Maidstone Borough Council Level 1 SFRA update and Level 2 SFRA

Final report

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Maidstone Borough Council

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Revision History

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Version 3 / August 2020	Final Report	Gavin Ball (Maidstone Borough Council)

Contract

This report describes work commissioned by Maidstone Borough Council. Maidstone Borough Council's representative for the contract was Gavin Ball. Ffion Wilson and Anna Hastings of JBA Consulting carried out this work.

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Purpose

This document has been prepared as an Final Report for Maidstone Borough Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Maidstone Borough Council.

Acknowledgements

We would like to acknowledge the assistance of:

- Maidstone Borough Council
- Kent County Council
- The Environment Agency
- Southern Water
- Upper Medway Internal Drainage Board

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Executive summary

Introduction

This version of the document is based on the information and data available and assessment possible in the elapsed time from the commencement of the project in May 2020.

The study area for this Strategic Flood Risk Assessment (SFRA) is the Maidstone Borough Council's authoritative area. This Level 1 and Level 2 SFRA is an update to the Level 1 SFRA prepared by Mott MacDonald for Maidstone Borough Council in May 2008 and the Level 1 and 2 SFRA addendum prepared by JBA Consulting in 2016.

Maidstone Borough Council is in the process of reviewing the current **Local Plan**[1], which was adopted in 2017. This SFRA report has been prepared to provide comprehensive and supporting evidence for Maidstone Borough Council's emerging Local Plan Review's spatial strategy and draft flood risk policies.

The SFRA update was required to be compliant with the latest guidance described in the 2018 revised National Planning Policy Framework (NPPF) (updated June 2019) and accompanying Planning Practice guidance (PPG). The 2020 SFRA provides flood risk evidence and long-term strategy to support the management and planning of development, protect the environment, deliver infrastructure and promote sustainable communities within the Local Plan Review area. It also supports the selection of site allocations in the emerging Local Plan Review and provides information and guidance to be used in the preparation of Flood Risk Assessments in support of site-specific planning applications.

SFRA objectives

The key objectives of the 2020 Level 1 and 2 SFRA are:

- To take account of best practice, the latest guidance and the most up to date information;
- Using the latest flood risk datasets, assess the flood risk to and from the borough from all sources, now and in the future, as well as assess the impact that cumulative land use changes and development in the area will have on flood risk;
- Identify updated requirements for site-specific flood risk assessments and the application of Sustainable Drainage Systems;
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as part of the evidence base for the Local Plan Review; and
- Provide the flood risk data to inform the application of the Sequential Test and, if necessary, the Exception Test.

SFRA outputs

The Planning Practice Guidance advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

Level 1: 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 2: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the National Planning Policy Framework's Exception Test. In these circumstances the assessment should consider the detailed nature of

1 Maidstone Borough Council (2017) Maidstone Borough Local Plan, available at: http://www.maidstone.gov.uk/__data/assets/pdf_file/0005/171149/Local-Plan-v2-November-2017.pdf [Accessed 16/05/2020]

the actual flood characteristics within a Flood Zone and assessment of the potential effects of other sources of flooding.

This report fulfils the Level 1 SFRA requirements and Level 2 SFRA requirements for sites included in the Local Plan Review where flood risk is a material issue.

To meet the objectives of the SFRA, the following outputs have been prepared.

- A review and update of new and amended data sources.
- Assessment of all potential sources of flooding and the potential impact of climate change on flood risk.
- Mapping areas at risk from other sources including surface water, sewer, ground water, reservoir inundation.
- Mapping of location and extent of functional floodplain
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Guidance for developers including requirements for site-specific flood risk assessments.
- Mapping areas covered by an existing flood alert / warning.
- Mapping of flood defence infrastructure and highlighting areas that need improvements.
- Identify opportunities to reduce flood risk which can be included in the Local Plan Review policies.
- An assessment of surface water management issues and the application of Sustainable Drainage Systems (SuDS).
- High-level screening of proposed development sites against flood risk information.
- An understanding of the level of actual risk affecting development included in the Local Plan Review.

Summary of assessment

Flood risk

- The Local Plan Review area has a long history of flooding, with the main cause being from fluvial sources. The primary source of fluvial flood risk to the borough is the River Medway and its major tributaries, the River Beult and River Teise. This flood risk is the result of high magnitude fluvial flows in the south and west of the borough. The River Medway is also tidally influenced within the lower reaches of the borough.
- The most notable flood events recorded from these rivers occurred in 1927, 1960, 1963, 1968 and 2000. Significant flooding occurred within the borough during Winter 2013/2014 and Winter 2019/20 which included notable flooding from the River Medway.
- Maidstone Borough has also experienced a number of historic surface water / drainage related flood events, which have been attributed to a range of sources. The primary source of surface water flooding was attributed to heavy rainfall overloading highway carriageways and paved areas, drains and gullies, but other sources of flooding were perceived to be from blockages and high water levels impeding free discharge from surface water drains and gullies. The Risk of Flooding from Surface Water (RoFSW) map shows a number of surface water flow paths which predominantly follow topographical flow paths along existing watercourses or dry valleys with some isolated ponding located in low lying areas.
- Up to date data from the Sewer Incident Report Form data supplied by Southern Water indicates a total of 131 recorded flood incidents in Maidstone Borough since 2016. The more frequently flooded postcodes are ME1 5 (38), TN1 2 (36), ME1 4 (17) and ME1 7

(15). However, it is important to recognise that the information does not present whether flooding incidences were caused by general exceedance of the design sewer system, or by operational issues such as blockages

- Historically, groundwater flood events have been recorded across the borough, but these have typically been isolated incidents (note: Boughton Monchelsea has a number of groundwater flood incident reports historically). The JBA Groundwater Flood Map suggests that the highest risk areas are near Eyhorne Street, Harrietsham, Lenham Heath, Marden and Staplehurst.
- The Risk of Flooding from Reservoirs mapping indicates that there are ten reservoirs within the borough and nine reservoirs outside of the borough that could affect the borough in the event of a breach. This includes Leigh Flood Storage Area and Weirwood Reservoir, located at the west of the borough, but most notably Bewl Bridge reservoir located south of the borough.
- There are currently six Flood Alert Areas and 12 Flood Warning Areas in the Local Plan Review area.

Flood defences

Analysis of the Environment Agency's Spatial Flood Defences layer indicates that there are no formal flood defences within the Local Plan Review area. However, defences are located both upstream in Tonbridge and Malling Borough Council (Leigh FSA and East Peckham FSA) and downstream in Tonbridge and Malling Borough Council and Medway Council (tidal flood walls/embankments). A number of structures (walls and embankments) are present which may provide a flood defence function although they are not considered to be formal flood defences.

Climate change

Climate change will not only cause changes in trends and mean values in temperature and rainfall but also increase the chance of occurrence and severity of more extreme wet and dry events. It is important that development is planned with consideration of these extreme events.

Development and flood risk

Information used to support the Sequential and Exception Tests for both Local Plans and Flood Risk Assessments has been documented, along with guidance for planners and developers. Links have been provided for various guidance documents and policies published by other Risk Management Authorities such as the Lead Local Flood Authority and the Environment Agency.

Relevant studies

There are many relevant regional and local key policies which have been considered within the SFRA, such as the North Kent Rivers and Stour Catchment Flood Management Plans, Thames River Basin Management Plan, the Kent County Council Preliminary Flood Risk Assessment, the Kent Local Flood Risk Management Strategy and several Surface Water Management Plans. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

Policy Recommendations

Maidstone Borough Council will take account of the following recommendations with respect to flood risk management when preparing appropriate policy.

A. Development and planning considerations

Sequential approach to development

It is recommended that the sequential approach, which considers all sources of flooding, is adopted for all future developments within the study area where there is flood risk.

New development and re-development of land should seek opportunities to reduce the overall level of flood risk at the site where possible.

Sequential and Exception tests

The SFRA has identified the areas of Maidstone Borough at high risk of flooding from fluvial and surface water (pluvial)sources. Proposed development sites at locations at risk of flooding will be required to satisfy the Sequential and, where necessary, Exception Tests in accordance with the NPPF.

Site-specific Flood Risk Assessments

Site specific Flood Risk Assessments (FRAs) are required by developers to provide a greater level of detail on flood risk and any protection provided by defences and, where necessary, demonstrate the development satisfies part b of the Exception Test.

Where required, developers should undertake more detailed hydrological and hydraulic assessments of the watercourses, including tidal areas, to verify flood extents (including latest climate change allowances) and provide evidence that describes the potential effects of proposed development. The modelling will inform floodplain and development zoning within the site and provide evidence that the Exception Test is satisfied if required. Where a site-specific Flood Risk Assessment (FRA) has produced modelling outlines which differ from the Environment Agency's Flood Map for Planning a full evidence-based review would be required. Where the watercourses are embanked, the effect of overtopping and breach must be considered and appropriately assessed.

All new development within the 1% AEP (Annual Exceedance Probability) fluvial flood extent including an allowance for climate change (for the lifetime of the development) must not normally result in a net loss of flood storage capacity to avoid cumulative effects. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage. Where proposed development results in a change in building footprint, the developer should normally ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided so the total volume of the floodplain storage is not reduced. Any flood risk management measures should be consistent with the wider catchment policies set out in the Catchment Flood Management Plan, Flood Risk Management Plan, Local Flood Risk Management Strategy and other relevant strategies.

A revised NPPF was published on 24 July 2018 (and last updated on 19 June 2019) setting out the Government's planning policies for England and how these are expected to be applied. This revised framework replaces the previous NPPF published in March 2012.

There are also several guidance documents which provide information on the

requirements for site-specific Flood Risk Assessments:

- **Planning Practice Guidance – Flood Risk and Coastal Change**
- **Standing Advice on Flood Risk (Environment Agency)**[2]
- **Flood Risk Assessment for Planning Applications (Environment Agency)**[3]
- **Site-specific Flood Risk Assessment: CHECKLIST (NPPG, Defra)** [4]

It should be noted that the UK Climate Change Projections 2018 (UKCP18) was published on 26 November 2018. The UKCP18 projections replace the UKCP09 projections and is the official source of information on how the climate of the UK may change over the rest of this century. This resulted in the Environment Agency making several updates to the climate change guidance, the most recent being in March 2020. Further updates are expected within 2020 and when undertaking an FRA, reference should be made to the most up to date climate change allowances provided by the Environment Agency.

Developers should consult with Maidstone Borough Council, Kent County Council, Upper Medway Internal Drainage Board, the Environment Agency and Southern Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

B. Surface water management and SuDS

Planners should be aware of the conditions and requirements set by Kent County Council as the Lead Local Flood Authority for surface water management and ensure development proposals and applications are compliant with the Kent County Council Drainage and Planning Policy.

C. Review of planning applications

The Council should consult the Environment Agency's **Flood Risk Assessment: Local Planning Authorities**[5], and any subsequent updates when reviewing planning applications for proposed developments at risk of flooding.

The Council will consult the relevant statutory consultees as part of the planning application process and they may, in some cases, also contact non-statutory consultees (e.g. Southern Water) that have an interest in the planning application. The Council will, when appropriate consult with the Upper Medway Internal Drainage Board (UMIDB) with respect to flood related and water level management aspects. The UMIDB can have more detailed local knowledge on the performance and characteristics of particular water features in the authority area.

D. Infrastructure and safe access

Minimum finished floor levels for development that does not include sleeping

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2 Department for Environment, Food & Rural Affairs and Environment Agency (2019) Preparing a flood risk assessment: standing advice, available at: https://www.gov.uk/guidance/flood-risk-assessment-standing-advice [Accessed 09/06/2020]

3 Department for Environment, Food & Rural Affairs and Environment Agency (2014) Flood risk assessments if you're applying for planning permission, available at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications [Accessed 09/06/2020]

4 Ministry of Housing, Communities & Local Government (2014) Flood risk and coastal change, available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section [Accessed 09/06/2020]

5 Department for Environment, Food & Rural Affairs and Environment Agency (2015) Review individual flood risk assessments: standing advice for local planning authorities, available at: https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities [Accessed 09/06/2020]

accommodation on the ground floor should normally be set to whichever is higher of the following:

- A minimum of 300mm above the fluvial 1% AEP + 35% climate change level.
- The fluvial 1% AEP + 70% climate change level.
- A minimum of 300mm above the tidal 0.5% AEP level, and appropriate allowance should be made for climate change based on the vulnerability classification of the development.
- A minimum of 300mm above the general ground level of the site.

Finished Floor Levels for sleeping accommodation should normally be set to whichever is higher of the following:

- A minimum of 600mm above the fluvial 1% AEP + 35% climate change level.
- The fluvial 1% AEP + 70% climate change level.
- A minimum of 600mm above the tidal 0.5% AEP level plus an allowance for climate change.

Climate change uplifts noted above are for the 2080s (2070 to 2115) epoch for fluvial and 2096-2125 epoch for coastal – these are generally appropriate for residential development. However, the lifetime of the proposed development should be used to decide which future time period to use.

If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches. Where no detailed flood modelling is available, an FRA would be required to estimate the flood level and subsequent Finished Floor Level. Additional freeboard may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA.

The use of basements should be avoided. Habitable uses of basements within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

Safe access and egress will need to be demonstrated at all development sites. Emergency vehicular access should be possible during times of flood.

Resilience measures will be required if buildings are situated in the flood risk area, and opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought.

E. Residual risk

Although there are no formal flood defences in the borough, there are defences located upstream in Tonbridge and Malling Borough Council (Leigh FSA and East Peckham FSA) and downstream in Tonbridge and Malling Borough Council and Medway Council (tidal flood walls/embankments). The probability of failure of defences is reduced by the actions of the defence owners in maintaining these, but there remains a residual risk from flooding. Should defences form part of future development plans within the borough, it would be necessary that assessment of the 'residual' risk of defence failure (e.g. breach) be considered. It may also be important to understand how existing defences outside of the borough may influence flood risk at a future development site.

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities

regarding emergency plans in case of reservoir breach.

F. Future flood management

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity / ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not normally be permitted.

The information provided in the SFRA should be used as a basis for investigating potential strategic flood risk solutions within the study area. Opportunities could consist of the following:

- Catchment and floodplain restoration;
- Flood storage areas;
- Opening up culverts, weir removal, and river restoration;
- The Regional Habitat Creation Programme;
- Green infrastructure; and
- Preserving the function of surface water flood routes where appropriate.

For successful future flood risk management, it is recommended that the Council adopts a catchment partnership working approach in tackling flood risk and environmental management.

Potential modelling improvements

The Environment Agency regularly reviews its flood risk mapping, and it is important to make contact to determine whether updated (more accurate) information is available prior to commencing a site-specific Flood Risk Assessment. Due to the publication of the UKCP18 the Environment Agency is continuing to update their climate change guidance. The Environment Agency should be contacted for the latest guidance on climate change modelling outputs for Flood Risk Assessments.

When using the SFRA to prepare FRAs it is important to check that the most up to date information is used, as is described in amendments to the flood mapping prepared and issued by the Environment Agency at regular intervals.

Use of Strategic Flood Risk Assessment data

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. This relates both to the current risk of flooding from rivers and surface water and where available the potential effects of future climate change.

Other datasets used to inform this SFRA may also be periodically updated and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities.
Recommendations and details on how to apply the Sequential and Exception tests using the data set out in this report are provided in Appendix N - Guide to using technical data.

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Abbreviations and glossary of terms

	Definition
AEP	Annual Exceedance Probability - the chance of an event with a particular magnitude occurring in each and every year
AOD	Above Ordnance Datum
AONB	Area of Natural Beauty
BSI	British Standards Institution
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
Defra	Department of the Environment, Food and Rural Affairs
FAA	Flood Alert Area
FCRMGiA	Flood and Coastal Risk Management Grant in Aid
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FSA	Flood Storage Area
FWMA	Flood and Water Management Act
FWA	Flood Warning Area
FWS	Flood Warning Service
FZ	Flood Zone
GI	Green Infrastructure
GIS	Geographic Information Service
GSPZ	Groundwater Source Protection Zone
JBA	Jeremy Benn Associates
KCC	Kent County Council
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
MBC	Maidstone Borough Council
NFF	National Flood Forum
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NRIM	National Reservoir Inundation Mapping
NVZ	Nitrate Vulnerable Zones
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.

PFRA	Preliminary Flood Risk Assessment
PFR	Property Flood Resilience
PPG	Planning Practice Guidance
RBMP	River Basin Management Plan
Resilience measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SIRF	Sewage Incident Reporting Form
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKCP18	United Kingdom Climate Projections 2018
UMIDB	Upper Medway Internal Drainage Board
WFD	Water Framework Directive

1 Introduction

1.1 Maidstone Borough

Maidstone Borough covers an area of approximately 400km^2 and has an estimated population of over 170,000[6]. The location of Maidstone Borough is shown within Figure 1-1. The largest settlement is the town of Maidstone in the north west of the borough. There are numerous smaller settlements in the borough include Harrietsham, Headcorn, Lenham, Marden, Staplehurst, Boughton Monchelsea, Coxheath, Eyhorne Street (Hollingbourne), Sutton Valence and Yalding.

There is approximately 70km of Main River in Maidstone Borough. The main watercourse flowing through the borough is the River Medway and major tributaries include the River Beult and the River Teise, which join the Medway at Yalding upstream of Maidstone Town. Other watercourses in the borough include River Len, Lesser Teise, Loose Stream, Paddock Wood Stream, Coult Stream and Great Stour.

1.2 Purpose of the Strategic Flood Risk Assessment

> "Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."
>
> (National Planning Policy Framework (2018), Section 14 paragraph 156)

Maidstone Borough Council is in the process of reviewing the current **Local Plan**[7], which was adopted in 2017. This will comply with the National Planning Policy Framework (NPPF) requirement to review Local Plans every 5 years. The reviewed Plan will cover the period 2022-2037.

The purpose of the 2020 Level 1 and 2 Strategic Flood Risk Assessment (SFRA) is to provide a robust, comprehensive and appropriate evidence base for Maidstone Borough's emerging Local Plan Review's spatial strategy and draft flood risk policies.

This 2020 SFRA is an update to the Level 1 SFRA prepared by Mott MacDonald for Maidstone Borough Council in May 2008 and the Level 1 and 2 SFRA addendum undertaken by JBA Consulting in 2016. The 2020 SFRA also includes a Level 2 assessment.

The SFRA update was required to be compliant with the latest guidance described in the 2018 update to the National Planning Policy Framework (NPPF), support the selection of site allocations in the Local Plan Review and to provide information and guidance to be used in the preparation of Flood Risk Assessments (FRAs) in support of site specific planning applications.

A **revised NPPF**[8] was published on 24 July 2018 (last updated on 19 June 2019) and sets out the Government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous NPPF published in March 2012.

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6 Kent County Council (2018), Population and Census, available at: https://www.kent.gov.uk/about-the-council/information-and-data/Facts-and-figures-about-Kent/population-and-census#tab-1 [Accessed 12/05/2020]

7 Maidstone Borough Council (2017) Maidstone Borough Local Plan, available at: http://www.maidstone.gov.uk/__data/assets/pdf_file/0005/171149/Local-Plan-v2-November-2017.pdf [Accessed 16/05/2020]

8 Ministry of Housing, Communities & Local Government (2019) Revised National Planning Policy Framework, available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed 15/05/2020]

1.3 SFRA objectives

The key objectives of the 2020 Level 1 SFRA update and Level 2 SFRA are:

- To take account of best practice, the latest guidance and the most up to date information;
- Using the latest flood risk datasets, assess the flood risk to and from the borough from all sources, now and in the future, as well as assess the impact that cumulative land use changes and development in the area will have on flood risk;
- Identify updated requirements for site-specific flood risk assessments and the application of Sustainable Drainage Systems;
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as part of the evidence base for the Local Plan Review; and
- Provide the flood risk data to inform the application of the Sequential Test and, if necessary, the Exception Test.

1.4 Levels of SFRA

The Planning Practice Guidance advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

Level 1: 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 2: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the National Planning Policy Framework's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This report fulfils the Level 1 and 2 SFRA requirements.

1.5 SFRA outputs

To meet the objectives, the following outputs have been prepared:

- A review and update of new and amended data sources.
- Assessment of all potential sources of flooding and the potential impact of climate change on flood risk based on updated datasets.
- Mapping areas at risk from other sources including surface water, sewer, ground water, reservoir inundation using updated datasets.
- Mapping of location and extent of functional floodplain.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- High-level screening of proposed development sites against flood risk information.
- Updated guidance for developers including requirements for site-specific flood risk assessments.
- Mapping areas covered by an existing flood alert / warning.
- Mapping of flood defence infrastructure and highlighting areas that need improvements.
- Identification of opportunities to reduce flood risk which can be included in the Local Plan Review policies.
- Updated assessment of surface water management issues and the application of Sustainable Drainage Systems (SuDS).

1.6 Consultation

The following parties have been consulted during the preparation of this Level 1 SFRA:

- Maidstone Borough Council
- Kent County Council
- Environment Agency
- Southern Water
- Neighbouring authorities (Tunbridge Wells District Council, Ashford Borough Council, Tonbridge and Malling Borough Council, Swale Borough Council and Medway Council)
- Upper Medway Internal Drainage Board
- Natural England

1.7 SFRA user guide

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed.
2. The Planning Framework and Flood Risk Policy	Provides an overview of the planning framework, flood risk policy and flood risk responsibilities.
3. Roles and Responsibilities of Risk Management Authorities	The roles and responsibilities of Risk Management Authorities (RMAs) in Maidstone Borough.
4. The Sequential, risk-based approach	Describes the Sequential Approach and application of Sequential and Exception Tests. Outlines cross boundary issues and considerations.
5. Climate change	Outlines climate change guidance and the implications for Maidstone Borough.
6. Sources of information used in preparing the SFRA	Outlines what information has been used in the preparation of the SFRA.
7. Understanding flood risk in the Local Plan Review area	Introduces the assessment of flood risk and provides an overview of the characteristics of flooding affecting the borough. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered.
8. Fluvial and tidal defences	Assessment of existing flood defences and flood risk management measures.
9. FRA requirements and flood risk management guidance	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Provides guidance for developers and outlines conditions set by the Lead Local Flood Authority (LLFA) and the Environment Agency that should be followed.

10. Surface water management and SuDS	Advice on managing surface water run-off and flooding and the application of SuDS.
11. Flood warning and emergency planning	Outlines the flood warning service in the SFRA area and provides advice for emergency planning, evacuation plans and safe access and egress.
12. Strategic flood risk solutions	Overview of possible strategies to reduce flood risk.
13. Level 1 sites assessment	A summary of the information presented in the site screening table, an overview of areas where flood defences may need improvements to reduce flood risk to the development sites, and an overview of the cumulative impacts of development in the study area.
14. Level 2 Assessment	An assessment of the sites included in the Local Plan Review where flood risk is a material issue
15. Summary	Review of the Level 1 SFRA.
16. Recommendations	Identifies recommendations for the council to consider as part of Flood Risk Management policy.
Appendix A-J: Flood risk mapping	Maps showing flood risk information from all sources.
Appendix K: Level 1 Site Screening table	Screening table showing the flood risk from all sources to the Level 1 development sites.
Appendix L: Flood mapping for sites where a detailed Level 2 Assessment is not required	Flood mapping for sites where a detailed Level 2 Assessment is not required and a sequential approach to development at a site level should be undertaken (
Appendix M: Level 2 site summary sheets	Flood risk summary tables and mapping for each Level 2 SFRA site
Appendix N: Guide to using technical data	Table advising developers on how to use the available flood risk information.

1.8 Use of SFRA data

It is important to recognise that SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the Local Plan and any future flood risk policies.

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

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

Advice to users has been highlighted in **amber boxes** throughout the document.

SFRAs should be a 'living document', and as a result should be updated when new information on flood risk, new planning guidance or legislation becomes available. New information on flood risk may be provided by Maidstone Borough Council, Kent County

Council, the Environment Agency and Southern Water. Such information may be in the form of:

- New hydraulic modelling results
- Flood event information following a flood event
- Policy / legislation updates
- Environment Agency flood map updates
- New flood defence schemes etc.

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

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

Appendix N contains a guide to using the technical data presented within this SFRA, further explaining how SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for Sequential and Exception Tests.

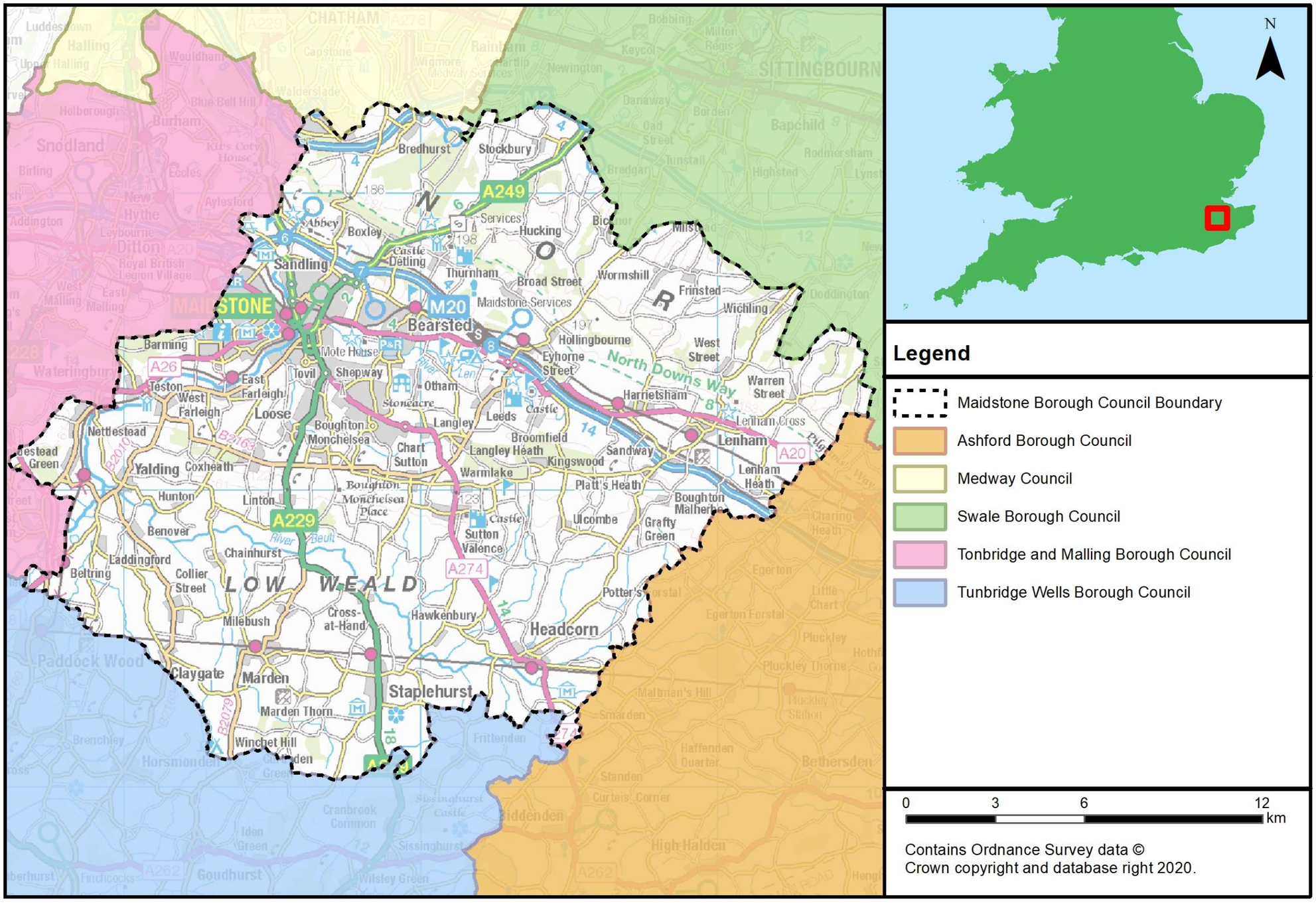

Figure 1-1: Maidstone Borough Council and neighbouring authorities

2 Flood risk policy and strategy

This section sets out the relevant legislation, policy and strategy for Flood Risk Management in Maidstone Borough and the context with respect to planning policy.

