egress is assessed on a site-specific FRA using hydraulic modelling.</p> <p>18% located within surface water flood risk during the 1% AEP extent and 25% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site is located within a Groundwater Source Protection Zone and Nitrate Vulnerable Zone.</p> <p>The site has not been identified to be located within a historic landfill site or flood warning/alert area.</p>
Land at Crouch House Road, Edenbridge	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Springfield Road to the south of the site with flood depths less than 0.3m.</p> <p>1% located within surface water flood risk during the 1% AEP extent and 3% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone, flood warning/alert or Nitrate Vulnerable Zone.</p>
Land at London Road, West Kingsdown	<p>Access and egress are available during the 1% AEP plus climate change surface water event along School Lane to the southeast of the site as this road is unaffected by flooding heading north, with depths less than 0.3m heading south.</p> <p>8% located within surface water flood risk during the 1% AEP extent and 13% within 1% AEP plus 45% climate change.</p>

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Site Name	Key points/constraints
	<p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
<p>Land between Back Lane and the A21, Bessels Green</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the B2042 to the east of the site as this road is unaffected by flooding.</p> <p>1% located within surface water flood risk during the 1% AEP extent and 2% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
<p>Brittains Lane, Kippington, Sevenoaks</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Brittains Lane to the east of the site along the southern end heading south, as this half of the road is unaffected by flooding.</p> <p><1% located within surface water flood risk during the 1% AEP extent and 1% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site or Nitrate Vulnerable Zone.</p> <p>A small northwestern section of the site is located within an Environment Agency's Flood Alert Area, known as the River Darent from Westerham to Dartford Alert Area (064WAF7Darent).</p> <p>The site is not shown to be located within a Flood Warning Area.</p>
<p>Land adjacent Seal Hollow Road and north of Blackhall Lane, Sevenoaks</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the golf course lane to the south of the site heading east as this road is unaffected by flooding.</p> <p><1% located within surface water flood risk during the 1% AEP extent and 1% within <1% AEP plus 45% climate change.</p> <p>The site is located within a Groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>

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Site Name	Key points/constraints
	<p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p>
<p>Land to the rear of Bowerwood House, 15 St Botolph's Rd, Sevenoaks</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the B2020 to the south of the site with flood depths less than 0.22m.</p> <p>11% located within surface water flood risk during the 1% AEP extent and 24% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p>
<p>Former Birchwood Primary School</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Leydenhatch Lane to the north of the site as flood depths are less than 0.2m.</p> <p><1% located within surface water flood risk during the 1% AEP extent and <1% within 1% AEP plus 45% climate change.</p> <p>The site has been identified to be located within a Groundwater Source Protection Zone and Nitrate Vulnerable Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site or flood warning/alert area.</p>
<p>Land North-East of Bloomfield Terrace, Westerham</p>	<p>Access and egress are unlikely during the 1% AEP plus climate change surface water event along Hortons Way to the south of the site as flood depths exceed 0.3m. Access and egress should therefore be assessed within a site-specific FRA.</p> <p>26% located within surface water flood risk during the 1% AEP extent and 45% within 1% AEP plus 45% climate change.</p> <p>0% located within the fluvial flood risk during the 1% AEP extent and 60% within 1% AEP plus 35% climate change.</p> <p>The site is not at risk of tidal, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone or Nitrate Vulnerable Zone.</p> <p>The majority of the site (excluding the northeast) is covered within the River Darent from Westerham to Dartford Flood Warning and Alert Area (064WAF7Darent).</p>

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Site Name	Key points/constraints
Land at Cramptons Road, Sevenoaks	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Crampton's Road to the west of the site as this road is predominantly unaffected by flooding, with flood depths less than 0.3m far north and south.</p> <p>37% located within surface water flood risk during the 1% AEP extent and 42% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
Land east of London Road, Dunton Green, Sevenoaks	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the A224 to the west of the site as this road contains flood depths less than 0.3m heading north.</p> <p>11% located within surface water flood risk during the 1% AEP extent and 18% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
Land at Wolfe Westerham, 190 London Road, Westerham	<p>Access and egress are available during the 1% AEP plus climate change surface water event along London Road to the east of the site as flood depths do not exceed 0.3m.</p> <p>10% located within surface water flood risk during the 1% AEP extent and 16% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone, flood warning/alert or Nitrate Vulnerable Zone.</p>
Land at Breezehurst Farm, Crouch House Road, Edenbridge, Kent	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Crouch House Road to the west of the site as flood depths do not exceed 0.16m.</p> <p>7% located within surface water flood risk during the 1% AEP extent and 14% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p>

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Site Name	Key points/constraints
	<p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone or Nitrate Vulnerable Zone.</p> <p>The site is located within an Environment Agency's Flood Alert Area, known as the Rivers Eden and Eden Brook Alert Area (064WAF324). This covers the River Eden, Eden Brook and Kent Ditch, from Bindley Heath to Penhurst, including Edenbridge and Hever.</p>
<p>78-80-82-84 the High Street and 1 - 2 Leathermarket, Edenbridge, Kent</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along High Street Road to the east of the site heading north or along Church Street heading east as flood depths do not exceed 0.3m.</p> <p><1% located within surface water flood risk during the 1% AEP extent and 1% within 1% AEP plus 45% climate change, using the Medway modelling (Appendix B).</p> <p>23% located within the fluvial flood risk during the 1% AEP extent and 81% within 1% AEP plus 37% climate change.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone or Nitrate Vulnerable Zone.</p> <p>The site is not at risk of tidal or sewer flooding.</p> <p>The southern half of the site is at risk of 'wet day' reservoir flooding.</p> <p>The site is located within the Rivers Eden and Eden Brook from Crowhurst to Penshurst Flood Warning Area (064FWF8A1) and the Rivers Eden and Eden Brook Flood Alert Area (064WAF324).</p>
<p>Land North and South of Maidstone Road, Swanley</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along B2173 to the west of the site as flood depths do not exceed 0.3m, and the road is predominantly flood free.</p> <p>3% located within surface water flood risk during the 1% AEP extent and 6% within 1% AEP plus 45% climate change.</p> <p>The site has been identified to be located within a Groundwater Source Protection Zone and Nitrate Vulnerable Zone.</p> <p>The site has not been identified to be located within a historic landfill site or flood warning/alert area.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p>

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Site Name	Key points/constraints
	<p>A very small portion of the site is located within the Boroughs of Barking and Dagenham, Bexley, Bromley and Croydon Flood Alert Area (064FAG99SE).</p>
<p>Sevenoaks Station and Car Park, Morewood Close, Sevenoaks</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the A224 between the two parcels of land as flood depths are predominantly less than 0.3m, however an assessment of access and egress should be completed at detailed design.</p> <p>37% located within surface water flood risk during the 1% AEP extent and 47% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
<p>Open Space, Community Hall and Convenience Shop Farmstead Drive, Edenbridge, Kent</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Fircroft Way and the B2027 heading west to the south of the site as flood depths do not exceed 0.23m.</p> <p>43% located within surface water flood risk during the 1% AEP extent and 59% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone or Nitrate Vulnerable Zone.</p> <p>The majority of the site is located within an Environment Agency's Flood Alert Area, known as the Rivers Eden and Eden Brook Alert Area (064WAF324). This covers the River Eden, Eden Brook and Kent Ditch, from Bindley Heath to Penhurst, including Edenbridge and Hever.</p> <p>The site is not shown to be located within a Flood Warning Area.</p>
<p>Land at Moat Farm, off Homedean Road, Chipstead, Kent</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along Homedean Road to the east of the site, heading north as flood depths are predominantly less than 0.3m.</p> <p>7% located within surface water flood risk during the 1% AEP extent and 21% within 1% AEP plus 45% climate change.</p>

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Site Name	Key points/constraints
	<p>2% located within the fluvial flood risk during the 1% AEP extent and 2% within 1% AEP plus 35% climate change, using the Darent and Cray Modelling (Appendix C).</p> <p>The site is not at risk of tidal, reservoir or sewer flooding.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site has not been identified to be located within a historic landfill site or Nitrate Vulnerable Zone.</p> <p>A small area to the north of the site is located within the River Darent from Westerham to Dartford (064WAF7Darent) and Westerham to Sevenoaks (064WAF7Westerham) Flood Alert and Flood Warning Areas respectively.</p>
<p>Land east of High Street, Sevenoaks</p>	<p>Access and egress are available during the 1% AEP plus climate change surface water event along the A225 to the west of the site with flood depths less than 0.2m.</p> <p>18% located within surface water flood risk during the 1% AEP extent and 28% within 1% AEP plus 45% climate change.</p> <p>The site is located within a groundwater Source Protection Zone.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site has not been identified to be located within a historic landfill site, flood warning/alert or Nitrate Vulnerable Zone.</p>
<p>Sevenoaks Quarry, Bat and Ball Road, Sevenoaks, Kent, TN14 5SR</p>	<p>Access and egress are unlikely during the 1% AEP plus climate change surface water event along Bat and Ball Road with flood depths exceeding 1m. It may be possible to permit access and egress from Childsbridge Lane to the east of the site where flood depths do not exceed 0.3m. It is therefore recommended access and egress are assessed during a site-specific assessment.</p> <p>6% located within surface water flood risk during the 1% AEP extent and 12% within 1% AEP plus 45% climate change.</p> <p>The site is not at risk of tidal, fluvial, reservoir or sewer flooding.</p> <p>The site is located within a groundwater Source Protection Zone and a historic landfill site.</p> <p>The site has not been identified to be located within a flood warning/alert or Nitrate Vulnerable Zone.</p>
<p>Land north of Skinners Lane</p>	<p>Access and Egress is likely possible to the east of the site along the B2027 during the 1% AEP plus climate change event.</p>