2.1 Introduction

This chapter describes flood risk and water management policy that should be considered when planning new development or preparing planning applications. The legislation, policy and requirement to perform assessments of risk is relevant for existing and proposed infrastructure and introduces the potential need to take account of material issues that affect the level of risk both now and in the future. Chapter 4 of the SFRA contains details of specific planning policy and guidance that must be considered in this context.

2.2 Key Legislation for flood and water management

2.2.1 Flood Risk Regulations (2009) and Preliminary Flood Risk Assessments

The **Flood Risk Regulations 2009**[9] translate the **EU Floods Directive**[10] into UK law. The EU requires Member States to complete an assessment of flood risk (known as a Preliminary Flood Risk Assessment (PFRA)) and then use this information to identify areas where there is a significant risk of flooding. For these Flood Risk Areas, States must then undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans.

LLFAs and the Environment Agency have the task of preparing a Preliminary Flood Risk Assessment (PFRA) report every 6 years. As the LLFA, Kent County Council must review the flood risk from local flood sources which includes surface water, groundwater and ordinary watercourses. The Environment Agency must review the flood risk from fluvial and coastal flood risks.

The LLFA **PFRA document**[11] that covers the study area was first published by Kent County Council (KCC) as the LLFA in 2011. The PFRA is a high-level screening exercise and considers floods which have significant harmful consequences for human health, economic activity, the environment and cultural heritage. The Regulations require the LLFA to identify significant Flood Risk Areas. The threshold for designating significant Flood Risk Areas is defined by Defra and the PFRA is the process by which these locations can be identified. Of the ten national Indicative Flood Risk Areas that were identified by the Defra/Environment Agency, one was found to encroach on the administrative area of Maidstone Borough Council. However, given that the Flood Risk Area is primarily located in Chatham and Gillingham, the Flood Risk Area was amended to the Medway Council administrative boundary and does not include any parts of Kent County Council.

In 2017, KCC prepared an **addendum**[12] to the PFRA which updated the 2011 report. The report concluded that no flood events have altered the understanding of significant flood risks in Kent, according to the criteria established by Defra.

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9 UK Government, Flood Risk Regulations (2009), available at http://www.legislation.gov.uk/uksi/2009/3042/contents/mad, [Accessed 10/07/2020]

10 European Union, The EU Floods Directive, available at: https://ec.europa.eu/environment/water/flood_risk/ [Accessed 10/07/2020]

11 Kent County Council (2011) Preliminary Flood Risk Assessment, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0013/12091/Preliminary-flood-risk-assessment.pdf, [Accessed 15/05/2020]

12 Kent County Council (2017) Preliminary Flood Risk Assessment Addendum, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698611/PFRA_Kent_County_Council_2017.pdf, [Accessed 15/05/2020]

The exercise was also carried out in 2018 by the Environment Agency and a further **national study**[13] was prepared to identify potential areas of significant flood risk ("Flood Risk Areas"). One Flood Risk Area was identified within the borough located to the south of Yalding.

2.2.2 Flood and Water Management Act (FWMA) 2010

The **Flood and Water Management Act (FWMA)**[14] was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for upper tier authorities, as LLFAs, designed to provide a strategic overview of local flood risk (from surface water, ground water and ordinary watercourses) and to provide a national overview role of all flood risk for the EA.

The content and implications of the FWMA provide opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

2.2.3 Water Framework Directive & Water Environment Regulations & Water Environmental Regulations (2017)

The purpose of the **Water Framework Directive**[15] (WFD), which was transposed into English Law by the **Water Environment Regulations**[16] (first published in 2003 and updated in 2017), is 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 (RBMP) (see section 2.3.3), which were last published in 2015 and are currently being updated.

2.2.4 Local 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.

Southern Region Land Drainage Byelaws

The Maidstone Local Plan Review area is covered by the **Southern Region Land Drainage Byelaws**[17] and enforced by the Environment Agency. These Byelaws have effect on functions relating to land drainage in the Southern Water Authority for any Main River or sea and tidal defences.

Byelaws relating to Main Rivers within the Southern Region cover river control works, the flow of water in rivers, the duties of riparian owners, operations in rivers/ on banks and the placing of vessels in rivers. Byelaws relating to sea and tidal defences within the region cover the prevention of interference with defences, the maintenance and alteration of

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13 Environment Agency (2018) Preliminary Flood Risk Assessment for England, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/764784/English_PFRA_December_2018.pdf [Accessed 15/05/2020]

14 UK Government, Flood and Water Management Act 2010, available at https://www.legislation.gov.uk/ukpga/2010/29/contents, [Accessed 10/07/2020]

15 European Union, The EU Water Framework Directive, available at https://ec.europa.eu/environment/water/water-framework/index_en.html, [Accessed 10/07/2020]

16 UK government, The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, available at http://www.legislation.gov.uk/uksi/2003/3242/contents/made, [Accessed 10/07/2020]

17 Environment Agency, Thames land drainage and sea defence byelaws, available at: https://www.gov.uk/government/publications/environment-agency-land-drainage-and-sea-defence-byelaws [Accessed 09/06/2020]

defences and the control of animals, vessels or acts affecting sea defences (e.g. erections and excavations).

Compliance to these standards must be demonstrated by any developer planning works within proximity of a Main River or sea/tidal defence within the Local Plan Review area.

Upper Medway Internal Drainage Board Land Drainage Byelaws

The **Upper Medway Internal Drainage Board Land Drainage Byelaws**[18] help secure the efficient working of the drainage system. The byelaws set out what can and cannot be done adjacent to IDB adopted watercourses within the drainage district without the Board permission.

2.2.5 Additional Legislation

Additional legislation relevant to development and flood risk in Maidstone Borough include:

- The Town and Country Planning Act (1990) and the Water Industry Act (1991). These set out the roles and responsibilities for organisations that have a role in Flood Risk Management (FRM).
- The Environmental Permitting Regulations (2018). This sets 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.
- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

Table 2-1 summarises relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. Figure 2-1 demonstrates how these documents link together. Hyperlinks are provided to external documents. These documents may:

- Provide useful and specific local information to inform Flood Risk Assessments within the local area.
- Set the strategic policy and direction for Flood Risk Management (FRM) 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 FRM and drainage in the District.
- Provide guidance and/ or standards that informs how a developer should assess flood risk and/ or design flood mitigation and SuDS.

The following sections outline the existing flood risk management policies and guidance for Maidstone Borough

18 Upper Medway Internal Drainage Board, Upper Medway Internal Drainage Board Land Drainage Byelaws, available at http://www.medwayidb.co.uk/wp-content/uploads/2018/12/Upper-Medway-Byelaws.pdf [Accessed 09/06/2020]

Table 2-1: National, regional and local key flood risk policy and strategy documents

	Document, lead author and date	Relevant direct legislation	Information	Policy and measures	Development design requirements	Next update due
National	**National Flood and Coastal Erosion Management Strategy** (Environment Agency) 2020	FWMA (Section 2.2.2)	No	Yes	No	2020
	Natural Flood Management Plans (Environment Agency)	N/A	Yes	No	No	-
	National Planning Policy Framework / Guidance (MHCLG) 2019/2014	Planning and Compulsory Purchase Act 2004 as amended & The Town and Country Planning (Local Planning) (England) Regulations 2012 as amended	No	No	Yes	-
Regional	**Thames River Basin Management Plan** (Environment Agency) 2015	WFD (Section 2.2.3)	No	Yes	No	2021
	Thames River Basin District Flood Risk Management Plan and the **South East River Basin District Flood Risk Management Plan** (Environment Agency) 2016	Flood Risk Regulations (Section 2.2.1)	No	Yes	No	2021
	River Medway/ North Kent Rivers/ Stour Catchment Flood Management Plans (Environment Agency) 2009	N/A	Yes	Yes	No	-
	Climate Change guidance for development and flood risk (Environment Agency) 2019	N/A	No	No	Yes	2020
Local	Drainage and Wastewater Management Plans (Southern Water) due 2023	N/A	Yes	Yes	Yes	2023
	Kent Local Flood Risk Management Strategy (KCC) 2017	FWMA (Section 2.2.2)	Yes	No	No	2023
	Kent County Council Drainage and Planning Policy (KCC) 2019	FWMA (Section 2.2.2)	Yes	No	Yes	-
	Maidstone Borough Council Water Cycle Study Outline Report (MBC) 2010	N/A	Yes	No	No	-
	Maidstone/ Maidstone & Malling/ Headcorn/ Staplehurst/ Marden Surface Water Management Plans (KCC) 2015/2016/2015	N/A	No	Yes	No	-

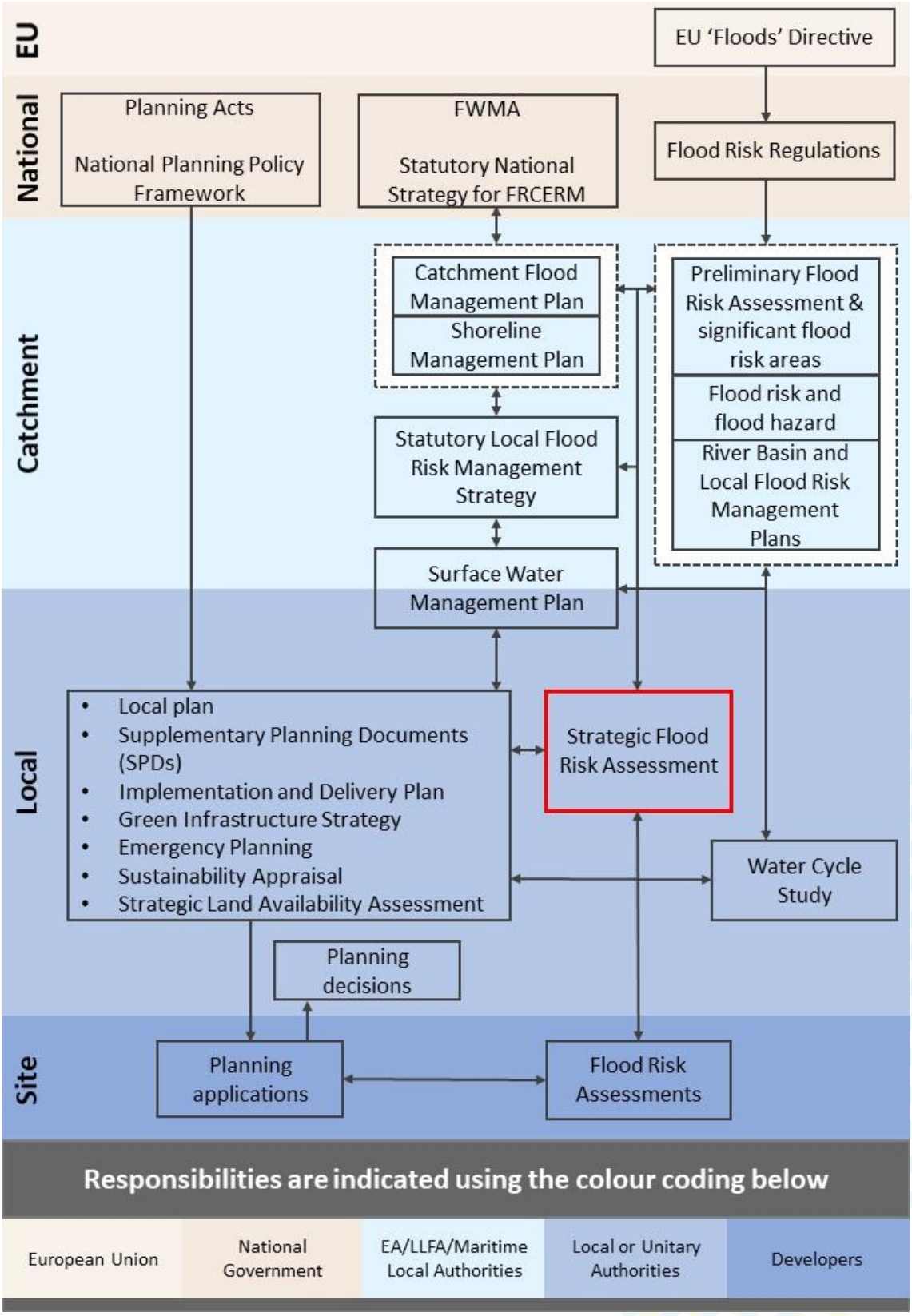

Figure 2-1: Strategic planning links and key documents for flood risk

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

The **National Flood and Coastal Erosion Risk Management Strategy (FCERM)**[19] or England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The new Strategy has been in preparation since 2018. The Environment Agency brought together a wide range of stakeholders to develop the strategy collaboratively. The Strategy is much more ambitious than the previous one from 2011 and looks ahead to 2100 and the action 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 and a nation ready to respond and adapt to flooding and coastal change. Measures include updating the national river, coastal and surface water flood risk mapping and the understanding of long term investment needs for flood and coastal infrastructure, trialling new and innovative funding models, flood resilience pilot studies, developing an adaptive approach to the impacts of climate change, seeking nature based solutions towards flooding and erosion issues, integrating natural flood management into the new Environmental Land Management scheme, considering long term adaptive approaches in Local Plans, maximising the opportunities for flood and coastal resilience as part of contributing to environmental net gain for development proposals, investing in flood risk infrastructure that supports sustainable growth, aligning long term strategic planning cycles for flood and coastal work between stakeholders, mainstreaming property flood resilience measures and 'building back better' after flooding, consistent approaches to asset management and record keeping, updating guidance on managing high risk reservoirs in light of climate change, critical infrastructure resilience, education, skills and capacity building, research, innovation and sharing of best practise, supporting communities to plan for flood events, develop world leading ways of reducing the carbon and environmental impact from the construction and operation of flood and coastal defences, development of digital tools to communicate flood risk and transforming the flood warning service and increasing flood response and recovery support.

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a New National Policy Statement for Flood and Coastal Erosion Risk Management. The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

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

2.3.2 Natural Flood Management Plans

The Environment Agency has developed **Natural Flood Management** (NFM) 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,

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[19] The Environment Agency and Defra (2020) National FCERM Strategy for England, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/899498/National_FCERM_strategy_for_England.pdf [Accessed 26/08/2020]

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.
- These catchments cross boundaries between the Rother Local Plan area and other neighbouring authorities. Discussions about NFM should be had with catchment stakeholders in combination with local knowledge.

2.3.3 River Basin Management Plans

River Basin Management Plans (RBMPs) are prepared under the WFD (Section 2.3.3) and assesses the pressure facing the water environment in River Basin Districts. The WFD aims to achieve at least 'good' status for all water bodies by 2015. The Maidstone Borough Council area falls within the Thames River Basin District.

Thames River Basin Management Plan (2015)

The second cycle of **The Thames RBMP**[20] was published in February 2016, replacing the previous version published in 2009. The document provides information on the following:

- Current state of the water environment
- Pressures affecting the water environment
- Environmental objectives for protecting and improving waters
- Programme of measures. And actions needed to achieve the objectives
- Progress since the 2009 plan

The Thames RBMP identified a number of significant water management issues, including:

- Physical modifications
- Pollution from wastewater
- Pollution from towns, cities and transport
- Changes to the natural flow and level of water
- Negative effects of invasive non-native species
- Pollution from rural areas

The RBMP describes how development planning needs to consider a number of issues relevant to the RBMP including housing locations, sewage treatment options, initiatives to reduce flow to sewage works, water efficiency measures and the reduction of nutrients from diffuse pollution.

The RBMP notes that 11% of water bodies in the Thames River Basin District currently have a 'good or better' overall status, which is expected to increase to 13% by 2021. However, this 'good or better' overall status is forecast to increase notably for the extended deadline of 2027 reported in the RBMP.

20 Environment Agency and Defra (2015) River Basin Management Plan Thames River Basin District, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289937/geth0910bswa-e-e.pdf, [Accessed 15/05/2020]

2.3.4 Flood Risk Management Plans

Under the Flood Risk Regulations (Section 2.2.1), Flood Risk Management Plans (FRMPs) are part of the six-year cycle of assessment, mapping and planning required under the Flood Risk Regulations. Under the Regulations, it is a requirement for the Environment Agency to prepare and publish a Flood Risk Management Plan (FRMP) for risk from rivers, reservoirs and the sea. The FRMP process adopts the same catchments as used in the preparation of River Basin Management Plans, in accordance with the Water Framework Directive.

The FRMP process adopts the same catchments as used in the preparation of River Basin Management Plans (as prepared to meet the requirements of the Water Framework Directive). The Local Plan Review Area lies largely within the North Kent Catchment area of the Thames River Basin District, though part of the south east of the borough is located within the Stour Catchment area of the South East River Basin.

More detailed strategic information on proposed strategic measures and approaches can be found in the **Thames River Basin District Flood Risk Management Plan**[21] (2016) – Parts A, B and C and the **South East River Basin District Flood Risk Management Plan**[22] (2016) – Parts A, B and C. The FRMPs draw on previous policies and actions identified in the Catchment Flood Management Plans and also incorporate information from Local Flood Risk Management Strategies.

Flood Risk Management Plans are now being updated for the second cycle of implementation of the Floods Directive. They will be published by December 2021.

2.3.5 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency 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 six national policies are:

- No active intervention (including flood warning and maintenance). Continue to monitor and advise.
- Reducing existing flood risk management actions (accepting that flood risk will increase over time).
- Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
- Take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change).
- Take action to reduce flood risk (now and/or in the future)

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21 Environment Agency (2016) Thames river basin district flood risk management plan, available at: https://www.gov.uk/government/publications/thames-river-basin-district-flood-risk-management-plan [Accessed 29/05/2020]

22 Environment Agency (2016) South East river basin district flood risk management plan, available at: https://www.gov.uk/government/publications/south-east-river-basin-district-flood-risk-management-plan [Accessed 29/05/2020]

- Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

The CFMPs covering Maidstone Borough and the relevant sub-areas with assigned national policies are shown in Figure 2-2.

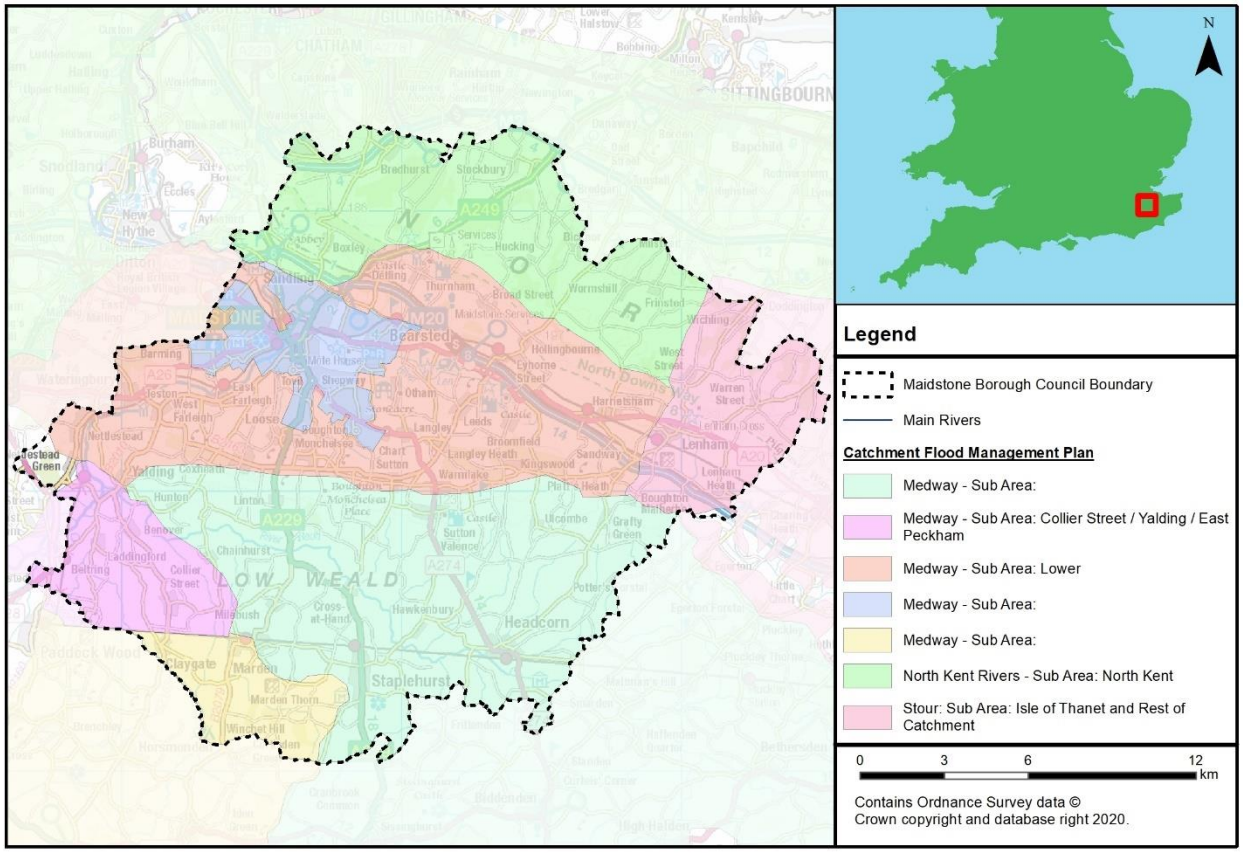

Figure 2-2: CFMPs policy units covering Maidstone Borough

River Medway CFMP (2009)

The majority of the borough is covered by the **River Medway CFMP**[23]. The primary policy units for Maidstone Borough are:

- Sub Area 5: Collier Street/Yalding/East Peckham – Policy Option 5
- Sub Area 6: Teise – Policy Option 3
- Sub Area 7: Beult – Policy Option 3
- Sub Area 8: Lower Medway – Policy Option 3
- Sub Area 9: Maidstone – Policy Option 5

Policy Option 3 is for areas of low to moderate flood risk where the Environment Agency are generally managing existing flood risk effectively.

Policy Option 5 is for areas of moderate to high flood risk where the Environment Agency can generally take further action to reduce flood risk.

23 Environment Agency (2009) River Medway Catchment Flood Management Plan, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/293890/Medway_Catchment_Flood_Management_Plan.pdf [Accessed 15/05/2020]

The CFMP provides a starting point for measures being considered strategically to manage flood risk within its area. To that end, an important consideration of the NPPF for Maidstone Borough relates to safeguarding land from development that is required for current and future flood management.

North Kent Rivers CFMP (2009)

The northern section of the borough is covered by the **North Kent Rivers CFMP**[24]. The primary policy unit for Maidstone Borough are:

- Sub Area 5: North Kent Downs – Policy Option 1

Policy Option 1 is for areas where there are very few properties at risk of flooding and the Environment Agency will continue to monitor and advise.

The CFMP notes that the sub-area covers the upper reaches of several watercourses in the North Kent Downs and that flood risk in this area is low as no flood damage was identified and no people or property were affected by flooding.

Stour CFMP (2009)

The eastern most section of the borough is covered by the Stour CFMP10. The primary policy units for Maidstone Borough are:

- Sub Area 9: Isle of Thanet and Rest of Catchment – Policy Option 1

Policy Option 1 is for area where there are very few properties at risk of flooding and the Environment Agency will continue to monitor and advise.

The CFMP notes that there has been little or no risk of flooding from rivers, surface water or foul water flooding.

2.3.6 Kent Local Flood Risk Management Strategy 2017-2023

Under the Flood and Water Management Act (Section 2.2.2), LLFA's are required to develop, maintain, apply and monitor a Local Flood Risk Management Strategy (LFRMS). Kent County Council as the LLFA are responsible for the LFRMS for Kent, which includes the Local Plan area. The **Kent Local Flood Risk Management Strategy 2017-2023**[25] (2017) sets out the strategic vision for local flood risk management in Kent. The 2017 LFRMS builds upon the previous version of the Kent County Council Local Flood Risk Management Strategy, published in 2013. The aims of the local strategy are:

- To support and improve the safety and wellbeing of Kent's residents and the economy of Kent through appropriate flood risk management;
- To ensure effective partnership working and deliver appropriate flood risk management in Kent; and
- To contribute to sustainable development, regeneration and land management in Kent through the promotion of sustainable flood risk management practices that utilise natural processes where appropriate.

2.3.7 Water Cycle Studies

Future changes in climate and increases in new development are expected to exert greater pressure on the existing wastewater supply and infrastructure. A large number of new homes for instance may cause the existing water supply infrastructure to be overwhelmed which would result in adverse effects on the environment both locally and in wider

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24 Environment Agency (2009) North Kent Rivers Catchment Flood Management Plan available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/293893/North_Kent_rivers_Catchment_Flood_Management_Plan.pdf *[Accessed 15/05/2020]*

25 Kent County Council (2017) Kent Local Flood Risk Management Strategy, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0010/79453/Local-Flood-Risk-Management-Strategy-2017-2023.pdf, [Accessed 29/05/2020]

catchments. Planning for water management therefore has to take these potential challenges into account.

Water Cycle Studies (WCS) assist local authorities to select and develop sustainable development allocations so that there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk. This can be achieved in areas where there may be conflict between any proposed development and requirements of the environment through the recommendation of potential sustainable solutions.

Maidstone Borough Council prepared a **Water Cycle Study Outline Report**[26] in June 2010 as part of their planning process following the borough's designation as a Growth Point for significant new development. The document highlights that there were some potential constraints to development, related to the capacity of the sewerage network in Maidstone Town. It is noted that if a solution is not found, the number of new homes that can be provided in and around Maidstone Town will be seriously restricted, particularly for potential sites in the south-east area adjacent to the town. Furthermore, it is considered that the limited capacity of the wastewater treatment plant at Headcorn will restrict the number of new homes that can be provided in the area, and similar restrictions may occur at Yalding and Harrietsham. The WCS should be consulted to understand and manage potential impacts of a proposed develop on the environment, water quality, water resources, infrastructure and flood risk.