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Site Name	Key points/constraints
	<p>5% located within the fluvial flood risk during the 0.1% AEP extent, 1% located within the fluvial flood risk during the 1% AEP extent</p> <p>4% located within surface water flood risk during the 1% AEP extent and 10% within 1% AEP plus 45% climate change.</p> <p>The site has not been identified to be located within a historic landfill site, Groundwater Source Protection Zone or Nitrate Vulnerable Zone.</p> <p>A portion of the site is located within an Environment Agency's Flood Alert Area, known as the Rivers Eden and Eden Brook Alert Area (064WAF324). This covers the River Eden, Eden Brook and Kent Ditch, from Bindley Heath to Penhurst, including Edenbridge and Hever. The site is also located within a Flood Warning Area, known as Rivers Eden and Eden Brook from Crowhurst to Penshurst including Edenbridge and Hever.</p>

4.4 Sites not taken forward to a Level 2 assessment

The sites shown in Appendix D were not identified as requiring a Level 2 assessment, however some restraints may still apply. It is therefore critical that each site is assessed with access and egress, groundwater flood risk, reservoir flood risk etc to prepare the necessary documentation (for example a Flood Response Plan) and gain the appropriate advice. For example, it would be recommended that sites at risk of reservoir flooding contact the local reservoir owners.

Access and egress for the sites not taken forwards to a Level 2 assessment should still be considered and investigated prior to any development. Sites that have not been identified to have safe access and egress have flood depths greater than 300mm and are shown within Appendix D. These sites can still be allocated but should be assessed as part of an individual site-specific assessment and should have a Flood Response Plan produced to further consider access and egress on a site-specific basis. Residents should sign up to Flood Warnings and Alerts where these are available. Please refer to [Paragraph: 047](#) (Reference ID: 7-047-20220825) of the Flood and Coastal Change section of the PPG for further details on access and egress.

4.5 Cumulative Impact Assessment (CIA)

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume and potential effects of increased volumes of runoff from proposed development. Whilst the loss of storage or potential

The word JBA Consulting in a box with two rounded corners increase in flow volume for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

Future development sites within the study area were provided by Sevenoaks District Council. Predicted flood risk was assessed in the Level 1 SFRA using a variety of datasets and the catchments were then ranked to allow the categorisation of the catchment dependent on the sensitivity of the catchment to proposed levels of growth, historic flood risk and properties sensitive to growth. For more details on the CIA and catchment rankings please refer to Section 12 of the Level 1 SFRA report.

5 Summary

5.1 Overview

This Level 2 SFRA delivers site specific guidance and recommendations for sites in the Sevenoaks District. As part of the Level 2 SFRA 28 detailed site summary tables have been produced. The Level 2 SFRA should be read in conjunction with the Level 1 SFRA which deliver a strategic assessment of all sources of flooding in the area.

5.2 Recommendations

5.2.1 Level 1 SFRA

Recommendations from this report should be considered in addition to recommendations from the Level 1 SFRA, which still stands for the site allocations and any windfall development that comes forwards. Recommendations in the Level 1 SFRA were made regarding (but not limited to):

- Locating new development according to the Sequential and Exception Test requirements, including adopting a sequential approach within the site.
- Consider long-term opportunities to remove development from the floodplain and to make space for water.
- Where there is an unknown risk from an ordinary watercourse, risk should be adequately assessed. This could include modelling the watercourse should the potential risk be found to be high.
- Ensure development has safe, dry pedestrian egress and emergency vehicular access should be possible for all residential development.
- Considering flood resilience measures for new development.
- SuDS design should demonstrate how site-specific constraints have been considered and how the design provides multiple benefits.
- Seeking opportunities for betterment where possible, where surface water flooding issues are present.