2.3.8 LLFAs, surface water and SuDS

On 18 December 2014 a **Written Ministerial Statement**[27] from the Secretary of State for Communities and Local Government set out changes to the planning process that would apply for major development from 6 April 2015. These were implemented in the **Town and Country Planning (Development Management Procedure) (England) Order 2015**[28].

Major developments are defined as:

- Residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known; and
- Non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres or more or, where the floor area is not yet known, a site area of 1 hectare or more.

When considering planning applications, Local Planning Authorities should consult the LLFA on the management of surface water so that:

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

As LLFA, KCC has a strategic overview role for local flood risk, which involves flooding from surface water, groundwater and ordinary watercourses. The **Kent County Council Drainage and Planning Policy**[29] sets out the requirements that KCC has for drainage

26 Halcrow group Limited, (June, 2010), Maidstone Borough Council Water Cycle Study – Outline Report, available at: http://www.maidstone.gov.uk/__data/assets/pdf_file/0019/12088/Water-Cycle-Study-Outline-Report-2010.pdf [Accessed 15/05/2020]

27 UK Parliament (2014) Sustainable drainage systems: Written statement, available at: https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ [Accessed 29/05/2020]

28 UK Parliament (2015) The Town and Country Planning (Development Management Procedure) (England) Order 2015, available at: http://www.legislation.gov.uk/uksi/2015/595/contents/made [Accessed 29/05/2020]

29 Kent County Council (2019) Drainage and Planning Policy, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0003/49665/Drainage-and-Planning-policy-statement.pdf [Accessed 29/05/2020]

strategies and surface water management provisions relating to development applications. A new guidance document is currently being prepared by Kent County Council to provide guidance on run-off from new development. The emerging document should be referred to for the latest requirements for development applications once available.

2.3.9 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. They are produced to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from surface runoff, groundwater, and ordinary watercourses. SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments. The action plan from SWMPs should be reviewed and updated as a minimum every six years.

Surface Water Management Plans (SWMPs) applicable to Maidstone Borough are:

- **Maidstone and Malling Stage 1 SWMP (2012)**[30]
- **Maidstone Stage 1 SWMP (2013)**[31]
- **Headcorn Stage 2 SWMP (2017)**[32]
- **Marden Stage 2 SWMP (2017)**[33]
- **Staplehurst Stage 2 SWMP (2017)**[34]

The outcomes and actions from each of these SWMPs should be considered in the context of proposed developments within the area of Maidstone Borough.

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30 JBA Consulting (2012) Maidstone and Malling surface water management plan, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/maidstone-and-malling-surface-water-management-plan [Accessed 29/05/2020]

31 JBA Consulting (2013) Maidstone Stage 1 Surface Water Management Plan, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/maidstone-surface-water-management-plan [Accessed 15/05/2020]

32 JBA Consulting (2017) Headcorn Surface Water Management Plan, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/headcorn-surface-water-management-plan [Accessed 15/05/2020]

33 JBA Consulting (2017) Marden surface water management plan, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/marden-surface-water-management-plan [Accessed 15/05/2020]

34 JBA Consulting (2017) Staplehurst surface water management plan, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/staplehurst-surface-water-management-plan [Accessed 15/05/2020]

3 Roles and responsibilities of Risk Management Authorities

This section sets out the relevant legislation, policy and strategy for Flood Risk Management in Maidstone Borough.

There are a number of organisations that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). The roles and responsibilities of the various RMAs in Maidstone Borough, as described in the **Flood Risk Regulations (2009)**[35] and **Flood and Water Management Act (2010)**[36] are outlined below.

3.1 Maidstone Borough Council

As a Local Planning Authority, Maidstone Borough Council assess, consult on and determine whether development proposals are acceptable, ensuring that flooding and other similar risks are effectively managed.

The council will consult relevant statutory consultees as part of planning application assessments and may, in some cases, also contact non-statutory consultees, such as Southern Water, that have an interest in the planning application.

3.2 Environment Agency

The Environment Agency is responsible for protecting and enhancing the environment and contributing to the government's aim of achieving sustainable development in England and Wales. In terms of flood risk, the Environment Agency has a strategic overview of all sources of flooding and coastal erosion. Examples of this strategic overview role include:

- Setting the direction for managing the risks through strategic plans;
- Providing evidence and advice to inform Government policy and support others;
- Working collaboratively to support the development of risk management skills and capacity; and
- Providing a framework to support local delivery.

The Agency also has operational responsibility for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.

The Environment Agency has powers to carry out flood and coastal risk management work and to regulate the actions of other flood risk management authorities on the coast. These powers are permissive, which means they are not a duty.

The Environment Agency also has powers to regulate and consent works. You must follow the environmental permitting rules if you want to do work:

- on or near a main river
- on or near a flood defence structure
- in a flood plain
- on or near a sea defence

Further details on Environment Agency permits can be found on the **Environment Agency's Flood risk activities: environmental permits**[37] website

35 UK Government (2009) The Flood Risk Regulations 2009, available at: http://www.legislation.gov.uk/uksi/2009/3042/contents/made, [Accessed 29/05/2020]

36 UK Government (2010) Flood and Water Management Act 2010, available at: http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf [Accessed 29/05/2020]

37 Environment Agency (2016) Flood risk activities: environmental permits, available at: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits [Accessed 29/05/2020]

3.3 Kent County Council

As the Lead Local Flood Authority (LLFA) for the area, Kent County Council's duties and powers include:

- Local Flood Risk Management Strategy (LFRMS): LLFAs must develop, maintain, apply and monitor a LFRMS to outline how they will manage flood risk, identify areas vulnerable to flooding and target resources where they are needed most.
- Flood Investigations: When appropriate and necessary LLFAs must investigate and report on flooding incidents (Section 19 investigations).
- Register of Flood Risk Features: LLFAs must establish and maintain a register of structures or features which, in their opinion, are likely to have a significant effect on flood risk in the LLFA area.
- Designation of Features: LLFAs may exercise powers, as all RMAs can, to designate structures and features that affect flood risk, requiring the owner to seek consent from the authority to alter, remove or replace it.
- Consenting: When appropriate, LLFAs will perform consenting of works on ordinary watercourses. Further details can be found on the **KCC land drainage website**[38]**.**
- Regulation: The LLFA has enforcement powers under the Land Drainage Act 1991 and FWMA 2010.

KCC is also the Local Highway Authority and manages highway drainage, carrying out maintenance and improvement works on an on-going basis, as necessary. It also has the responsibility to ensure road projects cause no increased flood risk. KCC are statutory consultees with respect to surface water management in proposed new development. **KCC's sustainable drainage in planning website** provides further information and advice.

3.4 Water and wastewater providers

Southern Water is the sewerage undertaker for the Local Plan Review area. They have the responsibility to maintain surface, foul and combined public sewers to ensure the area is effectually drained. When flows (foul or surface water) are proposed to enter public sewers, Southern Water will assess whether the public system has the capacity to accept these flows as part of their pre-application service. If there is not available capacity, they will provide a solution that identifies the necessary mitigation. Southern Water can also comment on the available capacity of foul and surface water sewers as part of the planning application process although this is not a statutory role.

South East Water provide potable water to the Local Plan Review area.

For further details about developer services and relevant application forms please see **Southern Water's Developer Services website**[39] and **South East Water's Developer Services Website**[40].

38 Kent County Council, Land Drainage, available at: https://www.kent.gov.uk/waste-planning-and-land/flooding-and-drainage/owning-and-maintaining-a-watercourse [Accessed 29/05/2020]

39 Southern Water, Developers and Builders, available at: https://developerservices.southernwater.co.uk/ [Accessed 29/05/2020]

40 South East Water, Developer Services, available at: https://wholesale.southeastwater.co.uk/help-advice/developer-services [Accessed 29/05/2020]

3.5 Upper Medway Internal Drainage Board (UMIDB)

Under the Land Drainage Act 1991 UMIDB exercises general powers of supervision over all matters relating to water level management within their district. Key watercourses are adopted by the Board for maintenance purposes and the Board also has responsibility for the operation and maintenance of assets used to manage water levels.

4 Planning policy for flood risk management

This section summarises national planning policy for development and flood risk. Consideration should also be given to the flood risk management policy and practices described in Chapter 2

4.1 National Planning Policy Framework and Guidance

The overarching aim of development and flood risk planning policy in the UK is to ensure that the potential risk of flooding is taken into account at every stage of the planning process. This section of the SFRA provides an overview of the planning framework and flood risk policy. In preparing the subsequent sections of this SFRA, appropriate planning and policy amendments have been acknowledged and taken into account.

4.1.1 Revised National Planning Policy Framework

The **Revised National Planning Policy Framework**[41] was published in July 2018, and last updated in June 2019, replacing the previous version published in March 2012 and subsequent updates. Key changes in the revised NPPF compared to the 2012 NPPF include:

- Strategic policies should also now consider the 'cumulative impacts in, or affecting, local areas susceptible to flooding' (para 156), rather than just to or from individual development sites.
- Future risk from climate change- the 'sequential approach should be used in areas known to be at risk now or in the future from any form of flooding' (para 158).
- Natural Flood Management - 'Using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques)' (para 157c).
- 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165).

  Emergency planning – measures identified so 'safe access and escape routes are included where appropriate, as part of an agreed emergency plan' (para 163e).

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.

4.2 Local Plan Policies

Local planning authorities must prepare a local plan which sets planning policies in a local authority area. These are important when deciding planning applications. The local plan is subject to examination by an independent planning inspector. This includes local development documents such as the Strategic Flood Risk Assessment.

41 Ministry of Housing, Communities & Local Government (2019) Revised National Planning Policy Framework, available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2, [Accessed 15/05/2020]

4.2.1 Adopted Local Plan policies

The adopted **Maidstone Borough Local Plan**[42] provides a framework for development until 2031. The core policies relating to flood risk and drainage are:

- DM1 Principles of good design
- DM3 Natural environment
- Flood risk considerations are also included within strategic policies for strategic site allocations.

4.2.2 Localism Act

The Localism Act outlines plans to shift and re-distribute the balance of decision making from central government back to councils, communities and individuals. Two provisions in the Act should be considered in relation to flood risk management and this SFRA:

- The duty to cooperate on Local Authorities. This duty requires Local Authorities to "engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter".
- New rights to allow local communities to come together and shape new developments by preparing Neighbourhood Plans. As neighbourhoods draw up their proposals, Local Planning Authorities are required to provide technical advice and support.

4.3 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas.

4.3.1 The Flood Zones

The Flood Zones are:

- Flood Zone 1: Low probability: less than a 0.1% chance of river and sea flooding in any given year
- Flood Zone 2: Medium probability: between a 1% and 0.1% chance of river flooding in any given year or 0.5% and 0.1% chance of sea flooding in any given year
- Flood Zone 3a: High probability: greater or equal to a 1% chance of river flooding in any given year or greater than a 0.5% chance of sea flooding in any given year. Excludes Flood Zone 3b.
- Flood Zone 3b: Functional Floodplain: land where water has to flow or be stored in times of flood. SFRAs identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. Flood Zone 3b is primarily based on the defended 5% AEP flood extent.

With the exception of Flood Zone 3b, the Flood Zones do not take into account defences. This is important for planning long term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones also do not take into account surface water, sewer or groundwater flooding or the impacts of canal or reservoir failure or climate change. Hence there could

42 Maidstone Borough Council (2017) Maidstone Borough Local Plan, available at https://localplan.maidstone.gov.uk/home/adopted-local-plan [Accessed 15/05/2020]

still be a risk of flooding from other sources and the level of flood risk will change over time during the lifetime of a development.

4.3.2 The Sequential Test

Firstly, land at the lowest risk of flooding and from all sources should be considered for development. To comply with this requirement A test is performed called the 'Sequential Test'. Figure 4-1 summarises the Sequential Test. The LPA applies the Sequential Test to strategic allocations. For all other developments, developers must supply evidence to the LPA, within Planning Application submissions, that the proposed development satisfies the test.

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

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

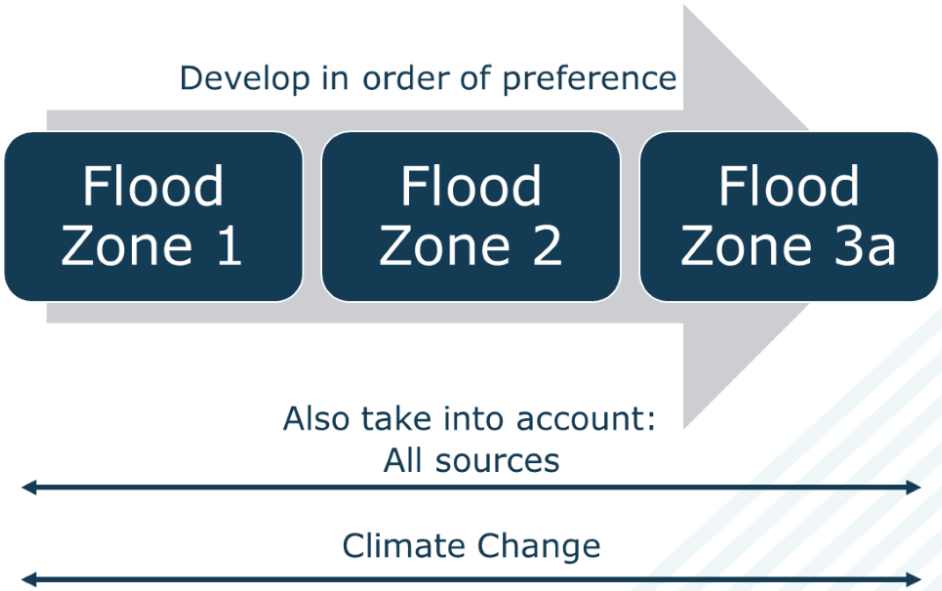

Figure 4-1: The Sequential Test

Figure 4-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against flood zones and development vulnerability compatibilities.

This is a stepwise process and a challenging one. The assessment involves consideration of a broad range of planning aspects related to wider community and environment issues. The process must be documented, and evidence used to support decisions recorded.

In addition, the risk of flooding from other sources and the potential effect of climate change must be considered when assessing which sites are suitable to allocate. The SFRA guide to using technical data in Appendix N shows where the Sequential and Exception Tests may be of concern with the datasets, recommending what development might be appropriate in what situations.

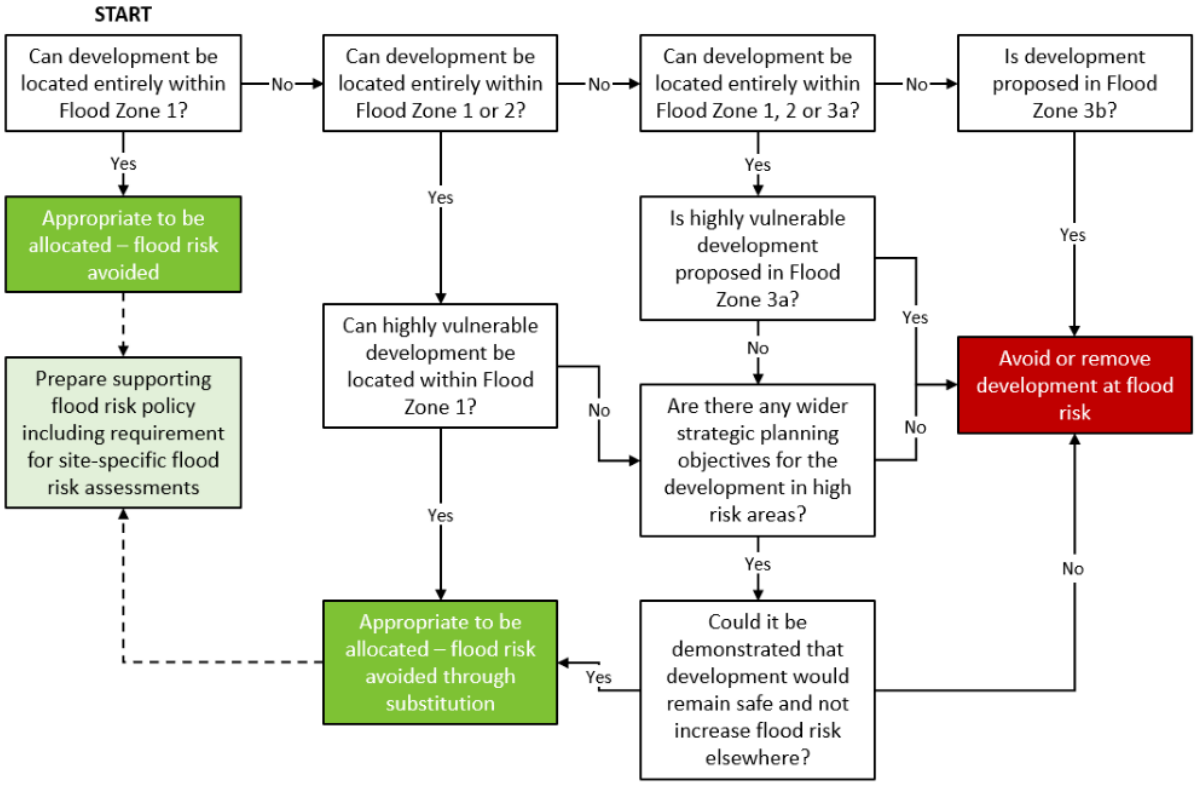

Figure 4-2: Local Plan sequential approach to site allocation

4.3.3 The Exception Test

It will 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.

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

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

Figure 4-3 summarises the Exception Test. An LPA should apply the Exception Test to strategic allocations (information in the Level 2 SFRA can be used to assess whether it is possible to implement proposed development safely). For all developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test. This is because when a site-specific Flood Risk Assessment is done, more information on the exact measures that can manage the risk is available.

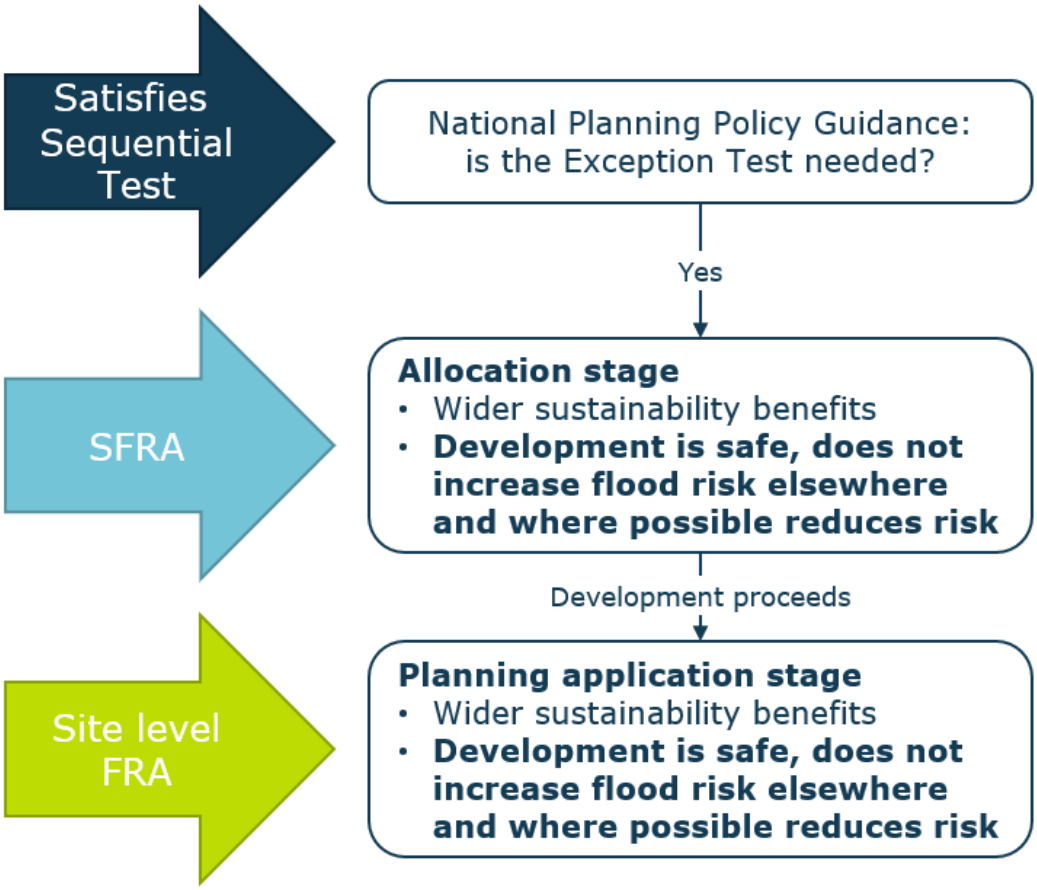

Figure 4-3: The Exception Test

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

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

Local planning authorities must consider what criteria they use to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been satisfied. If the application fails to demonstrate this, the Local Planning Authority may consider whether the use of planning conditions and / or planning obligations could appropriately be introduced to satisfy the necessary requirements. If this is not possible, this part of the Exception Test has not been satisfied and planning permission should normally be refused.

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

A Level 2 SFRA is likely to be needed to inform the Exception Test in these circumstances for strategic allocations. At Planning Application stage, a site-specific Flood Risk assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

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

The NPPF Planning Practice Guidance sets out how developers and planners need to consider flood risk to, and from, the development site, following the broad approach of assessing, avoiding, managing and mitigating flood risk. A checklist for site-specific Flood Risk Assessments is provided in Paragraph 68 of the Guidance.

A site-specific Flood Risk Assessment should be carried out to assess all sources of flood risk to, and from, a development. The assessment should demonstrate how flood risk will be managed over a development's lifetime, taking climate change and the user vulnerability into account. The latest Environment Agency guidance for climate change allowances should be referred to. Where appropriate a Flood Risk Assessment should also consider the cumulative impact of the development, so flood risk is not exacerbated.

The NPPF Planning Practice Guidance sets out the following objectives for a site-specific Flood Risk Assessment which can be found in Section 9.

4.4.1 Sequential Test

Maidstone Borough Council, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied.

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

- a strategic allocation and the test has already been performed by the LPA
- a change of use (except to a more vulnerable use)
- a minor development (householder development, small non-residential extensions with a footprint of less than 250m2); or
- a development in flood zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

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

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

The sources of information on reasonably available sites may include:

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

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

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

The SFRA guide to using technical data in Appendix N shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret

different levels of concern with the datasets, recommending what development might be appropriate in what situations.

4.4.2 Exception Test

If, following application of the Sequential Test it is not possible for the development to be located in areas with a lower probability of flooding the Exception Test must then be applied if required (as set out in Table 3 of the NPPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations).

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

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

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

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

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

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

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

Actual flood risk

If it has not been possible for all future development to be situated in Zone 1 then a more detailed assessment is needed to understand the implications of locating proposed development in Flood Zones 2 or 3. This is accomplished by considering information on the "actual risk" of flooding. The assessment of actual risk takes account of the presence of flood defences and provides a picture of the safety of existing and proposed development. It should be understood that the standard of protection afforded by flood defences is not constant and it is presumed that the required minimum standards for new development are:

- residential development should be protected against flooding with an annual probability of river flooding of 1% AEP (1 in 100-year chance of flooding); and
- residential development should be protected against flooding with an annual probability of tidal (sea) flooding of 0.5% AEP (1 in 200-year chance of flooding) in any year.

The assessment of the actual risk should take the following issues into account:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for the Flood Risk Management Strategy to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. FRAs should clearly state the intended lifetime of the development so that planning decisions can be made on long term sustainability. Over time the effects of climate change may reduce the standard of protection afforded by defences, due to increased river flows and levels, and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary land secured that is required for affordable future flood risk management measures.
- The assessment of actual risk can include consideration of the magnitude of the hazard posed by flooding. By understanding the depth, velocity, speed of onset, rate of rise and duration of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources. This assessment will be needed in circumstances where a) the consequences of flooding need to be mitigated or b) where it is proposed to place lower vulnerability development in areas of flood risk.

Residual flood risk

Residual risk refers to the risks that remain after measures have been taken to alleviate flooding (such as flood defences). It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- the effects of a flood with a magnitude greater than that for which the defences or management measures have been designed to alleviate (the 'design flood'). This can result in overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming discharges; and/or
- failure of the defences or flood risk management measures to perform their intended duty. This could be breach failure of flood embankments, failure of flood gates to operate in the intended manner, or failure of pumping stations.

4.5 Cumulative impacts

When allocating land for development, consideration must be given to the potential cumulative impact of development on flood risk. The increase in impermeable surfaces and resulting rise in runoff increases the chances of surface water flooding if suitable mitigation measures, such as SuDS, are not put in place. Additionally, the increase in runoff may

result in more flow entering watercourses, increasing the risk of fluvial flooding downstream.

Consideration must also be given to the potential cumulative impact of the loss of floodplain as a result of development. The effect of the loss of floodplain storage should be assessed, at both the development and elsewhere within the catchment and, if required, the scale and scope of appropriate mitigation should be identified.

Whilst the increase in runoff, or loss in floodplain storage, from individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe without appropriate mitigation measures.

For windfall sites which have not yet been allocated, the NPPF requires that the cumulative impact of development should be considered at the application stage 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.

4.6 Cross boundary considerations

The topography and location of the borough means that there are several watercourses and overland flow routes that cross the Maidstone Borough boundary. As such, future development, both within and outside the borough, can have the potential to affect flood risk to existing development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation. Maidstone Borough has boundaries with various Local Authorities, displayed in Figure 1-1.

5 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. Refer to Appendix N for recommendations and details on how to apply the Sequential and Exception tests using the data set out in this section.

5.1 Climate change, the NPPF and NPPG

The updated NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. The NPPF states that new development should be planned for in ways that avoids vulnerability to the range of effects that result from climate change.

NPPF and NPPG describe how FRAs should demonstrate how flood risk will be managed over the lifetime of the development, taking climate change into account.

The NPPF also states that the 'sequential approach should be used in areas known to be at risk now or in the future from any form of flooding' (para 158).

5.2 Climate change guidance and allowances

The Environment Agency published **updated climate change guidance**[43] on 19 February 2016 (further updated on 16 March 2020). The 2016 climate change guidance includes climate change predictions of anticipated change for peak river flow, sea level rise and peak rainfall intensity. By making an allowance for these climate change predictions it will help reduce the vulnerability of the development and provide resilience to flooding in the future. These allowances are based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere.

The guidance has been undergoing updates since the release of **UK Climate Projections 2018 (UKCP18)**[44]. This SFRA has been prepared in line with the latest guidance at the time of preparation. However, as further updates are expected in 2020, please consult the latest Environment Agency guidance if you are preparing a flood risk assessment for a development.

5.3 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.

For the purposes of this SFRA, the peak river flow allowances provided in the Environment Agency's updated climate change guidance have been used where readily available.

These allowances show the anticipated changes in peak flow in the Environment Agency river basin districts. The majority of the borough is located within the Thames River Basin District with a small area in the east of the borough in the South East River Basin District. **Maps**[45] showing the extent of River Basins are published by the Environment Agency.