5.2.2 Level 2 SFRA

To pass the Exception Test, it must be shown that the development will provide wider sustainability benefits that outweigh the risk, and that the development will be safe throughout its lifetime without increasing risk elsewhere. The former is a planning-related consideration and the Level 2 SFRA helps to answer the latter part of the Test.

In principle, it is possible for the majority of sites to pass the flood risk element of the Exception Test by:

- Siting development within the site away from the highest areas of risk.

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- Considering safe access/ egress in the event of a flood (from all parts of the site, if say the site is severed by a flood flow path). If access and egress is affected a Flood Response Plan may be required.
- Finished floor levels should be above the estimated flood level (Fluvial 1% AEP event with an allowance for climate change), including an allowance for freeboard.
- Using areas in Flood Zone 2 for the least vulnerable parts of the development in accordance with Table 2 in the PPG. No development should be permitted in Flood Zone 3b (aside from essential infrastructure).
- Considering space for green infrastructure in the areas of highest flood risk.

Some sites are at greater risk and will require careful consideration and mitigation to pass the flood risk element of the Exception Test.

Consideration should be given to the surface water risk where this is high, with regards to the Exception Test. For example, a site may pass the test based on fluvial flood risk alone, but greater risk may come from surface water.

If a settlement site is split in future into smaller land parcels for development, and some of those parcels are in areas of flood risk, the Exception Test may need to be re-applied by the Developer at the planning application stage.

In some cases, and following the application of the Sequential Test, it may be appropriate for the developer to contribute to the improvement of maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS).

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses, including latest climate change allowances, to verify flood extent in order to inform the sequential approach within the site and demonstrate, as required, that the Exception Test is satisfied.

5.3 Use of SFRA data and future updates

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

The SFRA should be a 'living document', and as a result should be updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. Additional guidance should be sought from Kent County Council, the Environment Agency, Southern Water and Thames Water where relevant to ensure the most up to date information is considered within any new assessments. Such information may be in the form of:

- Policy/ legislation updates
- Flood event information following a flood event
- New hydraulic modelling results

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- Environment Agency flood map updates
- New flood defence or alleviation schemes

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated information is available prior to commencing a detailed Flood Risk Assessment.

5.4 Neighbourhood Plans

Flood risk should be fully addressed in development plan preparation and in bringing forward policies for the allocation of land. Therefore, SFRA findings should be used in the production of Neighbourhood Plans.

Neighbourhood planners can use the information in the Level 1 and Level 2 SFRAs on the sources of flood risk across Sevenoaks District and the flood risk mapping, to assess the risk of flooding to sites within their community. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas.

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A Site Assessment Summary Tables

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B Medway Hydraulic Modelling Report

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C Darent and Cray Hydraulic Modelling Report

D Sites not taken forwards for a Level 2 assessment

Site Name	Wet Day reservoir flood risk	Surface Water 1% AEP plus 45% CC	Percentage in Flood Zone 1
42-44 Bullfinch Lane, Riverhead	0%	7.69%	100%
Bevan Place, Swanley	0%	0%	100%
Currant Hill Allotments, Westerham	0%	0%	100%
Delivery & Post Office / BT Exchange, South Park, Sevenoaks	0%	0%	100%
Edenbridge War Memorial Hospital	0%	0%	100%
Falcon House and grounds, Black Eagle Close, Westerham	0%	0%	100%
Garages, Conifer Way	0%	0%	100%
Grosvenor, Church Road, Hartley	0%	0%	100%
Johnsons, Oak Lane & Hoptarden Lane	0%	0%	100%
Land at Bartram Farm and adjacent to Vestry Road	0%	0%	100%
Land at Mill Farm, West Kingsdown	0%	0%	100%
Land at Millfield Road, West Kingsdown	0%	0%	100%
Land east of Croydon Road (Northern Parcel), Westerham	0%	0%	100%
Land east of Croydon Road (Southern Parcel), Westerham	0%	0%	100%
Land east of Mead Road, Edenbridge	0%	0%	100%
Land south of Farley	0%	0%	100%

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Lane, Westerham			
Land to the west of Manor Lane, Hartley	0%	0%	100%
Oxford Builders Merchants, High Street	0%	0%	100%
Pedham Place, London Road, Swanley	0%	0%	100%
Pinetops, 5 Crownfields	0%	0%	100%
Ryecroft, Ryecroft Road, Otford	0%	0%	100%
School House, Oak Lane & Hoptarden Lane	0%	0%	100%
Seven Acre Farm, Edenbridge	0%	0%	100%
Station Court, Sevenoaks Road, Knockholt	0%	0%	100%
Swanley Centre	0%	0%	100%
The Forge, Ash	0%	0%	100%

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