The guidance provides uplift in peak flows based on percentiles. A percentile is a measure used in statistics indicating the value below which a given proportion (percentage) of

43 Environment Agency (2016) Flood risk assessments: climate change allowances, available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances [Accessed 29/05/2020]

44 Met Office, UK Climate Projections, available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index, [Accessed 29/05/2020]

45 Defra, Spatial Data Download, available at https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/WFDRiverBasinDistrictsCycle2&Mode=spatial [Accessed 29/05/2020]

observations in a set of results falls. For flood risk it is a way of taking account of the uncertainty in the methods and data used to define predicted flood water levels as generated for climate change conditions. The higher the percentile the more likely it is that the range of statistically generated results will lie within the specified threshold. Whereas a lower percentile will not encompass such a wide range of statistically generated values and thus the predicted flood water level would be lower.

The percentiles are based on the following:

- Central allowance is based on the 50th percentile (so only contains half of the total number of results generated)
- Higher central is based on the 70th percentile
- Upper end is based on the 90th percentile

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 2115)

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. Further information on what is considered to be the lifetime of development is provided in paragraph 26 of the **NPPG**.

At the time of preparing the SFRA this guidance was being further revised in line with the **UKCP18**. The Environment Agency should be contacted for the latest guidance if you are preparing a flood risk assessment for a development.

5.4 Peak rainfall intensity allowance

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.

At the time of the preparation of this SFRA the peak rainfall intensity allowances were reviewed by the Environment Agency due to the publication of the **UKCP18**. The Environment Agency should be contacted for the latest guidance for Flood Risk Assessments.

5.5 Tidal change

The **Environment Agency's updated guidance** included sea level allowances and these have been used in the preparation of this report as confirmed by the Environment Agency.

As part of the SFRA, new tidal boundaries were prepared for the North Kent Coast (2019) model in line with the updated guidance. These new tidal boundaries have also been used to update the tidal River Medway (2016) model.

5.6 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. 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.

5.7 The impact of climate change in the Local Plan Review area

5.7.1 Previous studies

The **UKCP18** provides a number of future projections for different variables across the UK. Climate change will cause changes in trends and mean values in temperature and rainfall.

However, the more influential effect of climate change with respect to flood risk and drought is to increase the chance of occurrence and severity of more extreme wet and dry events. It is important that development is planned with consideration of these extreme events.

5.7.2 Adapting to climate change

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

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses

At the county level, KCC adopted the **Kent Environment Strategy**[46] in 2016. The strategy's priorities include integrating strategy and policy, changing behaviours, conserving and enhancing natural resources, improving resource efficiency, improving resilience to environmental change, and encouraging sustainable growth. Supporting the strategy, the **Kent State of the Environment Report: Evidence Base Supporting the Strategy**[47] provides statistics and information about Kent, including greenhouse gas emissions, energy consumption, waste and flood risk.

In April 2019, Maidstone Borough Council declared a Biodiversity and Climate Emergency. Further details can be found on Maidstone Borough Council's **Biodiversity and Climate Emergency webpage**[48].

46 Kent County Council (2016) Kent Environment Strategy, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/environmental-policies/kent-environment-strategy [Accessed 29/05/2020]

47 Kent County Council (2015) Kent State of the environment 2015, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0020/63812/Kent-State-of-the-Environment-Report-Evidence-base-supporting-the-strategy.pdf [Accessed 29/05/2020]

48 Maidstone Borough Council, Biodiversity and Climate Emergency, available at https://www.maidstone.gov.uk/home/other-services/campaigns-and-projects/tier-2-primary-areas/biodiversity-and-climate-emergency [Accessed 05/06/2020]

6 Sources of information used in preparing the SFRA

This chapter describes the key sources of flood risk information used within this SFRA. Refer to Appendix N for recommendations and details and details on how to apply the Sequential and Exception tests using the data set out in this section

6.1 Historic flood risk

The historic flood risk in the Local Plan Review area has been assessed using information of recorded incidents provided by the Environment Agency's recorded flood outline dataset and Southern Water's Sewage Incident Reporting Form (SIRF). This has been supplemented with other information collected during the preparation of the SFRA. The key considerations from these sources are outlined in Section 7.1, the Environment Agency's recorded flood outlines are presented in Appendix A. Guidance on how this information should be used to inform the Sequential and Exception Tests can be found in Appendix N.

6.2 Flood Zones

The Flood Zones described in Section 4.3.1 should be used for the basis for decision making in the emerging Local Plan.

6.2.1 Delineation of Flood Zone 3b

Where modelled results are available for Flood Zone 3b they show flood risk that accounts for the presence of existing flood risk management features and flood defences, unlike the Zones 3a and 2 (which do not take account of defences). The mapping in the SFRA identifies Flood Zone 3b as land which would flood with a 5% AEP, where detailed modelling exists.

Flood Zone 3b informing this SFRA has been adjusted slightly from the data informing the previous 2016 SFRA assessment.

It was identified that relatively small regions of the River Beult and River Teise floodplains displayed larger extents in Flood Zone 3b (5% AEP defended case event) compared with Flood Zone 3a (1% AEP undefended case event). Therefore, where this was identified Flood Zone 3b has been restricted to the extent of Flood Zone 3a.

This approach is robust given that the flood flows are smaller within the Flood Zone 3b event and this discrepancy arose due to the Environment Agency flood modelling for Flood Zone 3a applying a smaller grid cell size of 10m (representing elevations on the floodplain) compared with the Flood Zone 3b event (which applied a 20m grid cell size). The finer grid size of the Flood Zone 3a event is more representative and so limiting the Flood Zone 3b data to this extent removes part of the zone displayed at risk only due to a lower resolution representation of the floodplain.

Where detailed modelling has not been undertaken and the 5% AEP outputs are not available, the precautionary approach has been taken using the 1% AEP undefended scenario (Flood Zone 3a). If a proposed development is shown to be within this area, further investigation should be undertaken as part of a detailed site-specific FRA to define and confirm the extent of Flood Zone 3b (as necessary, taking into account the presence of defences).

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.

Flood Zone mapping for the Local Plan area can be found in Appendix C.

6.3 Fluvial flood risk models used in this SFRA

Table 6-1 lists the fluvial flood risk modelling used to inform the SFRA. A list of the watercourses located within Maidstone Borough are found in Section 7.3 and are shown in Appendix B.

Table 6-1: Fluvial models used within the SFRA

Model name	Year	Software (type)
River Medway (including River Beult and River Teise)	2016	Flood Modeller/TUFLOW
River Len	2009	Flood Modeller/TUFLOW
Loose Stream	2016	JFlow

6.4 Tidal modelling used in the Level 1 SFRA

A small area of the River Medway within the borough has been modelled within the 2019 North Kent Coast tidal model. This provides mapped outputs in the tidal reach to Allington Lock. Tidal modelling and mapping has been extended upstream through Maidstone by applying tidal boundary conditions from the North Kent Coast model to the Environment Agency's model of the River Medway. The tidal mapping provides information for present day Flood Zone 3b, 3a and 2 (Appendix C) and for the climate change events for the Higher Central and Upper End allowance categories for the years 2095 and 2120 (Appendix D).

6.5 Climate change

The Environment Agency 2016 climate change guidance shows that for watercourses in the Thames River Basin District the 25%, 35% and 70% allowances should be considered. For further information on climate change allowances please refer to Section 5.2.

As part of this SFRA the Environment Agency confirmed that the North Kent Coast model should be updated with the latest allowances based on the **UKCP18** guidance. The tidal boundaries were prepared for the Higher Central and Upper End allowances for the 2095 and 2120 epochs. Maidstone Borough Council confirmed that they consider the lifetime of development for commercial property could range between 60 to 75 years and therefore the modelling reflects the longer timescale of this period.

Table 6-2: Climate change allowances used in the SFRA

Model	Allowances
River Medway (including River Beult and River Teise)	35% and 70%
River Len	35% and 70%
Loose Stream	35% and 70%
North Kent Coast (2019)	2095 and 2120 (Higher Central and Upper End)

Where there is no fluvial model available, Flood Zone 2 (0.1% AEP extent) has been used to provide indicative information on the potential effects of climate change. This level of assessment is suitable for an SFRA. However, detailed hydraulic modelling using topographic survey would be required at a site-specific level or within the Level 2 SFRA to confirm the flood risk to these sites.

6.6 Surface Water

Mapping of surface water flood risk in Maidstone Borough Council's Local Plan Review area has been taken from the Risk of Flooding from Surface Water (RoFSW) published online by the Environment Agency. 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 Environment Agency and any potential developers to focus their management of surface water flood risk. The different surface water risk categories used in the RoFSW mapping are defined in Table 6-3.

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.

Table 6-3: Surface water risk categories used in the RoFSW mapping

Category	Definition
High	Flooding occurring as a result of rainfall with a 3.3% AEP (greater than 1 in 30 chance in any given year)
Medium	Flooding occurring as a result of rainfall of between 1% AEP (1 in 100 chance in any given year) and a 3.3% AEP (1 in 30 chance in any given year).
Low	Flooding occurring as a result of rainfall of between a 0.1% AEP (1 in 1,000 chance in any given year) and 1% AEP (1 in 100 chance in any given year).
Very Low	Flooding occurring as a result of rainfall with a less than a 0.1% AEP (1 in 1,000 chance in any given year).

Although the RoFSW offers an improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRAs for local authorities. 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 considered to more accurately illustrate the flood risk at a site-specific scale. Such an assessment will 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.

The RoFSW map for the Local Plan Review area can be found in Appendix E. Guidance on how this information should be used to inform the Sequential and Exception Tests can be found in Appendix N.

No Flood Investigations (Section 19 reports) have been prepared by Kent County Council for the Local Plan Review area.

6.6.1 Surface water flood risk with climate change uplifts

Additional modelling has been carried out to account for the impact of climate change on surface water flood risk in the SFRA study area. The Environment Agency 2016 climate change guidance shows that increases in the peak rainfall intensity in small and urban catchments should be considered when preparing FRAs. The recommended uplifts for the central and upper end allowances are 20% and 40% respectively.

Therefore, the peak rainfall intensities for the RoFSW 1% AEP event have been uplifted by 20% and 40% to assess the impact of climate change on surface water flood risk in the Maidstone Borough.

Mapping showing the extents of the 1% AEP plus 20% and 40% climate change scenarios can be found in Appendix F. Guidance on how this information should be used to inform the Sequential and Exception Tests can be found in Appendix N.

6.7 Groundwater

JBA has developed a range of Groundwater Flood Map products at the national scale. The 5m resolution JBA Groundwater Flood Map has been used within the SFRA. The modelling involved simulating groundwater levels for a range of Annual Exceedance Probabilities (including 1.3%, 1% and 0.5% AEPs). Groundwater flood levels were then compared to ground surface levels to determine the head difference in metres. The JBA Groundwater Flood Map categorises the head difference (m) into five feature classes based on the 1% AEP model outputs which are outlined in Table 6-4.

Table 6-4: JBA Groundwater flood risk map categories

Flood depth range during a 1% AEP flood event	Groundwater flood 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 is important to note that the modelled groundwater levels are not predictions of typical groundwater levels. Rather they are flood levels i.e. groundwater levels that might be expected after a winter recharge season with 1% AEP, so would represent an extreme scenario.

The methods used to prepare the JBA Groundwater Flood Map are broadscale and so will not necessarily identify site specific local conditions. Thus, the JBA Groundwater flood map is suitable for general broad-scale assessment of the groundwater flood hazard in an area, but is not explicitly designed for the assessment of flood hazard at the scale of a single property. The mapping is based on the general geology of the area and does not take account of local circumstances. The mapping will thus not provide indications of specific local problems and it should be augmented, as appropriate, by reference to appropriate recorded historic data that is available.

For all development sites where there is a risk of groundwater flooding (i.e. not in an area with no risk) a site-specific risk assessment for groundwater flooding should be undertaken to fully inform the likelihood of groundwater flooding and so that the proposed development can be implemented safely. Groundwater levels should be surveyed during winter or early spring, and the amount of rainfall in the months prior to the testing should be assessed.

Monitoring should be undertaken, and a geotechnical engineer should then assess the results in an interpretive report and give an assessment of the risk of shallow groundwater.

The JBA Groundwater Flood Map for the Local Plan Review area can be found in Appendix G. Guidance on how this information should be used to inform the Sequential and Exception Tests can be found in Appendix N.

6.8 Sewers

Historical incidents of flooding are detailed by Southern Water through their Sewer Incident Report Form (SIRF) Data. This database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding.

The SIRF for the Local Plan Review area can be found in Section 7.8.

6.9 Reservoirs

The risk of inundation due to reservoir breach or failure of reservoirs within the area has been mapped using the outlines available from the Risk of Flooding from Reservoirs dataset made available by the Environment Agency.

The Risk of Flooding from Reservoirs mapping for the Local Plan Review area can be found in Appendix H. Guidance on how this information should be used to inform the Sequential and Exception Tests can be found in Appendix N. An Environment Agency programme for updating and improving this mapping is in progress and is due to be completed by 2020.

The reservoirs located in the Local Plan Review area are listed in Section 7.9.

6.10 Other relevant flood risk information

Users of this SFRA should also refer to other relevant information on flood risk where available and appropriate. This information includes:

- River Medway, North Kent Rivers and Stour Catchment Flood Management Plans (Environment Agency, 2009). Further information can be found in Section 2.3.5
- Kent Local Flood Risk Management Strategy 2017-2023 (Kent County Council, 2017). Further information can be found in Section 2.3.6.
- Thames River Basin District River Basin Management Plan (Environment Agency, 2016). Further information can be found in Section 2.3.3.
- Kent County Council Drainage and Planning Policy (Kent County Council, adopted November 2019). Further information can be found in Section 2.3.8.
- **Kent County Council Flood Response Plan**[49] (Kent County Council, 2017)
- Provides information on the principles determining the response of KCC to a flooding event within their local authority administrative area. This document details the actions, roles and responsibilities in response to a flood event.

49 Kent County Council (2019) Kent County Council Flood Response Plan, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0019/12097/Flood-response-plan.pdf [Accessed 29/05/2020]

7 Understanding flood risk in the Local Plan Review area

This chapter explores the key sources of flooding in the borough and the factors that affect flooding including topography, soils and geology.

Refer to Appendix N for recommendations and details and details on how to apply the Sequential and Exception tests using the data set out in this section.

7.1 Historical flooding

The Local Plan Review area has a long history of flooding, with the main cause being from fluvial (i.e. river/watercourse networks) sources. Information collated from the Environment Agency's recorded flood outlines and Southern Water's SIRF datasets were assessed to understand historical flooding in the Local Plan Review area.

Fluvial flood events have been recorded from the River Medway, Teise, Lesser Teise and the River Beult. The most notable flood events recorded from these rivers occurred in 1927, 1960, 1963, 1968 and 2000, and caused widespread flooding across the borough. Data provided by the Environment Agency also indicates that significant flooding occurred within the borough during Winter 2013/2014 and Winter 2019/20 which included notable flooding from the River Medway.

Surface water flooding is known to occur across the Local Plan Review area and in many cases may be associated to heavy rainfall overwhelming drainage infrastructure (drains/gullies etc). A number of areas in Maidstone have been identified as being particularly sensitive to surface water flooding; this includes Marden, Headcorn, Boughton-Monchelsea, and Staplehurst.

Historical flood records provided by the Environment Agency and Maidstone Borough Council identify fluvial flood events to have occurred between 1927 and 2020, particularly in the south-west area of the borough.

The key historical incidents of flooding identified are summarised as follows:

- December 1927: heavy rain on the 25th December, which changed to snow and caused what is regarded as one of the worst snowstorms in the 20th century[50], resulted in flooding of the area surrounding Allington downstream of Allington Lock[51].
- November 1960: the July to November rainfall in 1960 was the greatest on record in England and Wales since 1927 and caused widespread flooding across much of England in early November 1960. Frequent and heavy rainfall caused the River Medway, River Len, River Beult and the River Teise to overtop their banks in early November which resulted in catchment-wide flooding throughout the borough, including the flooding of Maidstone Town Centre.
- September 1968: prolonged heavy rainfall associated with a slow-moving depression and thunderstorms caused severe flooding across the south east of England. Between the 14th and 15th of September, 150mm-200mm of rainfall was recorded across Kent[52, 53] and caused the River Medway to exceed its channel capacity. The September 1968 flood event caused inundation along the River Medway through Maidstone and upstream of Teston.

50 Tonbridge Weather Notes 1900-1929 (December 1927)

51 Mott Macdonald (2008), Maidstone Borough Council: Strategic Flood Risk Assessment

52 Met office (2011) Sunday 15 September 1968 (Southeast England Floods)

53 Mott Macdonald, (2008) Maidstone Borough Council: Strategic Flood Risk Assessment

- October 2000: the autumn of 2000 was the wettest on record since records began in 1766 and is noted to have caused the largest floods in recent history as many river catchments were subjected to multiple flood events. Much of Kent was affected and flooding was particular severe over the mid-Kent catchments of the River Medway, River Beult and the River Teise. The principle source of flooding in the Kent area was the sheer volume of rain that fell over relatively short periods onto already wet or saturated catchments. Within Maidstone Borough, Yalding and Collier Street are noted to have suffered from extensive flooding but flooding in Maidstone Town was relatively limited[54].
- December 2013: During the winter of 2013-14 a series of Atlantic depressions brought heavy rainfall and stormy conditions to much of England and Wales, including the River Medway catchment, where the largest flood of the period occurred on 23-25 December 2013. Flows seen in the Medway rivers were amongst the highest ever recorded, in several cases larger than the previous largest gauged event in 1968. Drivers for the notable events were the very wet antecedent conditions, combined with an intense storm on 23 December.
- Winter 2019/20: Prolonged heavy rainfall during the winter of 2019/20 led to severe flooding across parts of the South East including internal flooding to properties in Yalding and Collier Street. Internal flooding also occurred to properties in East Farleigh.

Kent County Council may hold additional records which are not available at this time. Please contact the Lead Local Flood Authority for further details.

7.1.1 Winter 2019/20 flooding

The winter of 2019/20 was notable due to the prolonged heavy rainfall across the south east of England. This led to February being the wettest on record for England since records began in 1766[55]. The Local Plan Review area is reported (through mostly anecdotal evidence) to have suffered flooding both in December and February as a result of this. The Environment Agency has noted that flood depths were not as great as those during the 2013/14 flooding, although the return period for these flood events are unknown. The Environment Agency has reported that several properties in Yalding, Collier Street and East Farleigh flooded as a result of this event.

Local news reports indicate that flooding occurred to Yalding in Mid-February as a result of Storm Dennis (11th – 18th February 2020). Flooding from this event prevented access to the village across the Twyford Bridge and led to the evacuation of Little Venice Caravan Park[56].

7.2 Topography and geology

7.2.1 Topography

As shown in Figure 7-1, the topography of the Local Plan Review area comprises low lying ground towards the south of the Local Plan Review area associated with the soft clays of the Low Weald. The north of the Local Plan Review area forms the Kent Downs Area of Outstanding Natural Beauty (AONB) where the highest elevation is approximately 200m AOD.

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54 Mott Macdonald, (May, 2008), Maidstone Borough Council: Strategic Flood Risk Assessment

55 Met Office (2020) Record breaking rainfall, available at: https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2020/2020-winter-february-stats [Accessed 11/06/2020]

56 Kent Live (2020) Stunning drone pictures show extent of Storm Dennis flooding in Yalding, available at: https://www.kentlive.news/news/kent-news/stunning-storm-dennis-drone-yalding-3858356 [Accessed 11/06/200]

7.2.2 Geology

The geology of a catchment can be an important influencing factor on the way that water runs off the ground surface and the volumes of runoff that are generated by the catchment. This is primarily due to the variations in the permeability of the surface material and bedrock stratigraphy.

Figure 7-2 and Figure 7-3 show the bedrock (solid) and superficial deposits (unconsolidated) in the Local Plan Review area respectively.

The bedrock layers and superficial deposits that are identified as being aquifers are classified as follows and are shown in Figure 7-4 and Figure 7-5 respectively:

- Principal: layers of rock or drift deposits with high permeability and, therefore, provide a high level of water storage
- Secondary A: rock layers or drift deposits capable of supporting water supplies at a local level and, in some cases, forming an important source of base flow to rivers
- Secondary B: lower permeability layers of rock or drift deposits which may store and yield limited amounts of groundwater
- Secondary undifferentiated: rock types which do not fit into either category A or B.
- Unproductive Strata: rock layers and drift deposits with low permeability and, therefore, have a negligible impact on water supply or river base flow.

The bedrock in the Local Plan Review area can be classified as a mixture of principal Lower Greensand aquifer units to the north of the Borough and unproductive Weald Group strata to the south. Smaller areas of secondary A and B aquifers are distributed throughout the Local Plan Review area.

The majority of superficial deposits in the north of the Local Plan Review area are unproductive although smaller areas of undifferentiated secondary aquifers are present. Undifferentiated secondary and secondary A aquifers are located towards the south of the Local Plan Review area and found in close proximity to the River Teise, River Beult and River Medway.

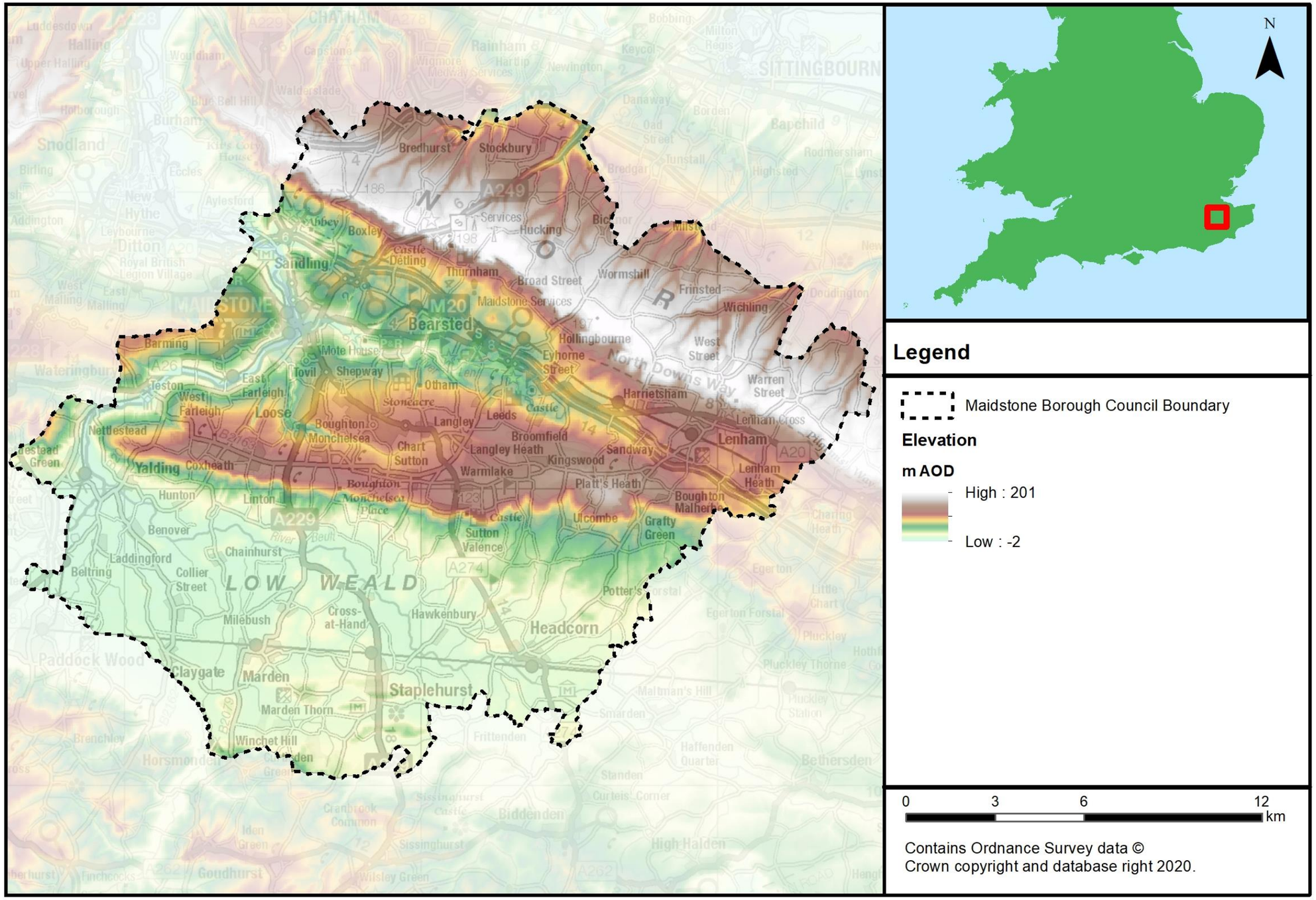

Figure 7-1: Topography of the Local Plan Review area

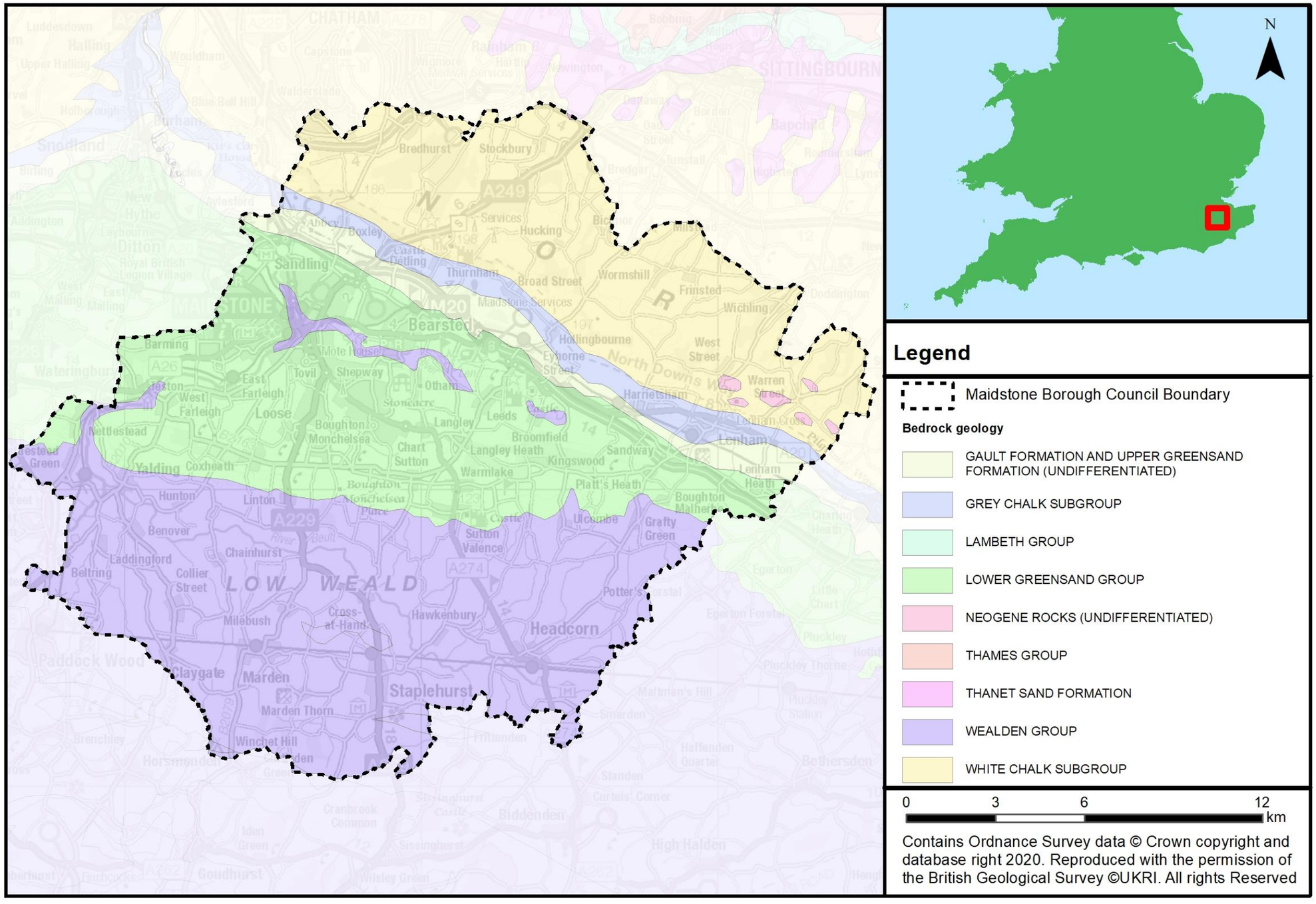

Figure 7-2: Bedrock geology in the Local Plan Review area

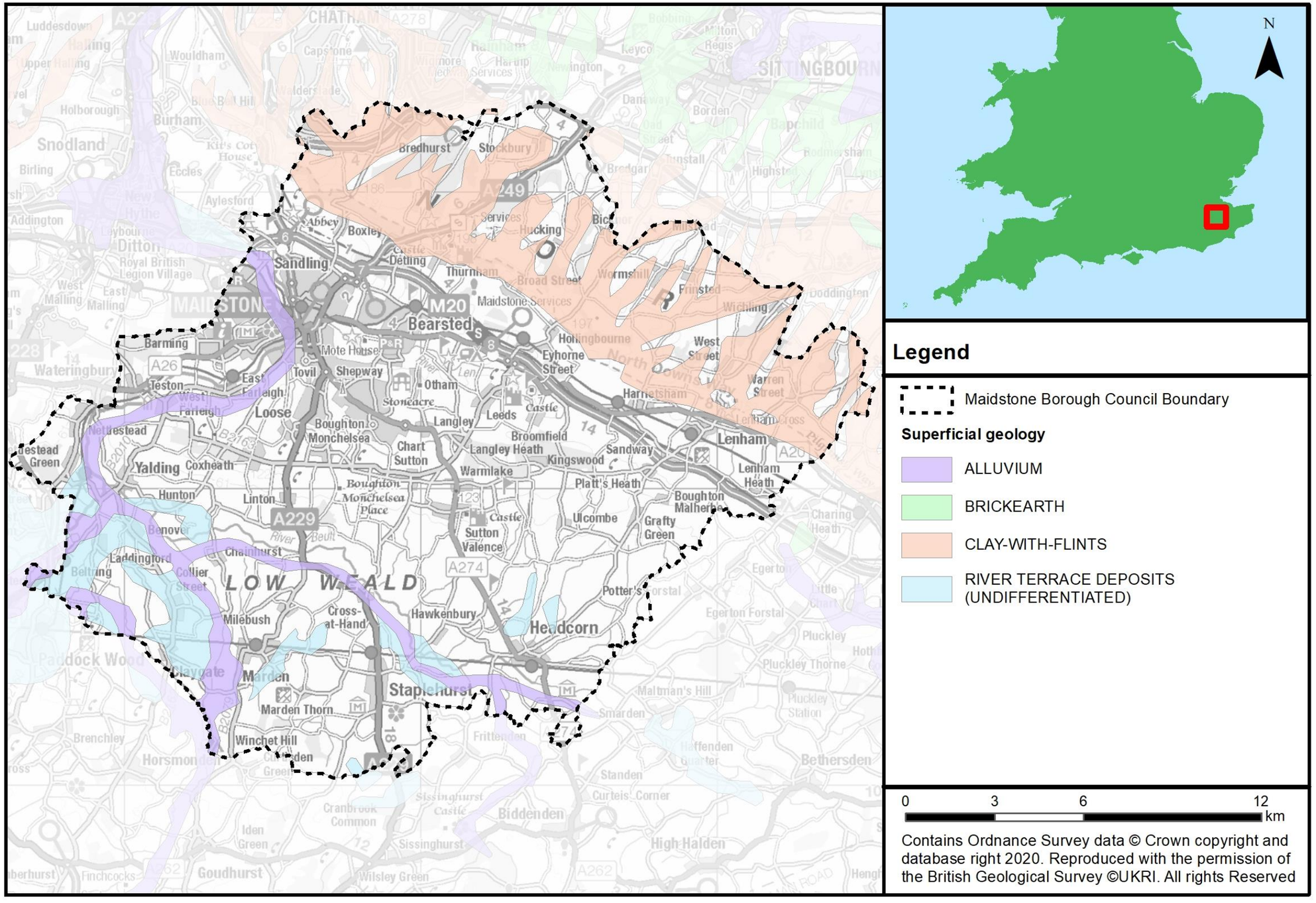

Figure 7-3: Superficial geology in the Local Plan Review area

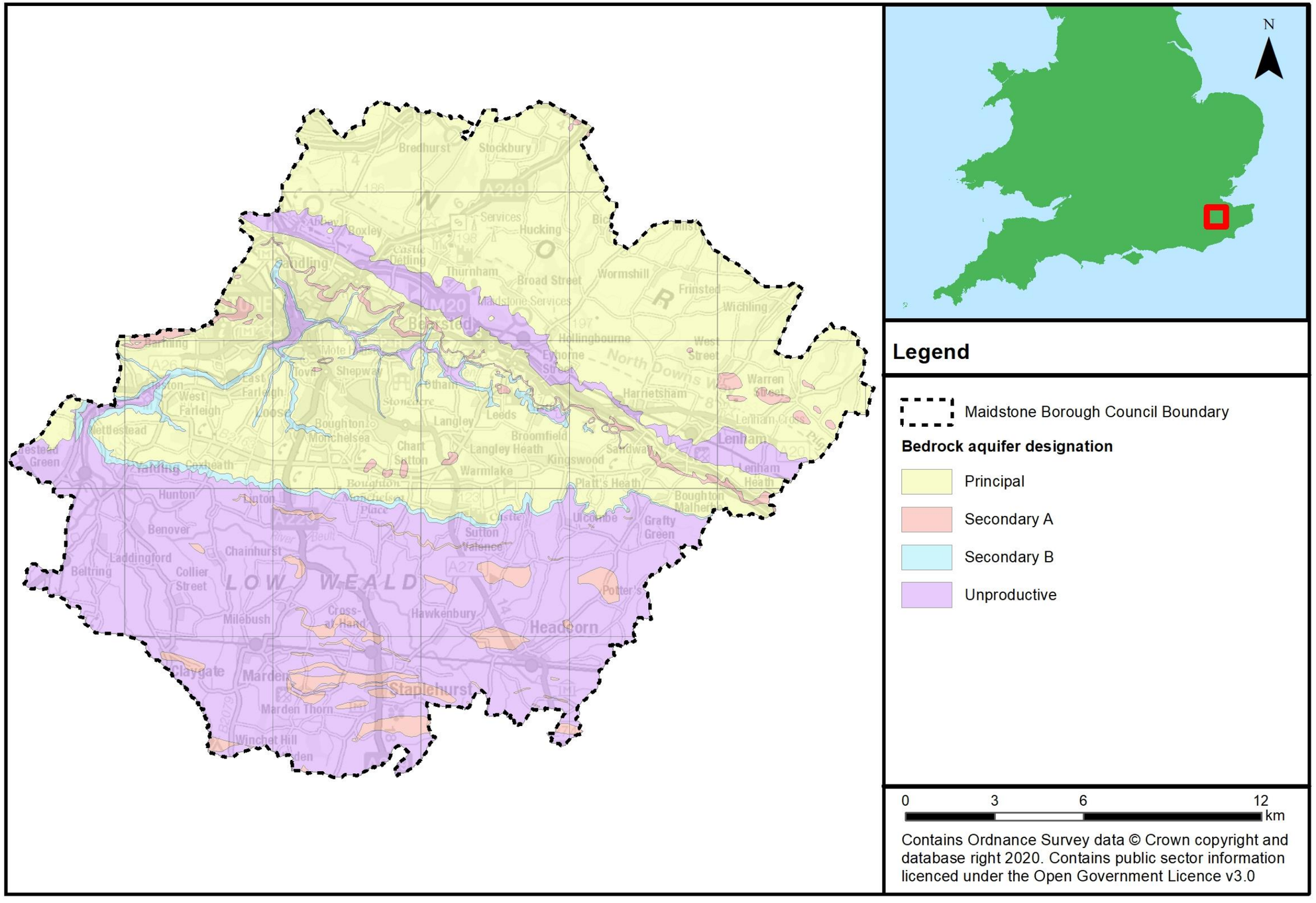

Figure 7-4: Bedrock aquifers in the Local Plan Review area

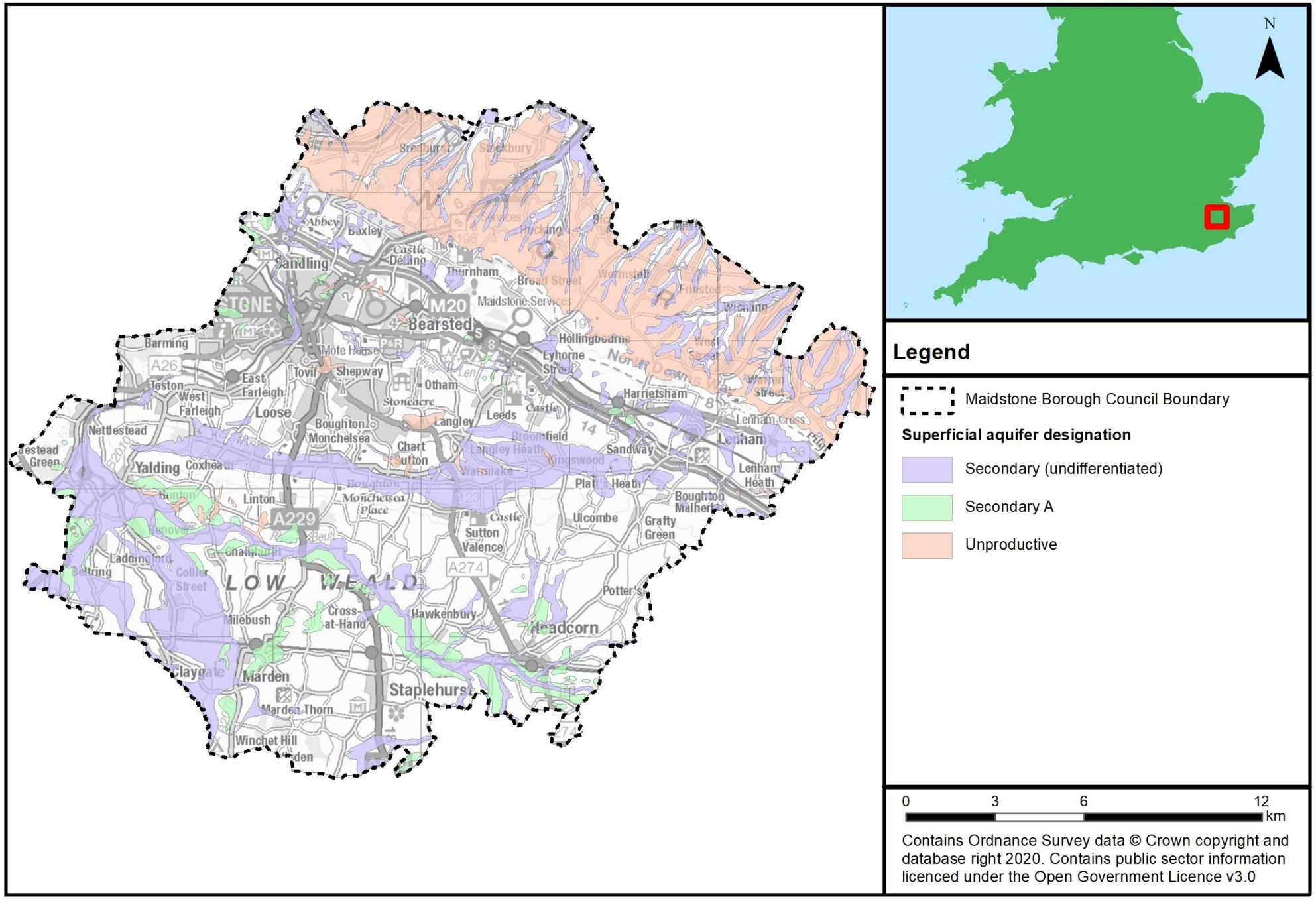

Figure 7-5: Superficial aquifers in the Local Plan Review area

7.3 Watercourses

The River Medway is the largest water feature within the Local Plan Review area. The River Medway runs from the south of the Borough towards Yalding, which is at a confluence between the River Teise and the River Beult which flow from the south east of the Borough. The River Medway runs north east towards Maidstone and north through Sandling after which it leaves the borough. Two other Main Rivers discharge into the Medway, these are the Loose Stream and the River Len, both of which discharge to the Medway at Maidstone.

A summary of the Principal Watercourses in the Local Plan Review area is provided below in Table 7-1. Mapping indicating the location of Principal Watercourses can be found in Appendix B.

Table 7-1: List of watercourses within the Local Plan Review area

Watercourse name	Classification	Description
River Medway	Main River	The River Medway enters the borough east of East Peckham (NGR: TQ 68017 48626). It generally flows in a north-eastern direction converging with several tributaries including the Teise, Beult and Len. The River Medway then cuts though the Greensand Ridge beyond Yalding before reaching its tidal limit at the Allington Lock in Maidstone Town (NGR: TQ 74776 58105). It then flows north, leaving the borough north of Sandling (NGR: TQ 74326 58186).
River Beult	Main River	The River enters the borough southeast of Headcorn (NGR: TQ 85827 43075) and flows in a north-western direction through much of the southern section Maidstone Borough, before converging with the River Medway (NGR: TQ 69282 50237).
River Teise	Main River	The River Teise enters Maidstone Borough at The Plantation approximately 1.04km north-west of Winchet Hill (NGR: TQ 72803 41193) and continues to flow north-west along the borough's boundary towards Claygate before converging with the Medway (NGR: TQ 69049 49738).
Lesser Teise	Main River	The Lesser Teise splits from the River Teise approximately 1.25km east of Marden Beech (NGR: TQ 72501 42755) and continues to flow in a north-east direction by-passing Marden, Collier Street and Chainhurst. The River reaches its confluence with the River Beult at Benover (NGR: TQ 71535 48259).
Great Stour	Main River/Ordinary Watercourse	The Great Stour is primarily an Ordinary Watercourse within Maidstone Borough. The Great Stour flows from its source near Lenham in a southerly direction to the east of Lenham. South of Lenham Heath the River becomes a designated Main River (NGR: TQ 91207 49147) and flows along the Maidstone Borough boundary for approximately 0.35km before leaving the

		borough and flowing south towards Stonebridge Green (NGR: TQ 91503 49000).
River Len	Main River/Ordinary Watercourse	The River Len is a tributary of the River Medway and the entire reach of the River is located within Maidstone Borough. The River consists of several Ordinary Watercourses, which flow from Harrietsham in a north-west direction parallel to the M20. The watercourses converge at Otham Lane (NGR: TQ 79956 54804) to form the River Len, which then flows between Bearsted and Willington and through Maidstone Town. The River Len reaches its confluence with the River Medway in Maidstone Town Centre (NGR: TQ 75823 55487). There is one gauging station located along the River Len in the centre of Maidstone Town.
Loose Stream	Main River/Ordinary Watercourse	The Loose Stream is a tributary of the River Medway and the entire reach of the Stream is located within Maidstone Borough. The Stream flows from its source near Sutton Valence as an Ordinary Watercourse in a north-west direction along the southern edge of Maidstone. At Tovil, the Stream becomes classified as a Main River (NGR: 75703 53661) and continues to flow north-west through Tovil before reaching its confluence with the River Medway near Maidstone Town Centre (NGR: TQ 75128 54836).
Coult Stream	Main River	A very small reach of the Coult Stream is located within the borough. The River enters the borough at the railway line between Beltring and Yalding approximately 0.5km east of Hale Street (NGR: TQ 68108 49062). The River then flows east for approximately 0.1km before reaching its confluence with the River Medway near Stoneham Lock (NGR: TQ 68203 49008).
Paddock Wood Stream	Main River	The Paddock Wood Stream is a tributary of the River Teise and is classified as a Main River. The Stream flows from its source on the southern edge of Paddock Wood in a northern direction before it enters the borough at Wagon Lane near High Lees Farm (NGR: TQ 67966 46283). The Stream continues to flow in a northern direction through mainly agricultural land before reaching its confluence with the River Teise south-west of Laddingford (NGR: TQ 68541 47558).

7.4 Fluvial flood risk

The primary source of fluvial flooding in the Local Plan Review area is the River Medway. Water levels in the River Medway are influenced by fluvial inflows for the majority of the borough. However, in the vicinity of Allington, water levels in the River Medway are also

influenced by tidal/estuarine effects and it has been known for the backwater effect from tidal water to reach as far upstream as East Farleigh[57].

Flooding was worse than that experienced during 2000 for many areas, however it is noted that in central Maidstone approximately 2.5ha of floodplain and banks alongside the River Len have been re-naturalised with woodland and wetland since 2002. Therefore, the flood risk to the area has been reduced and properties that were affected in 2000 were not flooded during Winter 2013/2014.

Although not indicated in Table 7-1, Ordinary watercourses are reported to have contributed to past flooding in the borough. Common factors described in these records report the perceived causes of flooding to be attributed to one or all of the following:

- Poor maintenance of watercourses
- Blocked infrastructure such as culverts
- Insufficient channel capacity
- High water levels impeding drainage of flows from associated tributaries

Considering the widespread historical fluvial flooding within the Local Plan Review area, individual settlements/areas susceptible to fluvial flooding have not been recorded here. Although there are no formal defences within Maidstone Borough, a number of structures (walls and embankments) and formal defences upstream (e.g. Leigh Flood Storage Area) and downstream (e.g. tidal flood walls) of Maidstone act to reduce flooding. This may be particularly important when considering the Functional Floodplain (Flood Zone 3b) for development proposals. Please refer to Section 8 for further information.

The extents of fluvial Flood Zones are shown in Appendix C. Consideration to how climate change may influence fluvial flood risk is presented in Appendix D.

In addition to flood risk shown by the flood risk mapping, there are potentially 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) has only been prepared for watercourses with a catchment greater than 3km^2. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk.

7.5 Tidal flood risk

Tidal flood risk is assessed based on Extreme Still Water Sea Levels (ESWSL). An ESWSL is the level the sea is expected to reach during a storm event for a particular magnitude of flood event as a result of the combination of tides and surges. As these levels are based on 'still' water, the effect of short-term fluctuations in sea level associated with wind and swell waves are not included.

The tidal influence of the River Medway extends from the north of the borough to beyond Allington Lock which is located near the boundary of the borough. The tidal limit of the River Medway is at Allington Sluice. However, despite the presence of Sluice gates at Allington, tidal backwater effects can influence water level depths upstream during extreme events and it has been known for the backwater effect to reach as far upstream as East Farleigh[58].

Interrogation of the Environment Agency's recorded flood outline dataset indicates the last known tidal flood event to flood areas of Maidstone Borough occurred in 1927 when the channel capacity was exceeded and there were no raised flood defences. This flood event caused areas of Aylesford and Allington to flood as a result and the Maidstone Borough

[57] Mott Macdonald (2008), Maidstone Borough Council: Strategic Flood Risk Assessment

58 Mott Macdonald (2008), Maidstone Borough Council: Strategic Flood Risk Assessment

Stage 1 SWMP states that there are approximately 7 properties that may have been affected by flooding.

Flood Zone mapping can be found in Appendix C, with consideration of the impact of climate change in Appendix D.

Flood Zones 2 and 3 represent the area that would be flooded in the 0.5% AEP and 0.1% AEP tidal events, respectively, in the absence of defences. In the context of the borough, tidal Flood Zone extents are small.

7.6 Surface water flood risk

Flooding from surface water runoff (or 'pluvial' flooding) is caused by short periods of high intensity rainfall and usually affects lower lying areas, often where the natural (or artificial) drainage system is unable to cope with the volume of water. Surface water flooding problems are inextricably linked to issues of poor drainage, or drainage blockage by debris, and sewer flooding.

Tide locking is also an issue where high tides prevent surface water from draining from gravity outfalls which may be an issue near Allington Lock. The Environment Agency's Risk of Flooding from Surface Water (RoFSW) mapping predominantly follows topographical flow paths of existing watercourses, dry valleys or roads with some isolated ponding located in low lying areas. The RoFSW mapping is available in Appendix E.

In order to better quantify the impacts of climate change in the future, JBA has also produced RoFSW mapping with climate change allowances of 20% and 40% to represent increases in peak rainfall intensities. These maps are available in Appendix F.

Following the conclusion of the Borough wide Stage 1 Surface Water Management Plan (SWMP) for Maidstone, Stage 2 SWMPs were published in 2017 focusing on specific settlements, these were Staplehurst, Headcorn and Marden. These Stage 2 SWMPs are all located in the south of the borough, where the flatter topography and underlying clays of the Low Weald lead to poor drainage.

7.6.1 Staplehurst SWMP

A stage 2 SWMP was prepared for Staplehurst in 2017, this identified highway drainage related issues as a significant cause of surface water flooding in Staplehurst, which is further exacerbated by the flat topography and the impermeable underlying Weald Clay. The action plan focuses on low cost measures such as Property Flood Resilience (PFR), more frequent drainage maintenance and outfall clearance.

7.6.2 Headcorn SWMP

The topography of Headcorn is relatively low lying and is underlain by the Weald Clay, contributing to surface water flooding in the village. The report also noted that there are few surface water drainage systems, with runoff discharging to the foul network or into soakaways, which are unlikely to be effective. Flooding coincided with high river levels in the River Beult, which may indicate an inability of the surface water drainage systems to discharge runoff during fluvial flood events. No flood alleviation options were found to be cost effective, however it was proposed to install a rain gauge to ensure more accurate and timely flood warnings.

7.6.3 Marden SWMP

Surface water flooding in Marden may be the result of the impermeable Weald Clay and the increasing amount of urbanisation which creates impervious areas. The report indicated that surface water flooding was associated with elevated Main River levels and may be the result of an inability of the surface water drainage system to discharge runoff during fluvial flood events. The action plan focused on low cost measures to manage flood risk including PFR and more frequent drainage maintenance.

7.7 Groundwater flood risk

Groundwater flooding occurs as excess water emerges at the ground surface or within manmade underground structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and it can result in significant damage to property. High groundwater levels can also impact subsurface assets such as sewers which may contribute to other types of flooding, particularly where such assets are poorly maintained.

The 2008 Level 1 SFRA states that most of the reports of groundwater flooding are noted to be isolated singular incidents. However, a number of groundwater flooding incidents were reported in Boughton Monchelsea[59]. Boughton Monchelsea is a complex area for flood risk, and flood risk in the area is likely to be a combination of fluvial, groundwater and surface water flood sources. Proposed developments in this area and others will need to consider how these sources of risk, and possible interaction can be managed. Elsewhere, the **Maidstone Stage 1 SWMP**[60] identified one recorded event of groundwater flooding at Water Lane, Harrietsham, due to the local springs affecting the highway.

The 5m resolution JBA Groundwater Flood Map for Maidstone Borough can be found in Appendix G.

As illustrated in Appendix G, a large proportion of Maidstone Borough is at risk from groundwater flooding, with some of the highest risk areas around Eyhorne Street, Harrietsham, Lenham Heath, Marden and Staplehurst. The JBA Groundwater Flood Map shows that these higher risk areas are associated with the Lower Greensand in the north of the borough and permeable superficial deposits towards the south of the borough.

It is noted that it can be difficult to ascertain if a source of flooding is from groundwater. This is because the flood risk may be the result of a combination of sources, or a culverted watercourse that may have been mistaken for a spring or an underground stream. Nonetheless, developers planning to build within should still investigate whether groundwater flooding is likely to be a problem locally.

7.8 Flooding from sewers

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and / or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems such as blockages, collapses or equipment (such as pumps) failure occur in the sewerage system. The flow of surface water into manhole openings, the soil or groundwater may cause high flows in sewers for prolonged periods of time.

Existing sewers can also become overloaded as new development adds to their catchment, even with restrictions in place on permitted discharge, or due to incremental increases in roofed and paved surfaces at the individual property scale. Sewer flooding is therefore a problem that could occur in many locations across the study area.

Southern Water provides records of incidents of flooding relating to public foul, combined or surface water sewers and identifies which properties suffered flooding. For confidentiality reasons, this data has been supplied on a postcode basis from the Sewer Incident Report Form (SIRF) hydraulic overload database. Data covers all reported incidents within the borough between January 2016 and May 2020. The information from the SIRF database is shown in Table 7-2.

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[59] Mott Macdonald (2008), Maidstone Borough Council: Strategic Flood Risk Assessment

[60] JBA Consulting (2013) Maidstone Stage 1 Surface Water Management Plan, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/maidstone-surface-water-management-plan [Accessed 15/05/2020]

Table 7-2 Sewer flooding incidents in the Local Plan Review area from 2016-2020

Postcode	2016	2017	2018	2019	2020	Total
ME1 4	2	4	4	6	1	17
ME1 5	6	19	4	3	6	38
ME1 6	1	0	5	3	0	9
ME1 7	2	3	3	3	4	15
ME1 8	0	2	3	1	1	7
TN1 2	6	2	8	5	15	36
TN2 7	3	2	4	0	0	9
Total	20	32	31	21	27	131

7.9 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres in England are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs. The Environment Agency is currently progressing a 'Risk Designation' process so that the risk is formally determined.

Outlines from the Risk of Flooding from Reservoirs dataset (informed from the National Reservoir Inundation Mapping (NRIM) study) show worst case inundation extents of reservoirs impacting the Local Plan Review area are detailed in Appendix H. The Environment Agency are currently engaged on a programme to improve the quality of its reservoir flood mapping, this is due to be completed by the end of 2020.

Most notably, the biggest risk of flooding from a reservoir breach is from the Bewl Bridge Reservoir, which is predicted to flood large parts of the River Teise and River Medway floodplains. Leigh Flood Storage Area (FSA) (formerly Leigh Barrier FSR) and Weirwood Reservoir are also predicted to flood parts of the River Medway floodplain, including the Yalding area. Although located approximately 6.2km south of the borough boundary near Wadhurst, a breach of this reservoir could have notable implications for the south-west area of the borough through to Maidstone Town. Potential sources of reservoir flooding are indicated in Table 7-3.

Table 7-3 Reservoirs presenting a potential flood risk to the Local Plan Review area

Reservoir	Location (grid reference)	Reservoir owner	Environment Agency area	Local Authority
Within Maidstone borough				
Cheveney Farm Upper Lake No 1	571465, 149587	Cheveney Farm	Kent and South London	Kent County Council
Dreamfields (ID370)	574704, 149087	Alan Firmin Ltd		
Leeds Castle Moat	583507, 153242	Leeds Castle Foundation		
Little London Reservoir	576427, 149697	Smith		

Mote Park Lake (ID398)	577417, 155375	Maidstone Borough Council		
Parkwood Farm Reservoir	578148, 151490	Boughton Monchelsea Parish Council		
Redwalls Lower Reservoir (ID283)	574885, 148981	Alan Firmin Ltd		
Redwalls Upper Reservoir (ID369)	575025, 149111	Alan Firmin Ltd		
The Ringles Reservoir	584573, 144224	Ringles Ltd		
Weirton Hill	577658, 149089	Pavlovic		
Outside of Maidstone borough				
Bayham Lake	564315, 136595	Shchukina	Kent and South London	Kent County Council
Bedgebury Park Great Lake	572382, 134818	Bell Bedgebury International School		
Bewl Bridge Reservoir	568239, 133654	Southern Water Services Ltd		
Bough Beech Reservoir	549168, 147292	Sutton and East Surrey Water Company		
Churches Reservoir	566321, 153960	Hugh lowe Farms Ltd		
Coult Stream Dam	565824, 149375	Environment Agency		
Leigh Barrier (Medway) FSA	556408, 146112	Environment Agency		
Style Place Farm	564326, 149164	Laurence J Betts Ltd		
Weirwood Reservoir	540713, 135333	Southern Water Services Ltd		East Sussex County Council

7.10 Summary of flood risk to key settlements

A high-level review of the flood risk to key wards in the Maidstone Borough Local Plan Review area has been undertaken. Table summarises the flood risk to the main settlements in Maidstone Borough.

Table 7-4: Summary of flood risk to the key settlements in the study area

Settlement	Fluvial/tidal/coastal flood risk	Formal flood defences	Surface water flood risk	Predicted groundwater levels across the settlement during the 1% AEP event according to JBA Groundwater Flood Map (note that predicted groundwater levels may vary across the settlement so more than one level category could be ticked)					Reservoir inundation
				No risk	5m below surface	0.5 to 5m below surface	0.025m to 0.5m below surface	Within 0.025m of surface	
Maidstone	Maidstone is located at the confluence of the River Medway, River Len and Loose Stream. The Medway is tidally influenced as far inland as East Farleigh. Consequently, parts of the town centre are within Flood Zones 2 and 3, the Environment Agency's historic flood outlines show a history of flooding in Maidstone.	See Section 8	Mapping indicates that large areas of surface water ponding occur at Maidstone Hospital, Scotney Gardens and on the railway line south of Maidstone West Station. Significant overland flow paths occur at Upper Fant and north-east Maidstone as a result of the steeper topography.	✓	✓	✓	✓	✓	Inundation from Bewl Bridge, Mote Park lake, Leigh Barrier and Bough Beech reservoirs
Staplehurst	Staplehurst is located outside of Flood Zones 2 and 3 (Flood Zone 1). The A229 1km north of the town is indicated to be in Flood Zone 3 and Environment Agency data indicated that this section of road has previously flooded.	See Section 8	Mapping indicates that surface water ponding occurs along Fishers Road, Corner Farm Road and Staplehurst Station. OS data indicates that flow paths in Staplehurst are likely to be associated with ordinary watercourses, some of which are culverted under Station Road.	✓			✓		None
Yalding	Southern Yalding is located within Flood Zones 2 and 3 due to its proximity to the Rivers Beult and Medway. This includes properties at High Street, Lyngs Close and along the B2162 that are situated within the Functional Floodplain (Flood Zone 3b). Northern Yalding is situated outside Flood Zones 2 and 3.	See Section 8	The topography of the town is relatively steep, from higher areas in the north of Yalding to lower areas in the floodplain of the Rivers Beult and Medway. This results in the occurrence of surface water flow paths in Vicarage Road, Medway Avenue and Kenward Road. Due to the topography, there are fewer areas in which surface water ponding occurs.	✓	✓			✓	Inundation from Bewl Bridge, Weirwood and Bough Beech reservoirs.
Marden	Western parts of Marden are located within Flood Zones 2 and 3 including Meades Close, Reader Drive and the industrial estate north of the railway line. The railway line itself is also indicated to be within Flood Zones 2 and 3.	See Section 8	Areas of surface water ponding occur along Sovereigns Way and Pattenden Lane, this is partly due to the relatively flat topography of Marden. There are a number of small flow paths present in Marden along the B2079 and Howland Road. In some cases, these appear to be associated with ordinary watercourses, for example at Phoenix Road.	✓			✓		Inundation from Bewl Bridge reservoir.
Headcorn	Headcorn is situated between two tributaries of the River Beult, which converge west of the settlement. As a result, parts of northern and southern Headcorn are located in	See Section 8	Headcorn is relatively flat and is underlain by Weald Clay which results in a larger quantities of surface water runoff. This is indicated in the RoFSW maps with large areas of ponding, of note is Headcorn Fire Station. There are also a small number of flow	✓			✓	✓	None

	Flood Zones 2 and 3. This includes Headcorn Primary School and properties along Kings Road and Brooklands. Properties along Biddenden Lane and Orchard Glade are also within Flood Zones 2 and 3.		paths which in some cases appear to be associated with ordinary watercourses.						
Bearstead	Parts of Bearstead are located within Flood Zones 2 and 3 due to their proximity to The Lilk, a tributary of the River Len. This may affect properties along The Street and Mallings Drive.	See Section 8	There are significant surface water flow routes in Bearstead, particularly along Church Lane and Trapfield Close in the east of Bearstead, which is active during the 3.33% AEP event (1 in 30 year). These flow paths appear to affect many of the surrounding properties. In other parts of Bearstead, surface water flow paths appear to be related to existing watercourses.	✓	✓	✓			None
Shepway	Shepway is not located within Flood Zones 2 and 3.	See Section 8	There are large overland flow routes within Shepway along with areas of ponding during the 3.33% AEP event. This affects properties throughout Shepway, particularly along Suffolk Road, Plains Avenue and Sussex Road. Flows are indicated to eventually discharge to the River Len, north of Shepway.	✓		✓			None
Harrietsham	No properties are indicated to be located within Flood Zones 2 and 3. There are areas associated with tributaries of the River Len which are within Flood Zones 2 and 3 along with parts of the M20 which are in Flood Zone 2.	See Section 8	There are minor flow paths and small areas of surface water ponding within Harrietsham. In many cases these appear to be associated with smaller ordinary watercourses as opposed to overland flow paths.	✓	✓	✓	✓		None
Lenham	Lenham is not located within Flood Zones 2 and 3.	See Section 8	Lenham slopes steeply towards the south-east and there are large overland flow paths crossing the town from higher areas. These affect potentially affect properties along Old Ashford Road, Douglas Road and Faversham Road.		✓	✓			None
Coxheath	Coxheath is not located within Flood Zones 2 and 3.	See Section 8	There are major overland flow routes on and parallel to Stockett Lane. These flow paths potentially affect properties along Linden Road, Hanover Road and Springett Way. Based on the topography these will flow in a south-north direction and are indicated to be active during the 3.33% AEP (1 in 30 year) event.	✓					None
Kingswood	Kingswood is not located within Flood Zones 2 and 3.	See Section 8	There are very large areas of surface water ponding to the north of Kingswood. This is generally confined to open fields although may affect a small number of properties. A number of small flow paths are also present which may result in property flooding along Charlesford Avenue.	✓					None
Sutton Valence	Sutton Valence is not located within Flood Zones 2 and 3.	See Section 8	The area slopes steeply towards the south, this appears to result in significant surface water flow paths along South Lane which is indicated to be active during the 3.33% AEP event (1 in 30 year). There are also a number of smaller ordinary watercourses parallel to this flow path, these both	✓					None

			feed into the River Beult ~5km south of Sutton Valence.						
Detling	Detling is not located within Flood Zones 2 and 3.	See Section 8	Due to the steep topography, there are large flow routes south of Detling that may potentially impact properties within the village. There are no significant instances of ponding within the village except on The Street.	✓	✓				None
Lenham Heath	Lenham Heath is not located within Flood Zones 2 and 3.	See Section 8	Lenham Heath is only partially located within Maidstone Borough. This part of the settlement is affected by large surface water flow routes which flow across Crabtree Lane and Lenham Heath Road potentially causing flooding to properties. These flow routes are active during the 3.33% AEP (1 in 30 year) event.	✓			✓	✓	None
Ulcombe	Ulcombe is not located within Flood Zones 2 and 3.	See Section 8	Mapping indicates that areas shown as surface water flooding are more likely to be related to existing ordinary watercourses within Ulcombe. This includes a watercourse that is culverted under The Street. Small amounts of ponding do occur resulting in highway flooding on The Street, close to the culvert.	✓					None
Grafty Green	Grafty Green is not located within Flood Zones 2 and 3.	See Section 8	The majority of surface water ponding is generated during the 0.1% AEP (1 in 1000 year), with very little surface water flooding during the 3.33% (1 in 30 year) and 1.00% AEP (1 in 100 year) events.	✓			✓		None
Chart Sutton	Chart Sutton is not located within Flood Zones 2 and 3.	See Section 8	There is a large flow path flowing across the industrial estate to the north of Chart Sutton. And discharging to Langley Loch north of the village. Aerial photography indicates that this flow path is more likely to be associated with an ordinary watercourse that may be present.	✓					None
Knowles Hill	Properties on the outskirts of Knowles Hill/Cross-at-Hand are within Flood Zones 2 and 3 from the River Beult to the north-east of the village. The majority of the village is on higher ground and is within Flood Zone 1.	See Section 8	There are no significant areas of surface water ponding or overland flow routes within the village. Outside the village there are a number of flow paths which are also associated with watercourses and also within the fluvial floodplain.	✓			✓	✓	None

8 Fluvial and tidal defences

This section provides a summary of the existing flood defence assets within the Maidstone Borough. Refer to Appendix N for recommendations and details and details on how to apply the Sequential and Exception tests using the data set out in this section.

A high-level review of flood defences was carried out for this SFRA and this involved an interrogation of existing information on asset condition and standard of protection. The Environment Agency's Spatial Flood Defences dataset was primarily used to understand the flood risk associated with defences in the borough.

Defences are categorised as either raised flood defences (e.g. walls/embankments) or Flood Storage Areas (FSAs). The assessment of the Environment Agency dataset has considered raised defences which potentially provide a standard of protection from a 5% AEP event or greater. Man-made and natural defences which may arise for instance due to the presence of naturally high ground adjacent to a settlement have been considered. The defences and their locations are summarised in the following sections.

8.1 Defence standard of protection and residual risk

One of the principal aims of the SFRA is to outline the present risk of flooding across Maidstone Borough including consideration of the effect of flood risk management measures (including flood banks and defences). The modelling that informs the understanding of flood risk within the Local Plan Review area is typically of a catchment wide nature, suitable for preparing evidence on possible site options for development. In cases where a specific site risk assessment is required, detailed studies should seek to refine the results used to provide a strategic understanding of flood risk from all sources.

Consideration of the residual risk behind flood defences has been undertaken as part of this study. Residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse. Developers should also consider the standard of protection provided by defences and residual risk when preparing detailed Flood Risk Assessments.

8.2 Defence condition

Formal structural defences are given a rating by the Environment Agency based on a grading system for their condition[61]. A summary of the grading system used by the Environment Agency for condition is provided in Table 8-1.

Table 8-1 Defence condition asset rating

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.

61 Condition Assessment Manual, Environment Agency (2012)

The condition of existing flood defences and whether they are planned to be maintained and/or improved in the future must be considered with respect to the safety and sustainability of development over its intended life and also with respect to the financial and economic commitment to the long-term provision of appropriate standards of protection. In some cases, the relevant strategy may suggest that it is not appropriate to maintain the condition of the assets, which may prove influential for the development over its intended life. In addition, detailed FRAs undertaken by developers (if a defence is influential to the proposed development) will need to thoroughly explore the condition of defences, especially where these defences are informal and demonstrate a wide variation of condition grades. It is important that all of these assets are maintained to a good condition and their function remains unimpaired in accordance with the policy and strategy for Flood Risk Management.

8.3 Tidal and fluvial flood risk management measures (defences) in the Local Plan Review area

Analysis of the Environment Agency's Spatial Flood Defences layer indicates that there are no formal flood defences within the Local Plan Review area. However, defences are located both upstream (Leigh FSA and East Peckham FSA) and downstream (tidal flood walls/embankments).113

The probability of failure of defences is reduced by the actions of the defence owners in maintaining these, but there remains a residual risk from flooding. Should defences form part of future development plans within the borough, it would be necessary that assessment of the 'residual' risk of defence failure (e.g. breach) be considered. It may also be important to understand how existing defences outside of the borough may influence flood risk at a future development site.

A number of structures (walls and embankments) are present in the Local Plan Review area which may provide a flood defence function although they are not considered to be formal flood defences. These structures are shown in Appendix I. For the purposes of the SFRA, structures which are indicated to have a design standard of less than 5% AEP have been excluded. Details regarding the structures standard of protection, condition and type are shown in Appendices I.1, I.2 and I.3 respectively.

8.4 Alleviation Schemes

There are a number of flood alleviation schemes that involve flood risk management measures both within and outside the borough, which may have an impact on flood risk within the Local Plan Review area.

8.4.1 Middle Medway Flood Resilience Scheme

The Environment Agency in partnership with Kent County Council and Maidstone Borough Council is working to implement Property Flood Resilience (PFR) and Community Level Resilience (CLR) measures as part of the **Middle Medway Flood Resilience Scheme**[62] (MMFRS). These measures are targeted at homes near the confluence of the Rivers Medway, Teise and Beult and aims to reduce flood risk to homes considered to be at 'very significant risk' in the following parishes:

- Yalding
- Collier Street
- Hunton

62 Environment Agency (2019) Policy paper: Middle Medway flood resilience scheme, available at: https://www.gov.uk/government/publications/middle-medway-flood-resilience-scheme/middle-medway-flood-resilience-scheme [Accessed 11/06/2020]

- East Farleigh
- West Farleigh
- Wateringbury
- Marden
- Nettlestead

The scheme has been divided into multiple phases, with -Phase 1a being a pilot that delivered PFR measures to 28 properties, this was completed in early 2018, with Phase 2a being completed in 2020. Phase 2 involves the delivery of the CLR measures of the MMFRS, with initial assessments being completed in 2018.

8.4.2 Leigh FSA embankments scheme

The Leigh Flood Storage Area (FSA) was built in 1982 following the 1968 floods and is operated by the Environment Agency. It reduces flood risk to 965 properties and 300 businesses in Tonbridge, outside the borough. Three steel radial gates can be moved to restrict flows during flood events, this controls the volume of water flowing downstream (towards Maidstone) and stores water in the FSA.

The **Leigh FSA embankments scheme** will increase the storage capacity of the existing Leigh FSA and includes the construction of an additional embankment at Hildenborough. The scheme will provide an additional 7.3 million cubic metres of storage, a capacity increase of 24%. The scheme is due to be completed by the end of 2023.

8.5 Future schemes

The schemes set out below are proposed flood management schemes. As such, these schemes have not been considered within any flood mapping and should not be taken into account within any assessments of flood risk until they are delivered.

8.5.1 Improving the River Beult SSSI

The River Beult is approximately 25km in length, from its source in Hadmans Bridge, to the confluence with the River Medway in Yalding and is almost entirely contained within the borough.

The Medway Flood Partnership (established in 2017) set out a number of **potential options to improve the River Beult** in 2018 including regrading and realignment of the channel, Natural Flood Management (NFM) and impounding flows. If implemented these options will provide a reduction in flows into the River Medway and reduce flood risk along the River Beult.

8.5.2 Defences near Fairmeadow, Maidstone

Maidstone Borough Council is undertaking a flood defence scheme to protect businesses and the main A229 carriageway along Fairmeadow. Flood walls will be constructed along the subway and temporary defences with run between Fairmeadow and the dual carriageway. The scheme is led and funded by MBC, with support from the Environment Agency.

8.6 Residual flood risk

Residual risks are those remaining after applying the sequential approach and taking mitigating actions. In circumstances where measures are put in place to manage the flood risk there remains a possibility of flooding being experienced, either as a consequence of the event exceeding the design capacity or the failure of the asset providing the appropriate standard of protection. 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 through an FRA.

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

9 FRA requirements and flood risk management guidance

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

9.1 Over-arching principles

This SFRA focuses on delivering a strategic assessment of flood risk within the Maidstone Borough Local Plan Review area. Prior to any construction or development, site-specific assessments will need to be undertaken, as appropriate so all forms of flood risk at a site are fully addressed. It is the responsibility of the developer to provide an FRA with an application.

It should be acknowledged that a detailed FRA may show that a site is not appropriate for development of a particular vulnerability or even at all. Where the FRA shows that a site is not appropriate for a particular use, a lower vulnerability classification may be appropriate.

Some sites may additionally require the application of the Exception Test following the Sequential Test which is detailed in Section 4.

9.2 Requirements for site-specific flood risk assessments

9.2.1 What are site specific FRAs?

Site specific FRAs are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with planning applications and should demonstrate how flood risk will be managed over the development's lifetime, taking into account climate change and vulnerability of users.

Paragraph 068[63] of the NPPF Flood Risk and Coastal Change Planning Practice Guidance sets out a checklist for developers to assist with site specific flood risk assessments.

9.2.2 When are site specific FRAs required?

Site specific FRAs are required in the following circumstances:

- Proposals for new development (including minor development and change of use) in Flood Zones 2 and 3
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency)
- Proposals of 1 hectare or greater in Flood Zone 1 due to their surface water impact which will be dealt with through a surface water drainage strategy.
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding
- Proposals of less than one hectare in Flood Zone 1 where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water)

An FRA may also be required for some specific situations:

63 Ministry of Housing, Communities & Local Government (2014) Flood risk and coastal change, available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section [accessed 05/06/2020]

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)
- Where the site is intended to discharge to the catchment or assets of a water management authority which requires a site-specific FRA
- Where evidence of historical or recent flood events have been passed to the LPA
- On land in the vicinity of small watercourses or drainage features that might not have been demarcated as being in a flood zone on the national mapping
- At locations where proposals could affect or be affected by substantial overland surface water flow routes

A Surface Water Drainage Strategy is required for any major development.

9.2.3 Objectives of site specific FRAs

The aim of an FRA is to demonstrate that the development is protected to the 1% AEP fluvial and 0.5% AEP tidal flood scenario and is safe for its intended life span during the 'design' flood event, including an allowance for climate change. This includes assessment of mitigation measures required to safely manage flood risk. Development proposals requiring FRAs should establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source over the lifetime of the development;
- Whether a proposed development will increase flood risk elsewhere;
- Whether the measures proposed to deal with the effects and risks are appropriate;
- Assess the potential cumulative impact of development on flood risk (as described in Section 4.5);
- The evidence, if necessary, for the Local Planning Authority to apply the Sequential Test; and
- Whether, if applicable, the development will be safe and pass the Exception Test, if applicable.

FRAs for sites located in the Local Plan Review area should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and Kent County Council. This includes:

- **Planning Practice Guidance – Flood Risk and Coastal Change**[64]
- **Site-specific Flood Risk Assessment: Checklist**[65]
- **Standing Advice on Flood Risk**[66]
- **Flood Risk Assessment for Planning Applications**[67]

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[64] Planning Practice Guidance – Flood Risk and Coastal Change available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change [Accessed 27/08/2020]

65 Ministry of Housing, Communities & Local Government (2014) Flood risk and coastal change available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section [Accessed 04/06/2020]

66 Department for Environment, Food & Rural Affairs and Environment Agency (2019) Preparing a flood risk assessment: standing advice, available at: https://www.gov.uk/guidance/flood-risk-assessment-standing-advice [Accessed 04/06/2020]

67 Department for Environment, Food & Rural Affairs and Environment Agency (2017) Flood risk assessments if you're applying for planning permission, available at: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications, [Accessed 04/06/2020]

- **Drainage and Planning Policy**[68]

The following sections provide information for Maidstone Borough Council and developers to assist in the preparation of FRAs.

9.3 For Maidstone Borough Council

One of the key objectives of the SFRA is to provide an evidence base, which will inform the preparation of the Local Development Framework with respect to local flood risk issues and the location of future development.

The local planning authority can play an important role in strategic flood risk management. The overall aim should be to direct development to areas of lower flood risk wherever possible and resist development in areas of flood risk unless the type of development is commensurate with the type of flood risk.

The Council should also seek flood risk reduction in every new development and redevelopment through design, changes in land use and drainage requirements.

9.3.1 Reviewing of FRAs

Guidance for local planning authorities for reviewing flood risk assessments submitted as part of planning applications has been published by Defra in 2015 – **Flood Risk Assessment: Local Planning Authorities**[69].

9.4 For developers

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

In general, all future developments should demonstrate:

- That the probability and consequences of flooding will be reduced.
- How actual and residual flood risk to the development and flood risk to others from all sources will be managed over the lifetime of the development, taking into account climate change.
- That development will be safe through the layout, form and floor levels of the development and mitigation measures.
- That surface water runoff is being managed.
- A development will have certain requirements to fulfil, dependent upon which Flood Zone it is located within.

The following subsections contain information to assist developers where flood risk to and from a development is identified which should be read alongside the guidance documents listed in Section 9.2.3.

9.4.1 Climate change projections

In order to assess whether a development will be safe from flooding over its lifetime it is important to look at the impact of climate change as outlined in Section 5.

9.4.2 Smaller watercourses

As described in Section 7.4, the Environment Agency's Flood Maps may suggest that there is not a flood risk along small watercourses (watercourses with a catchment less than

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68 Kent County Council, Drainage and Planning Policy, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0003/49665/Drainage-and-Planning-policy-statement.pdf [Accessed 04/06/2020]

69 Department for Environment, Food & Rural Affairs and Environment Agency (2015) Review individual flood risk assessments: standing advice for local planning authorities, available at: https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities [Accessed 04/06/2020]

3km^2). As part of a site-specific flood risk assessment the potential flood risk and extent of Flood Zones should be determined for these smaller watercourses and this information used as appropriate to perform the Sequential and Exception tests.

9.4.3 Reducing fluvial and tidal flood risk through site design and layout

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 use away from flood zones, to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas. However, vehicular parking in floodplains should be based on the nature of parking, flood depths and hazard including evacuation procedures and flood warning. The nature of risk to water quality also needs to be considered and mitigated for to ensure that accumulated hydrocarbons and other vehicle related pollutants are not released to the aquatic environment. Particular consideration should be given to designing drainage systems that reduce the risk of groundwater ingress, as this is a known existing problem.

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 ensure safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

Raised floor levels

The raising of internal floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood.

If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, finished floor levels for development that does not include sleeping accommodation on the ground floor should normally be set to whichever is higher of the following, where relevant:

- A minimum of 300mm above the fluvial 1% AEP + 35% climate change level.
- The fluvial 1% AEP + 70% climate change level.
- A minimum of 300mm above the tidal 0.5% AEP level, and appropriate allowance should be made for climate change based on the vulnerability classification of the development.
- 300mm above the general ground level of the site.

Finished Floor Levels for sleeping accommodation should normally be set to whichever is higher of the following:

- A minimum of 600mm above the fluvial 1% AEP + 35% climate change level.
- The fluvial 1% AEP + 70% climate change level.
- A minimum of 600mm above the tidal 0.5% AEP level plus an allowance for climate change.

Climate change uplifts noted above are for the 2080s (2070 to 2115) epoch for fluvial and 2096-2125 epoch for coastal – these are generally appropriate for residential development. However, the lifetime of the proposed development should be used to decide which future time period to use.

If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches. Where no detailed flood modelling is available, an FRA would be required to estimate the flood level and subsequent Finished Floor Level.

The additional height that the floor level is raised above the maximum water level is referred to as the "freeboard". Additional freeboard may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels.

Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water. This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route. However, access and egress would still be an issue, particularly when flood duration covers many days.

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

Modification of ground levels

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for flood waters. However, care must be taken at locations where raising ground levels could adversely affect existing communities and property.

In most areas of fluvial flood risk, raising land above the floodplain would reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land.

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 (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary.

Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

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 ensure that it would not cause increased ponding or build-up of surface runoff on third party land.

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

Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain if they are overtopped or breached.

If defences are constructed to protect a development site, it will need to be demonstrated that the defences will not have a resulting negative impact on flood risk elsewhere, and that there is no net loss in floodplain storage. Compensatory storage must be provided where raised defences remove storage from the floodplain. It would be preferable for schemes to involve an integrated flood risk management solution.

Temporary or demountable defences are not acceptable forms of flood protection for a new development but might be appropriate to address circumstances where the consequences of residual risk are severe. In addition to the technical measures the proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate.

Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and ensure 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. Building adjacent to riverbanks can also cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult.

Various buffer strip Byelaws are in place within Maidstone Borough. Under the Southern Region Land Drainage and Sea Defences Byelaws, the Environment Agency specifies that no development is permitted within 8m either side of a Main River or within 15m of the foot of the landward side of any sea defences or between the low water mark of medium tides and the seaward side of any defence.

Under the Upper Medway Internal Drainage Board Land Drainage Byelaws, no development is permitted within 8m of the landward to of the bank where there is an embankment or wall, or within 8m of the top of the batter where there is no embankment or wall, or where the watercourse is enclosed within 8m of the enclosing structure.

9.4.4 Reducing flood risk through site design from other sources

Surface water

Reference should be made to the Environment Agency's Risk of flooding from Surface Water Map. KCC expect that the site should be designed so that the natural surface water flow routes are preserved. This will mitigate the need for resistance and resilience measures at the new development. If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled.

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of greenfield surface water drainage by encouraging water to flow along natural flow routes and thereby reduce runoff rates and volumes during storm events while providing some water treatment benefits. More detailed guidance on the use of SuDS is providing in Section10 10.

Groundwater

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

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off site. Developers should provide evidence and ensure that this will not be a significant risk.

Sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. The development must improve the drainage infrastructure to reduce flood risk on site and the wider area.

Non-return valves prevent water entering the property from drains and sewers. These can be installed within gravity sewers or drains in a property's private sewer upstream of the public sewerage system. They need to be carefully installed and must be regularly maintained. Consideration must also be given to attenuation and flow ensuring that flows

during the 1% AEP plus climate change storm event are retained within the site if any flap valves shut. This must be demonstrated with suitable modelling techniques. Particular consideration should be given to designing drainage systems that reduce the risk of groundwater ingress.

Reservoirs

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage:

Developers should seek to contact the reservoir owner to obtain information which may include

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

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

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

Consultation should be undertaken with relevant authorities regarding emergency plans in case of reservoir breach.

In addition to the risk of inundation those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

9.4.5 Resistance and Resilience measures

There may be instances where flood risk to a development remains despite implementation of such site design and layout measures as those outlined above. For example, where the use is water compatible where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk at the 0.1% AEP scenario. In these cases, (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not normally be relied on for new development as an appropriate mitigation method.

Resistance measures aim to reduce the amount of floodwater entering the building and resilience measures aim to reduce the damage caused by flood water which has entered the property.

Resistance measures

Most of the resistance measures should be regarded as reducing the rate at which flood water can enter a property during an event and considered an improvement on what could be achieved with sandbags. They are often deployed with small scale pumping equipment to control the flood water that does seep through these systems. The effectiveness of these forms of measures is often dependant on the availability of a reliable forecasting and warning system, so the measures are deployed in advance of an event. The following resistance measures are often deployed:

- Permanent barriers - Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

- Temporary barriers - Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

Resilience measures

Interior design measures to reduce damage caused by flooding. For example:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level
- Water-resistant materials for floors, walls and fixtures
- If redeveloping existing basements for non-residential purposes, new electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level to minimise damage if the development floods.
- When redeveloping existing buildings, it may be acceptable to install pumps in basements as a resilience measure. However, for new development this is not considered an appropriate solution.

Resistance and resilience measures will be specific to the nature of flood risk, and as such will be informed and determined by the FRA. Further guidance relating to appropriate resistance and resilience measures can be found on the Environment Agency's **Flood risk Assessment in Flood Zones 2 and 3**[70] webpage. The Kent Resilience Forum also provides information and advice on resilience measures in its **Protect Your Home**[71] section.

9.4.6 Cumulative effects

At some locations it will be necessary to include consideration in an FRA of not only the flood risk at a particular site, but also the cumulative effects of all proposed plan allocations within a catchment. Reference should be made to Section 13.4 with respect to the consideration that should be given in these circumstances.

9.4.7 Community resistance measures

Community resistance measures include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood. However, new developments should normally not require consideration of community resistance measures.

The Kent Resilience Forum provides advice on **Community Flood Resilience**[72], containing resources and information on how properties and communities can be made as prepared and resilient for flooding as possible.

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70 Department for Environment, Food & Rural Affairs and Environment Agency (2017) Flood risk assessment in flood zones 2 and 3, available at: https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zones-2-and-3#extra-flood-resistance-and-resilience-measures [Accessed 04/06/2020]

71 Kent Resilience Forum, Protect your home, available at https://www.kentprepared.org.uk/protect-your-home [Accessed 04/06/2020]

72 Kent Resilience Forum, Help your community, available at https://www.kentprepared.org.uk/help-your-community [Accessed 04/06/2020]

9.4.8 Emergency planning

Safe access and egress from the site should be provided to reduce the residual risks to a development. 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 11.

9.4.9 Making space for water

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

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

Consideration for making space for water should also be applied to surface water generated by impermeable surfaces. All new developments should aim to incorporate SuDS to minimise the amount of surface water that is generated. Through a sequential design, known areas of flood risk from surface water can be set aside as open space to ensure flow routes are not blocked, preventing water from building up to potentially dangerous depths. The provision of SuDS also allows water related features to become part of the landscape, offering improved aesthetics to a development and removing the need for underground storage or culverting.

9.5 Developer contributions

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

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRMGiA) can be obtained by operating authorities to contribute towards the cost of a range of activities including flood risk management schemes that help reduce the risk of flooding and coastal erosion. Some schemes are only partly funded by FCRMGiA and therefore any shortfall in funds will need to be found from elsewhere when using Resilience Partnership Funding, for example local levy funding, local businesses or other parties benefitting from the scheme.

However, the provision of funding by a developer for the cost of the necessary standard of protection from flooding or coastal erosion does not mean the development is appropriate as other policy aims must also be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the Council and the Environment Agency.

The appropriate route for the consideration of strategic measures to address flood risk issues is the Local Flood Risk Management Strategy (LFRMS) prepared by the Lead Local Flood Authority. The LFRMS should describe the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS, can be afforded and have an appropriate priority.

The Environment Agency is also committed to working in partnership with developers to reduce flood risk. Where assets are in need of improvement or a scheme can be

implemented to reduce flood risk, the Environment Agency request that developers contact them to discuss potential solutions.

10 Surface water management and SuDS

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

10.1 Introduction

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 facilities into the development landscape strategy.

10.2 Role of the LLFA and Local Planning Authority in surface water management

From April 2015 local planning policies and decisions on planning applications relating to major development or major commercial development should make provision for sustainable drainage systems to manage run-off where major developments are defined as:

- residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known; and
- non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres or more or, where the floor area is not yet known, a site area of one hectare or more.

The Local Planning Authority must satisfy themselves that clear arrangements are in place for future management of the maintenance arrangements and the LLFA (Kent County Council), as statutory consultee to the planning system must be consulted on the drainage and Sustainable Urban Drainage proposals.

When considering planning applications, local planning authorities should seek advice from the relevant flood risk management bodies, principally the LLFA on the management of surface water (including what sort of SuDS they would consider to be reasonably practicable), satisfy themselves that the proposed minimum standards of operation are appropriate and ensure, through the use of planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the development's lifetime. Judgement on what SuDS system would be reasonably practicable should be through reference to Defra's **'Non-statutory technical standards for SuDS'** document and should take into account design and construction costs.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. This will assist with the delivery of well designed, appropriate and effective SuDS. Proposals should also comply with the key SuDS principles regarding solutions that deliver multiple long-term benefits. These principles are:

- **Quantity**: should be able to cope with the quantity of water generated by the development at the agreed rate with due consideration for climate change via a micro-catchment-based approach
- **Quality**: should utilise SuDS features in a "treatment train" that will have the effect of treating the water before infiltration or passing it on to a subsequent water body
- **Amenity/Biodiversity**: should be incorporated within "open space" or "green corridors" within the site and designed with a view to performing a multifunctional purpose

10.3 Local policy and guidance on surface water management

10.3.1 Water. People. Places – A guide for master planning SuDS (2013)

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.

10.3.2 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) provides the latest guidance and best practice on planning, design, construction and maintenance of SuDS. The document is designed to help the implementation of SuDS features into new and existing developments, whilst maximising the key benefits regarding flood risk and water quality. It is recommended that developers and the LPA utilise the information within the manual to help design SuDS which are appropriate for development.

10.3.3 Defra Non-Statutory Technical Guidance (2015)

The guidance was developed to sit alongside PPG and provide non-statutory standards as to the expected design and performance for SuDS. The LPA will make reference to these standards when determining whether proposed SuDS are considered reasonably practicable and appropriate.

10.3.4 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.

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

A **guidance document** 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.

10.4 SuDS opportunities in Maidstone Borough

10.4.1 Infiltration

Sites underlain by higher permeability bedrock provide opportunities for infiltration techniques, like soakaways and infiltration trenches. A key Kent County Council policy set out in the Drainage and Planning Policy is to maximise infiltration through SuDS schemes wherever possible, with efforts made to utilise opportunities for infiltration where sites are underlain by lower permeability soils and bedrock:

- Highly permeable soils – in areas underlain by soils (e.g. the Hythe Beds), KCC will expect that use of infiltration will be maximised. With no off-site discharge, additional volume control will not be required.
- Intermediate permeability soils - in these areas infiltration should still be maximised; offsite discharge should be limited to QBAR, (the mean annual flood flow rate, equivalent to an approximate return interval of 2.3 years). Where sites are small and flows are calculated to be less than 2 l/s, the minimum flow rate will apply of 2 l/s.
- Low permeability soils - areas underlain by largely impermeable soils (e.g. Weald clay and London clay) will require "staged" discharge.

Where lower permeability bedrocks are overlain by more permeable superficial deposits, such as sands and gravels, there may be opportunities to utilise shallow infiltration SuDS, such as filter drains and permeable paving. As such, incorporating infiltration techniques to more sustainably manage surface water is expected by KCC for new developments.

While infiltration is an important consideration, some soil types can have other challenges which require careful design of SuDS (e.g. Hythe beds can be susceptible to solution features).

10.4.2 Other SuDS opportunities

SuDS can be integrated into the design of all new development within Maidstone Borough. The **Water, People, Places** 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.

Areas with low permeability soils and bedrock may still have potential for surface detention features, such as ponds and basins, while areas at risk of fluvial flooding can provide attenuation and biodiversity through the implementation of conveyance features, such as swales, and wetland areas. In more densely populated areas, like Maidstone, Marden, and Staplehurst, space efficient SuDS approaches may be suitable, such as green roofs, rills and permeable paving.

Additionally, Kent County Council prefer the application of 'green' and open SuDS, such as attenuation ponds, rills and swales, where possible, as opposed to 'hard' SuDS, such as permeable paving.

10.5 SuDS Considerations

10.5.1 Groundwater Vulnerability Zones

The Environment Agency published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise the underlying bedrock. The maps show the vulnerability of groundwater at a location based on the hydrological, hydrogeological and soil properties within a one-kilometre grid square.

Two maps are available:

- **Basic groundwater vulnerability map:** this shows the likelihood of a pollutant discharged at ground level (above the soil zone) reaching groundwater for superficial and bedrock aquifers and is expressed as high, medium and low vulnerability
- **Combined groundwater vulnerability map:** this map displays both the vulnerability and aquifer designation status (principal or secondary). The aquifer designation status is an indication of the importance of the aquifer for drinking water supply.

The Environment Agency's groundwater vulnerability map can be found on **Defra's Magic Interactive mapping website**[73]. 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.

10.5.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones in the vicinity of groundwater abstraction points. These areas are defined to protect areas of groundwater that are used for potable supply, including public / private potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks. **The Environment Agency's approach to groundwater protection**[74] document defines what restrictions are placed on infiltration in these zones.

The definition of each zone is shown below:

- **Zone 1 (Inner Protection Zone)** – Most sensitive zone: defined as the 50-day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres.
- **Zone 2 (Outer Protection Zone)** – Also sensitive to contamination: defined by a 400-day travel time from a point below the water table. This

73 Defra, Magic Maps, available at: https://magic.defra.gov.uk/home.htm [Accessed 10/06/2020]

74 Environment Agency (2017) The Environment Agency's approach to groundwater protection, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Envirnment-Agency-approach-to-groundwater-protection.pdf [Accessed 10/06/2020]

zone has a minimum radius around the source, depending on the size of the abstraction.

- **Zone 3 (Total Catchment)** - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75. Individual source protection areas will still be assigned to assist operators in catchment management.
- **Zone 4 (Zone of special interest**) – A fourth zone SPZ4 or 'Zone of Special Interest' usually represents a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream). In the future this zone will be incorporated into one of the other zones, SPZ 1, 2 or 3, whichever is appropriate in the particular case, or become a safeguard zone.

GSPZs in the Local Plan Review area

Large areas in the north and north east of the Local Plan Review area are within Groundwater Source Protection Zones (Figure 10-1).

10.5.3 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. The definition of each NVZ is as follows:

- **Groundwater NVZ** – an area of land where groundwater supplies are at risk from containing nitrate concentrations exceeding the 50mg/l level dictated by the EU's Surface Water Abstraction Directive (1975) and Nitrates Directive (1991).
- **Surface Water NVZ** – an area of land where surface waters (in particular those used or intended for the abstraction of drinking water) are at risk from containing nitrate concentrations exceeding the 50 mg/l dictated by the EU's Surface Water Abstraction Directive (1975) and Nitrate Directive (1991).
- **Eutrophic NVZ** – an area of land where nitrate concentrations are such that they could / will trigger the eutrophication of freshwater bodies, estuaries, coastal waters and marine waters.

The locations of the Nitrate Vulnerable Zones in the Local Plan Review area are shown in Figure 10-2.

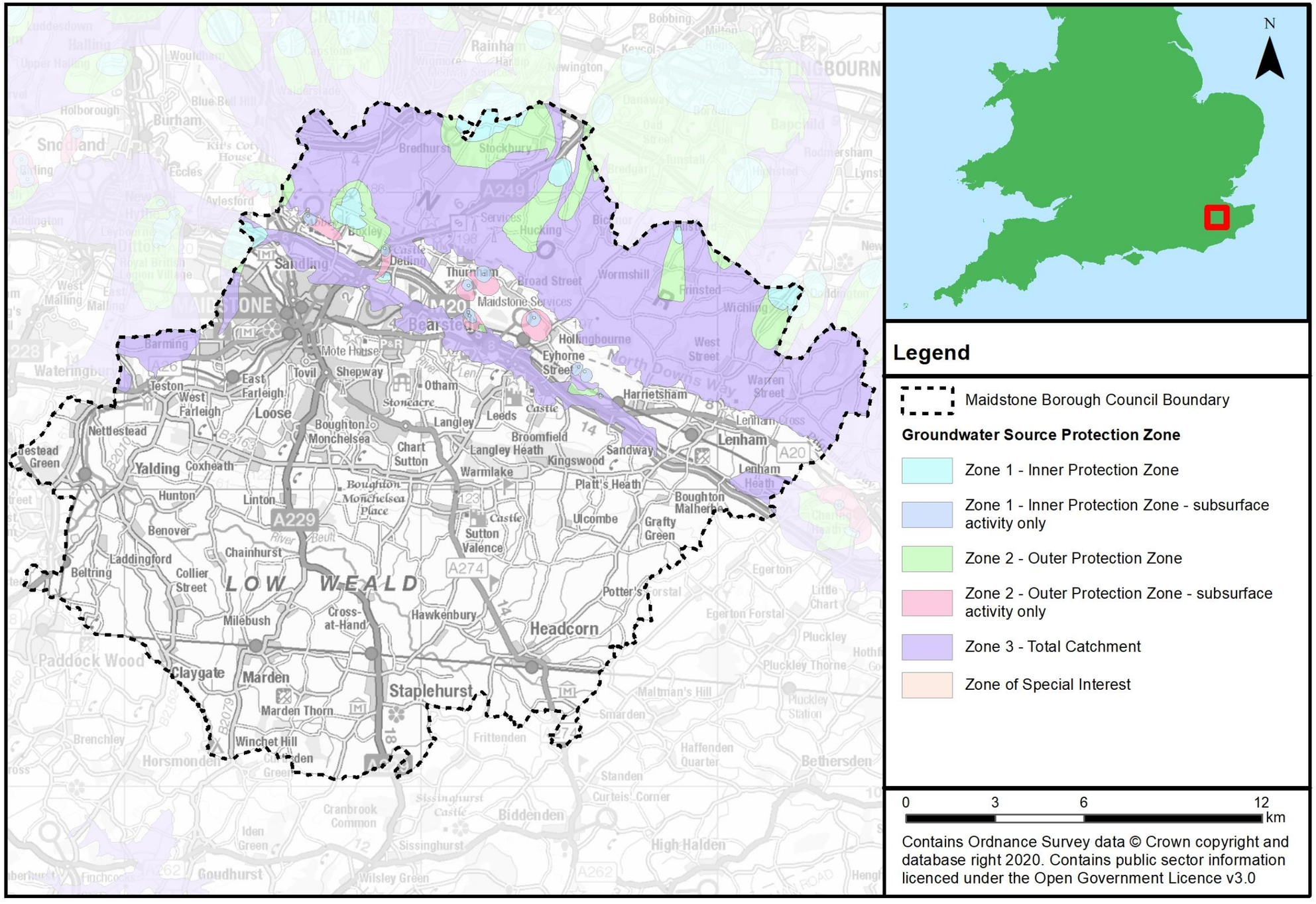

Figure 10-1: Groundwater Source Protection Zones in the Local Plan Review area

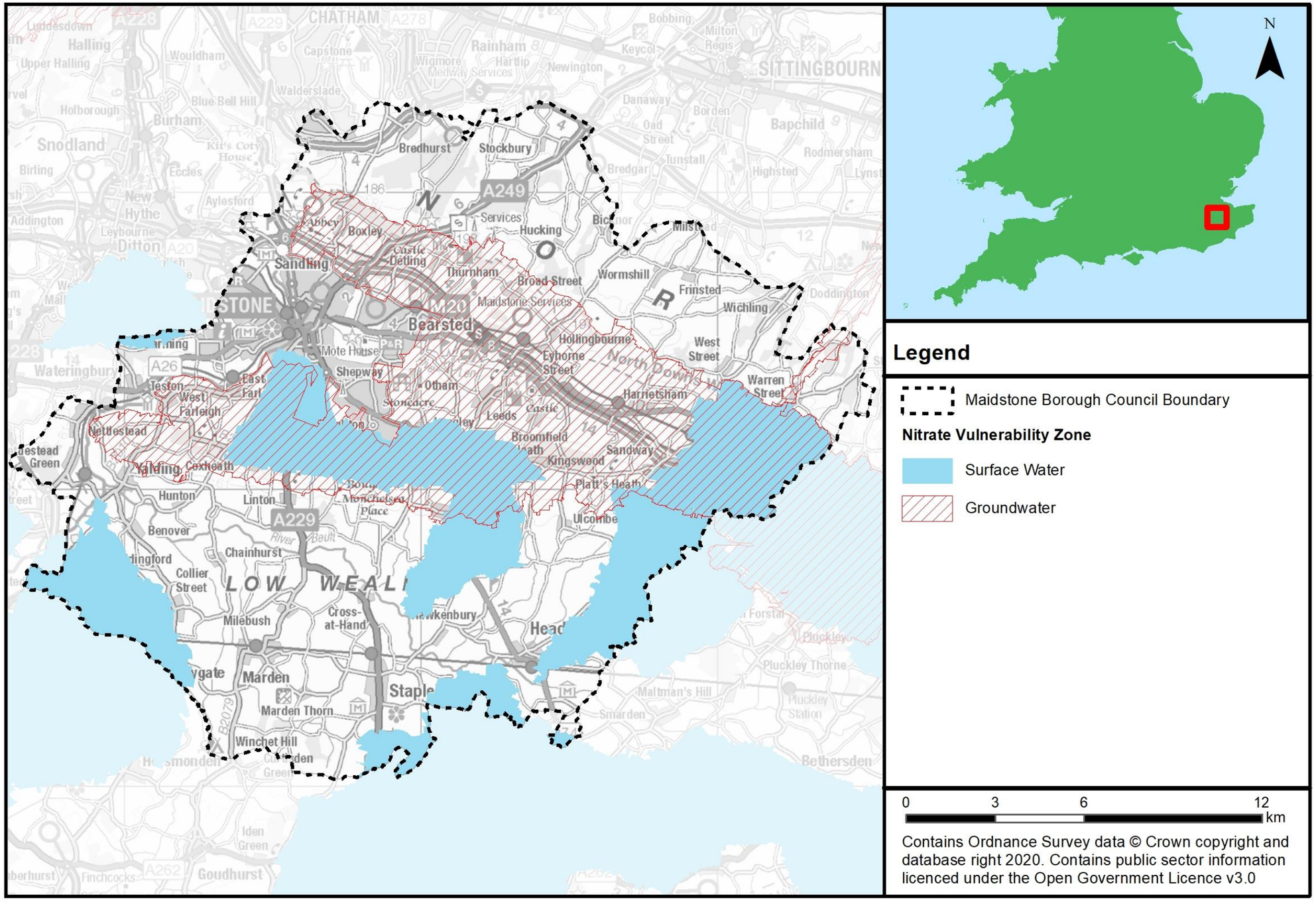

Figure 10-2: Nitrate Vulnerability Zones in the Local Plan Review area

11 Flood warning and emergency planning

This chapter provides guidance and advice on managing flood related incidents before, during and after flooding occurs.

11.1 Emergency planning

Emergency planning is one option to help manage flood related incidents. From a flood risk perspective, emergency planning can be broadly split into three phases: before, during and after a flood. The measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding.

In development planning, a number of emergency planning activities are already integrated in national building control and planning policies e.g. the NPPF Flood Risk Vulnerability and Flood Zone 'Compatibility' table seeks to avoid inappropriate development in areas at risk from all sources of flooding. Flood warning and emergency planning is a last resort after using this SFRA to undertake the Sequential Test appropriately first.

However, safety is a key consideration for any new development and includes residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures.

ADEPT and the Environment Agency have published a **Flood Risk Emergency Plans for New Development**[75] document which provides guidance for Local Planning Authorities regarding their decisions over planning applications.

The **NPPF Planning Practice Guidance**[76] outlines how developers can ensure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test. As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the LPA (where appropriate) and the Environment Agency.

There are circumstances where a flood warning and evacuation plan[77] is required and / or advised:

- It is a requirement under the 2018 NPPF that safe access and escape routes are included in an FRA where appropriate, as part of an agreed emergency plan.
- The **Environment Agency and Defra's standing advice**[78] for undertaking flood risk assessments for planning applications states that details of emergency escape plans will be required for any parts of the building that are below the estimate flood level.

It is recommended that Emergency Planners at Kent County Council (where appropriate) are consulted prior to the production of any emergency flood plan.

In addition to the flood warning and evacuation plan considerations listed in the NPPF / PPG, it is advisable that developers also acknowledge the following:

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75 ADEPT AND Environment Agency (2019) Flood risk emergency plans for new development, available at https://www.adeptnet.org.uk/system/files/documents/ADEPT%20%26%20EA%20Flood%20risk%20emergency%20plans%20for%20new%20development%20September%202019....pdf [Accessed 11/06/2020]

76 Ministry of Housing, Communities & Local Government (2019) Revised National Planning Policy Framework, available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed 15/05/2020]

77 Flood warning and evacuation plans may also be referred to as an emergency flood plan or flood response plan.

78 Environment Agency and DEFRA (2012) Flood Risk Assessment: Standing Advice: https://www.gov.uk/flood-risk-assessment-standing-advice

- How to manage the consequences of events that are un-foreseen or for which no warnings can be provided e.g. managing the residual risk of a breach.
- Proposed new development that places additional burdens on the existing response capacity of the Council will not normally be considered to be appropriate.
- Developers should encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.
- The vulnerability of site occupants.
- Situations may arise where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where applicable, a site-specific Flood Risk Assessment to help develop emergency plans.

Further emergency planning information links:

- **2004 Civil Contingencies Act**[79]
- **National Flood Emergency Framework for England**[80]
- **Sign up for Flood Warnings with the Environment Agency**[81]
- **National Flood Forum**[82]
- **Make a Flood Plan guidance and templates**[83]
- **FloodRe**[84]

11.2 Flood warning systems

Flood warnings can be derived and, along with evacuation plans, can inform emergency flood plans or flood response plans. The Environment Agency is the lead organisation for providing warnings of fluvial flooding (for watercourses classed as Main Rivers) and coastal flooding in England. Flood Warnings are supplied via the Flood Warning Service (FWS), to homes and business within Flood Zones 2 and 3. The different levels of warnings are shown in Table 11-1.

79 UK Government, Civil Contingencies Act 2004, available at: http://www.legislation.gov.uk/ukpga/2004/36/contents [Accessed 11/06/2020]

80 Department for Environment, Food & Rural Affairs, Environment Agency, and Public Health England (2013) The national flood emergency framework for England, available at: https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england [Accessed 11/06/2020]

81 GOV.UK, Sign up for flood warnings, available at: https://www.gov.uk/sign-up-for-flood-warnings [Accessed 11/06/2020]

82 National Flood Forum, available at: https://nationalfloodforum.org.uk/ [Accessed 11/06/2020]

83 GOV.UK, Prepare for a flood, available at https://www.gov.uk/prepare-for-flooding/future-flooding [Accessed 11/06/2020]

84 FloodRe, available at: https://www.floodre.co.uk/ [Accessed 11/06/2020]

Table 11-1: Environment Agency Warnings

Flood Warning Symbol	What it means	What to do
	Flood Alerts are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advance notice of the possibility of flooding, but before there is full confidence that flooding in Flood Warning Areas is expected.	• Be prepared to act on your flood plan • Prepare a flood kit of essential items • Monitor local water levels and the flood forecast on the Environment Agency website • Stay tuned to local radio or TV • Alert your neighbours • Check pets and livestock • Reconsider travel plans
	Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.	• Move family, pets and valuables to a safe place • Turn off gas, electricity and water supplies if safe to do so • Seal up ventilation system if safe to do so • Put flood protection equipment in place • Be ready should you need to evacuate from your home • 'Go In, Stay In, Tune In'
	Severe Flood Warnings warn people of expected severe flooding where there is a significant threat to life.	• Stay in a safe place with a means of escape • Co-operate with the emergency services and local authorities • Call 999 if you are in immediate danger
Warning no longer in force	Informs people that river or sea conditions begin to return to normal and no further flooding is expected in the area. People should remain careful as flood water may still be around for several days.	• Be careful. Flood water may still be around for several days • If you have been flooded, ring your insurance company as soon as possible

It is the responsibility of individuals to sign-up to the Flood Warning Service in order to receive the flood warnings via FWS. Registration and the service is free and publicly available through **https://www.gov.uk/sign-up-for-flood-warnings** or call 0345 988 1188.

It is recommended that any household considered at risk of flooding signs-up. Developers should also encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.

11.2.1 Flood Alert and Warning Areas in the Local Plan Review area

There are currently six Flood Alert Areas (FAAs) and twelve Flood Warning Areas (FWAs) within the Local Plan Review area. A list of FAAs in the study area are shown in Appendix J. A list of the FAAs in the study area are shown in Table 11-2 and a list of FWAs are shown in Table 11-3.

Table 11-2: Flood Alert Areas within Maidstone Borough Local Plan Review area

Flood Alert Code	Flood Alert Name	Source of flooding	Description
064WAF6UpStour	Upper River Stour	Great Stour, East Stour, Aylesford Stream, Ruckinge Dyke, Whitewater Dyke, Stour	Communities on the Great Stour from Charing Heath to the A2070 including Ashford, communities on the East Stour, communities on the Whitewater and Ruckinge Dykes and the Aylesford Stream
064WAF8LowMed	Lower River Medway	River Medway	The River Medway from Hampstead Lock at Yalding to Allington Lock, including East Farleigh, Wateringbury, Teston and Teston Park, Tovil and Maidstone including Millennium Park
064WAT1MedEst	Tidal Medway, Medway estuary and Isle of Grain	River Medway	Areas at risk of tidal flooding on the Tidal Medway, Medway estuary and Isle of Grain, including Aylesford, Medway Towns, Lower Halstow, Middle Stoke and Lower Stoke
064WAF8Beult	River Beult from Pluckley and	Beult	The River Beult

	Bethersden to Hampstead Lock at Yalding		from Pluckley and Bethersden to Hampstead Lock at Yalding, including Smarden, Headcorn, Collier Street, Benover and The Lees
064WAF8LowTeise	River Teise and Lesser Teise area from Horsmonden to Yalding	Teise, Lesser Teise	River Teise and Lesser Teise area from Horsmonden to Yalding, including Claygate, Collier Street and Laddingford
064WAF8MidMed	Middle River Medway	River Medway	The River Medway from Penshurst to Hampstead Lock at Yalding, including the Leigh Flood Storage area, the Ensfield Road, Tonbridge, Paddock Wood, the Hop Farm, East Peckham, Branbridges and Hale Street

Table 11-3 Flood Warning Areas within Maidstone Borough Local Plan Review area

Flood Warning Code	Flood Warning Name	Source of Flooding	Description
064FWF6LenHeath	Great Stour from Lenham Heath to Hothfield	, Great Stour	The Great Stour from Lenham Heath to Hothfield including Charing Heath, Little Chart and the Hothfield Flood Storage area
064FWF8PaddWood	Paddock Wood and Laddingford	River Teise, River Medway	River Teise and Medway at Paddock Wood and Laddingford
064FWF8CollStreet	River Beult and Lesser Teise at Collier Street	River Teise, River Beult	River Beult and Lesser Teise at Collier Street, including Marden, Benover, Chainhurst and Haviker Street
064FWT8TidalMed	Tidal River	River Medway,	Tidal River

	Medway from Allington to Cuxton		Medway between Allington and Cuxton
064FWF8Yalding	River Medway, River Teise and River Beult at Yalding	River Medway, River Teise, River Beult	Yalding including Benover and Congelow
064FWT1Medway	Tidal River Medway and Medway estuary	River Medway,	Areas at risk of flooding from the tidal River Medway and the Medway Estuary, including Aylesford, Larkfield, Wouldham, Medway Towns, Upnor, Hoo and Lower Halstow
064FWF8EastPeck	River Medway, Alder Stream, Coult Stream and River Bourne at East Peckham	River Medway, Alder Stream, Coult Stream, River Bourne	River Medway and The Bourne at East Peckham, including Little Mill and Hale Street
064FWF8Beult	River Beult from Bethersden and Pluckley to Stile Bridge	River Beult	River Beult from Bethersden and Pluckley to Stile Bridge, including Smarden, Headcorn, Staplehurst and Hawkenbury
064FWF8LVenice	Little Venice Country Park and Marina	River Medway	Little Venice Country Park and Marina, including low lying properties in Yalding around Yalding Bridge
064FWF8Maidstne	River Medway at Maidstone	River Medway	River Medway at Maidstone, including Tovil, Allington, Allington Marina and Aylesford
064FWF8LowerMed	River Medway between Yalding and Maidstone	River Medway	River Medway between Yalding and Maidstone, including Wateringbury, West Farleigh, Teston and East Farleigh

064FWF8Teise	River Teise and Lesser Teise between Horsmonden and Claygate	River Teise, Lesser Teise	River Teise and Lesser Teise between Horsmonden and Claygate, including Sheephurst Lane and Maidstone Road

11.2.2 Reservoirs

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 it is very much less likely than flooding from rivers or surface water. It may not be possible or safe 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.

11.2.3 Local arrangements for managing flood risk

The **Flood Risk to Communities in Maidstone**[85] report details the Category 1 and Category 2 responders for a flooding emergency in the borough, as well as their roles and responsibilities. The Maidstone Borough Council's **website**[86] also provides information on emergency planning, community resilience planning and useful contacts in case of a flood incident. Additionally, the **Kent County Council Flood Response Plan**[87] outlines the response of the Local Authority to a flooding event, with information on actions, roles and responsibilities, with coastal, fluvial, surface water and groundwater flooding all accounted for.

11.3 Emergency planning and development

11.3.1 NPPF

The NPPF Flood Risk Vulnerability and Flood Zone 'Compatibility' table seeks 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 on 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 (Updated in March 2020). For example, the NPPF classifies police, ambulance and fire stations and command centres that are required to be operational during flooding as Highly Vulnerable development, which is not permitted in Flood Zones 3a and 3b and only permitted in Flood Zone 2 providing the Exception Test is passed. Essential infrastructure located in Flood Zone 3a or 3b must be operational during a flood event to assist in the emergency evacuation process. All flood sources such as fluvial, surface, groundwater, sewers and artificial sources (such as canals and reservoirs) should be considered. In particular sites should be considered in relation to the areas of drainage critical problems highlighted in the relevant SWMPs.

85 Kent County Council (2017) Flood Risk to Communities in Maidstone, available at https://www.kent.gov.uk/__data/assets/pdf_file/0007/71665/Flood-risk-to-communities-in-Maidstone.pdf [Accessed 11/06/2020]

86 Maidstone Borough Council, Emergency Planning, available at: http://www.maidstone.gov.uk/home/other-services/community-protection/tier-2-primary-areas/safer-maidstone/tier-3-additional-areas/emergency-planning [Accessed 11/06/2020]

87 Kent County Council (2019) Kent County Council Flood Response Plan, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0019/12097/Flood-response-plan.pdf [Accessed 11/06/2020]

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 perspective ones), so that evacuees are outside of the high-risk Flood Zones and will be safe during a flood event.

11.3.2 Safe access and egress

The NPPF Planning Practice Guidance outlines how developers can secure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test. Access considerations should include the voluntary and free movement of people during a 'design flood' as well as for the potential of evacuation before a more extreme flood. The access and egress must be functional for changing circumstances over the lifetime of the development. The NPPF Planning Practice Guidance sets out that:

- Access routes should allow occupants to safely access and exit their dwellings in design flood conditions. Vehicular access to allow the emergency services to safely reach the development during design flood conditions will also normally be required.
- Where possible, safe access routes should be located above design flood levels and avoid flow paths including those caused by exceedance and blockage. Where this is unavoidable, limited depths of flooding may be acceptable providing the proposed access is designed with appropriate signage etc. to make it safe. The acceptable flood depth for safe access will vary as this will be dependent on flood velocities and risk of debris in the flood water. Even low levels of flooding can pose a risk to people in situ (because of, for example, the presence of unseen hazards and contaminants in floodwater, or the risk that people remaining may require medical attention).

The depth, velocity and hazard mapping from hydraulic modelling should help inform the provision of safe access and egress routes.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with Maidstone Borough Council and the Environment Agency. Site and plot specific velocity and depth of flows should be assessed against standard hazard criteria to ensure safe access and egress can be achieved.

11.3.3 Potential evacuations

During flood incidents, evacuation may be considered necessary. The NPPF Planning Guidance states practicality of safe evacuation from an area will depend on:

1. the type of flood risk present, and the extent to which advance warning can be given in a flood event;
2. the number of people that would require evacuation from the area potentially at risk;
3. the adequacy of both evacuation routes and identified places that people could be evacuated to (and taking into account the length of time that the evacuation may need to last); and
4. sufficiently detailed and up to date evacuation plans being in place for the locality that address these and related issues.

The vulnerability of the occupants is also a key consideration. The NPPF and application of the Sequential Test aims to avoid inappropriate development in flood risk areas. However, developments may contain proposals for mixed use on the same site. In this instance, the NPPF Planning Practice Guidance states that layouts should be designed so that the most vulnerable uses are restricted to higher ground at lower risk of flooding, with development

which has a lower vulnerability (parking, open space etc.) in the highest risk areas, unless there are overriding reasons to prefer a different location. Where the overriding reasons cannot be avoided, safe and practical evacuation routes must be identified.

The Environment Agency and Defra provide standing advice for undertaking flood risk assessments for planning applications. Please refer to **the government website**[88] for the criteria on when to follow the standing advice. Under these criteria, you will need to provide details of emergency escape plans for any parts of the building that are below the estimated flood level. The plans should show:

- single storey buildings or ground floors that do not have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- basement rooms have clear internal access to an upper level, e.g. a staircase; and
- occupants can leave the building if there is a flood and there is enough time for them to leave after flood warnings[89].

Situations may arise where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. developments located immediately behind a defence and at risk of a breach). These allocations should be assessed against the outputs of the SFRA and where applicable, a site-specific Flood Risk Assessment to help develop appropriate emergency plans.

11.3.4 Flood warning and evacuation plans

Flood warning and evacuation plans are potential mitigation measures to manage the residual risk, as stated in the NPPF Planning Practice Guidance. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels).

A flood warning and evacuation plan should detail arrangements for site occupants on what to do before, during and after a flood as this will help to lessen its impact, improve flood response and speed up the recovery process. The Environment Agency provides practical advice and templates on how to prepare flood plans for individuals, communities and businesses (see text box for useful links).

It is recommended that emergency planners at Kent County Council are consulted prior to the production of any emergency flood plan. The council will provide guidance to help local communities to protect their home and valuables and understand what to do before, during and after a flood.

Once the emergency flood plan is prepared, it is recommended that it is distributed to emergency planners at Kent County Council and the emergency services. When developing a flood warning and evacuation plan, it is recommended that it links in with the **Kent County Council Flood Response Plan**[90] and any existing parish / community level plans.

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88 Environment Agency and DEFRA (2012) Flood risk assessments if you're applying for planning permission, available at: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications [Accessed 11/06/2020]

89 Environment Agency and DEFRA (2012) Flood Risk Assessment: Standing Advice: https://www.gov.uk/flood-risk-assessment-standing-advice

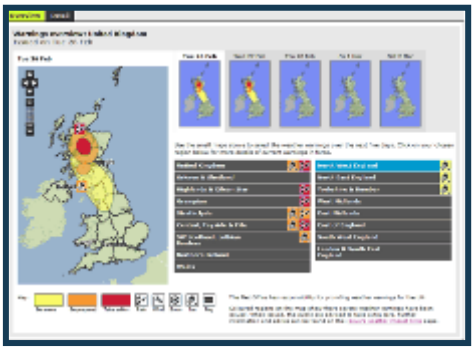
90 Kent County Council Flood Response Plan (December 2019): https://www.kent.gov.uk/__data/assets/pdf_file/0019/12097/Flood-response-plan.pdf

Guidance documents for preparation of flood response plans

- **Environment Agency (2012) Flooding – minimising the risk, flood plan guidance for communities and groups**
- **Environment Agency (2014) Community Flood Plan template**
- **Environment Agency Personal flood plans**
- **Flood Plan UK 'Dry Run' - A Community Flood Planning Guide**
- **ADEPT and the Environment Agency (2019) - Flood Risk Emergency Plans for New Development**

11.3.5 Other sources of information

As well as being a statutory consultee for new development at risk of flooding, the Environment Agency can offer independent technical advice. The Environment Agency website contains a breadth of information on flood risk and there are numerous publications and guidance available. For example, the **flooding from groundwater**[91] guide has been produced by the Environment Agency and Local Government Association to offer practice advice to reduce the impact of flooding from groundwater.



The Met Office provides a National Severe Weather Warning Service about rain, snow, wind, fog and ice. The severity of warning is dependent upon the combination of the likelihood of the event happening and the impact the conditions may have. In simplistic terms, the warnings mean: Yellow: Be Aware, Amber: Be Prepared, Red: Take Action. This service does not provide flood warnings. The Met Office provide many other services and products. For further information, please visit their **website**[92].

The **National Flood Forum**[93] (NFF) is a national charity, set up in 2002 to support those at risk and affected by flooding. The NFF helps people to prepare and recover from flooding as well as campaigning on behalf of flood risk communities, including providing advice on matters such as insurance.

91 Local Government Association and Environment Agency (2011) Flooding from groundwater, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf [Accessed 11/06/2020]

92 Met office, Find a forecast, available at: https://www.metoffice.gov.uk/ [Accessed 11/06/2020]

93 National Flood Forum, available at https://nationalfloodforum.org.uk/ [Accessed 11/06/2020]

The Individual property flood resilience protection (PFR) measures are design to help protect homes and businesses from flooding. These include a combination of flood resistance measures - trying to prevent water ingress – and flood resilience measures - trying to limit the damage and reduce the impact of flooding, should water enter the building. It is important that any measures have the BSI Kitemark. This shows that the measure has been tested and ensures that it meets industry standards. Please visit the Government website: **Prepare for flooding**[94] for more information.

94 GOV.UK, Prepare for flooding, available at https://nationalfloodforum.org.uk/ [Accessed 11/06/2020]

12 Strategic flood risk solutions

This chapter provides information on strategic flood risk solutions (for example flood storage schemes and natural flood management) and how these could be implemented.

12.1 Introduction

Strategic flood risk solutions serve more than one development site and may offer a potential opportunity to reduce flood risk in the Local Plan Review area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solution 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.

12.2 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. Methods to provide these schemes include[95]:

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

Flood storage schemes have the advantage that they generally benefit area downstream, not just the local area.

12.3 Flood defences

Analysis of the Environment Agency's Spatial Flood Defences layer indicates that there are no formal flood defences within the Local Plan Review area. However, defences are located both upstream (Leigh FSA and East Peckham FSA) and downstream (tidal flood walls/embankments). A number of structures (walls and embankments) are present which may provide a flood defence function although they are not considered to be formal flood defences. For the purposes of the SFRA, structures which are indicated to have a design standard of less than 5% AEP have been excluded. At these locations it will be important to understand the benefit that defences can have on reducing flooding, and consequences if their design standard is exceeded or they fail. Residual risk of these defences should be understood and managed. Maintenance arrangements, including funding mechanisms, for the defences will need to be evidenced for the lifetime of development

12.4 Land raising

Increasing the elevation of land for whole or parts of the sites could be implemented to prevent flood flows affecting the land up to the design level. The elevation selected could be determined to coincide with the re-designation of the site (or part of the site) from one Flood Zone to another (e.g. from Flood Zone 3a to Flood Zone 2).

Raising of land which floods would reduce the volume of storage on the floodplain in a flood event. Such ground level adjustments would therefore require level for level floodplain

95 Environment Agency: Fluvial Design Guide – Chapter 10 (2010)

volume compensation (so no loss of floodplain storage occurs) and also analysis to evidence that the increase in ground levels does not result in adverse changes in flood risk (or other environmental issues) elsewhere, e.g. through deflection of flood water or loss of conveyance.

In low-lying areas of land with little topographic gradient it is likely that conveyance of fluvial flood water may be less critical than the loss of floodplain volume, whereas in areas with greater topographic gradient, conveyance may become more critical.

12.5 Promotion of SuDS

By considering SuDS at an early stage in the development of a site, the risk from surface water can be mitigated to a certain extent within the site as well as reduce the risk that the site poses to third party land. The policies and guidance produced by KCC as the LLFA are summarised in Section 10.

12.6 Natural Flood Management

Natural Flood Management (NFM) is the use of natural functions of catchments, floodplains, rivers and the coast to reduce flooding and coastal erosion.

Consideration of 're-wilding' rivers upstream could provide cost efficiencies as well as addressing multiple sources of flood risk; for example, reducing peak flows upstream such as through felling trees into streams or building earth banks to capture runoff, could be cheaper and smaller-scale measures than implementing flood walls for example. With flood prevention schemes, consideration needs to be given to the impact that flood prevention has on the WFD status of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

There are a number of NFM schemes proposed within the Local Plan Review area.

12.6.1 Improving the River Beult SSSI

The Medway Flood Partnership (established in 2017) set out a number of potential options to **improve the River Beult in 2018**[96] including Natural Flood Management (NFM) techniques. The paper identified that the River Beult has an overly widened and deep channel and there could be potential benefits in using NFM to manage flood risk for the River Beult. In particular, options for riparian planting, floodplain restoration and re-naturalisation techniques were identified in seven sections of the Beult. The Medway Flood Partnership is now investigating potential funding options for a scheme.

12.6.2 Headcorn School/ Hogg Stream Project

The Hogg Stream is an ordinary watercourse that starts as a small spring and flows from the Greensand ridge through the northern part of the village of Headcorn to join the River Beult SSSI. Mapping indicates that the stream is very straight and unnatural in its alignment, with very little natural vegetation along much of its course. Headcorn Parish Council in partnership with the Kent Countryside Management Project, Natural England, Southern Water and the National Flood Forum is looking into **options to restore a natural meandering stream**[97] which will provide attenuation and reduce peak flows in Headcorn.

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96 Environment Agency and Natural England (2018) Improving the River Beult for People and Wildlife, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/734380/Improving_the_River_Beult_SSSI_Non-Technical_Summary.pdf [Accessed 11/06/2020]

97 Maidstone Borough Council (2018) Proposed Natural Flood Management Schemes, available at: https://beta.maidstone.gov.uk/home/primary-services/council-and-democracy/primary-areas/your-councillors?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZtZWV0aW5ncy5tYWlkc3RvbmUuZ292LnVrJTJGZG9jdW1lbnRzJTJGczYzMTI1JTJGQXBwZW5kaXglMjAxJTIwUHJvcG9zZWQlMjBOYXR1cmFsJTIwRmxvb2QlMjBNYW5hZ2VtZW50JTIwU2NoZW1lcy5wZGYmYWxsPTE%3D [Accessed 11/06/2020]

12.6.3 Bockingfold Farm Wetland Creation Project

A 10 hectare field, upstream of Collier Street has been offered by a local landowner as a **site for flood storage**[98]. This would allow up to 20,000m^2 of land to be used, which would provide approximately 15,000m3 of additional flood storage. In addition to providing a flood storage function, the scheme will create a variety of wetland features which will help meet other environmental targets.

There are a number of approaches and techniques within NFM, which are summarised in the following sections.

12.6.4 Catchment and Floodplain restoration

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

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

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain;
- Removal of redundant structures to reconnect the river and the floodplain;
- Apply the Sequential Approach to avoid new development within the floodplain.

For those sites considered within the emerging Local Plan Review and / or put forward by developers, that also have watercourses flowing through or past them, the sequential approach should be used to locate development away from these watercourses. This will ensure the watercourses retain their connectivity to the floodplain. Any losses of floodplain connectivity could potentially increase flooding.

12.6.5 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.

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[98] Ibid.

12.6.6 Bank Stabilisation

Bank erosion should be avoided, and landowners are encouraged to avoid using machinery and vehicles close to or within the watercourse.

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 spilling, 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.

12.6.7 Re-naturalisation

There is potential to re-naturalise a watercourse by re-profiling the channel, removing hard defences, re-connecting the channel with its floodplain and introducing a more natural morphology (particularly in instances where a watercourse has historically been modified through hard bed modification). Detailed assessments and planning would need to be undertaken to gain a greater understanding of the response to any proposed channel modification.

12.6.8 Habitat creation

There are also opportunities to deliver sites through the Environment Agency's Regional Habitat Creation Programme which seeks to replace intertidal habitats that are lost through coastal squeeze. The **Maidstone Green and Blue Infrastructure Strategy**[99] highlights the variety of habitats in the Local Plan Review area including chalk downland, broadleaved woodland and the improved grasslands of the low Weald. Four broad areas where green and blue infrastructure interventions will have the most impact on achieving the strategy objectives:

- Capstone-Bredhurst area
- The M20 corridor
- The River Beult corridor
- The Low Weald/Laddingford area

12.6.9 Working with Natural Processes

Developments provide opportunities to work with natural processes to reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. NFM requires integrated catchment management and involves those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies. The Environment Agency and JBA Consulting have developed **Working with Natural Processes mapping**[100] which displays opportunities for NFM. The locations highlighted in the mapping with opportunities for NFM are outlined below:

- River Beult catchment
- Yalding
- Marden Mill Stream catchment
- Lower Teise catchment
- Staplehurst

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99 Maidstone Borough Council (2008) Green and Blue Infrastructure Strategy, available at: http://www.maidstone.gov.uk/__data/assets/pdf_file/0004/164659/Green-and-Blue-Infrastructure-Strategy-June-2016.pdf [Accessed 1/06/2020]

100 JBA Consulting, Defra, Natural Resources Wales, Welsh Government and Environment Agency, Mapping the Potential for Working with Natural Processes, available at: http://wwnp.jbahosting.com/ [Accessed 11/06/2020]

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

The **Kent and Medway Growth and Infrastructure Framework**[101] (updated in 2018) illustrates the role of GI for development in Maidstone Borough and the surrounding area. Additionally, The **Maidstone Borough Local Plan**[102] (2017) provides more detailed information about the Borough's natural assets and green infrastructure network and strategy, highlighting existing and potential GI, and detailing the GI objectives for the Local Plan Review area in Policy ID 1.

12.8 Engaging with key stakeholders

Flood risk to an area or development can often be attributed to a number of sources such as fluvial, surface water and/or groundwater. In rural areas the definition between each type of flood risk is more distinguished. However, within urban areas flooding from multiple sources can become intertwined. Where complex flood risk issues are highlighted it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

Engagement with riparian owners is also important to ensure they understand their rights and responsibilities including:

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

More information about riparian owner responsibilities can be found in the Environment Agency's guidance on **Owning a Watercourse (2018)**[103].

101 Kent County Council (2018) Kent and Medway Growth and Infrastructure Framework, available at: https://www.kent.gov.uk/__data/assets/pdf_file/0018/80145/GIF-Framework-full-document.pdf [Accessed 11/06/2020]

102 Maidstone Borough Council (2017) Maidstone Borough Local Plan, available at: https://services.maidstone.gov.uk/docs/October%202017%20Adopted%20Local%20Plan.pdf [Accessed 11/06/2020]

103 Environment Agency (2018) Owning a watercourse , available at: https://www.gov.uk/guidance/owning-a-watercourse [Accessed 11/06/2020]

13 Level 1 sites assessment

This section details the site screening of potential development sites that was carried out as part of the Level 1 SFRA, as well as the cumulative impact assessment. Refer to Appendix N for recommendations and details and details on how to apply the Sequential and Exception tests using the data set out in this section.

13.1 Introduction

A total of 337 sites were provided by Maidstone Borough Council as shown in Figure 13-1. These sites were identified through Maidstone Borough Council's 2019 Call for Sites and were screened against a suite of available flood risk information and spatial data to provide a summary of risk to each site (see Appendix K).

The information considered includes the flood risk datasets listed below:

- Environment Agency Flood Zones 1, 2 and 3
- Flood Zone 3b
- Fluvial and coastal climate change allowances (including updated modelling for the North Kent Coast 2019 and River Medway 2016)
- Environment Agency Risk of Flooding from Surface Water
- Environment Agency Risk of Flooding from Surface Water with allowances for climate change
- Environment Agency Historic Flood Map
- JBA Groundwater Flood Map

A site screening spreadsheet has been prepared which identifies the proportion of each site that is affected by the different sources of flooding. The information provided is intended to enable a more informed consideration of the sites when applying the sequential approach. The site screening spreadsheet has been used to determine whether more detailed assessment of sites is needed to further identify those that should be taken forward as potential development allocations for a Level 2 assessment.

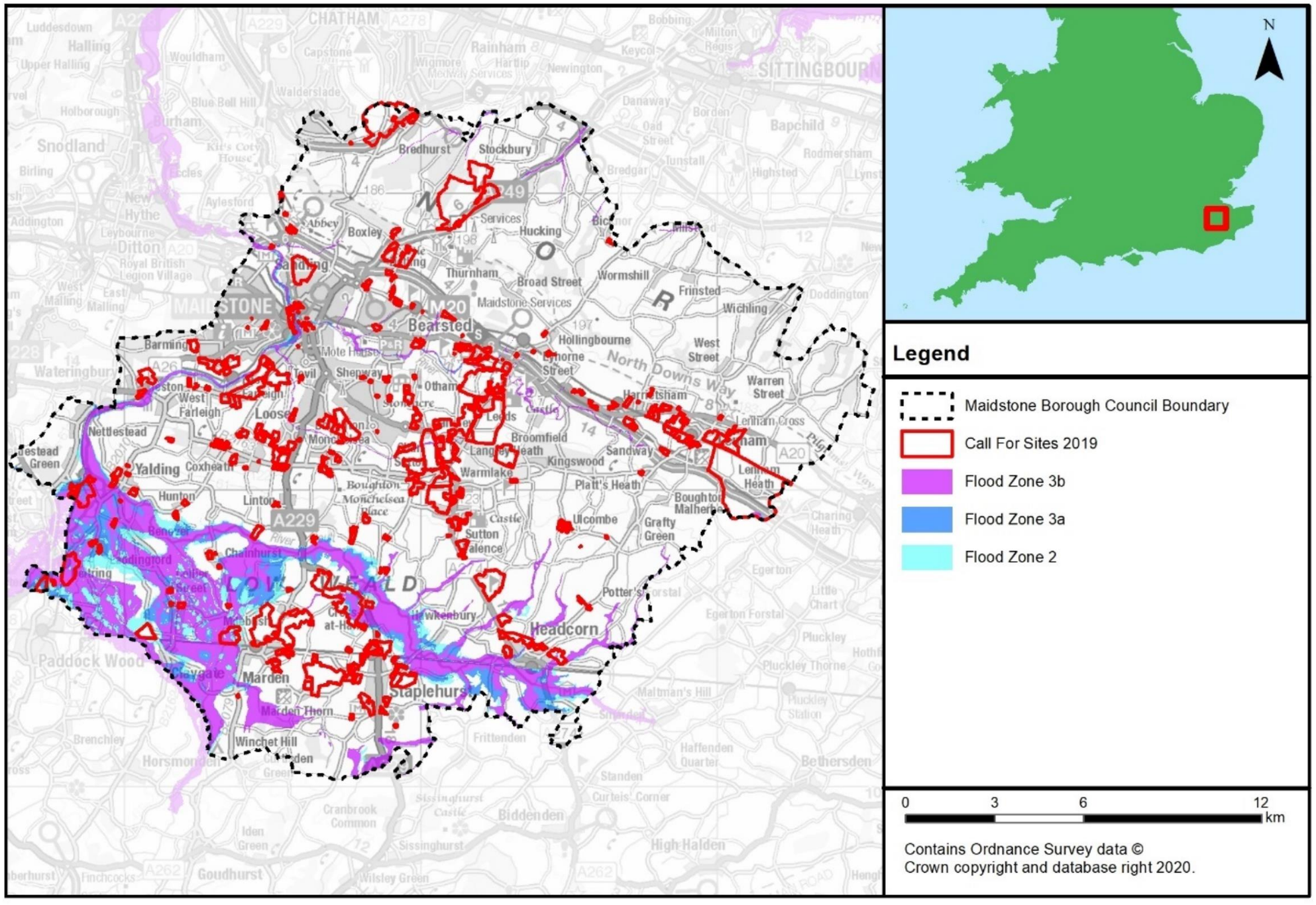

Figure 13-1: Screened sites with Flood Zones

13.2 Overview of risk at identified sites

A summary of flood risk at each of the sites in light of the screening is provided below:

- The majority of the sites have Flood Zone 1 comprising the largest proportion of their area, with 273 sites completely located within Flood Zone 1.
- 60 sites are partially located in Flood Zone 2
- 34 sites are partially located in Flood Zone 3a
- 45 sites are partially located in Flood Zone 3b
- 46 sites are predicted to be at risk of fluvial flooding in the future due to climate change
- 5 sites are predicted to be at risk from tidal flooding in the future due to climate change
- 20 sites lie within an area where climate change modelling is not available but lie within Flood Zone 2 which is used as a proxy for the effect of climate change.
- 126 sites are predicted to be at risk during a current day 1% AEP surface water flood event
- 163 sites are predicted to be a risk during a future 1% AEP surface water flood event with a 40% increase in rainfall.
- 36 sites intersect the Environment Agency's historic flood outlines
- 13 sites are predicted to have groundwater levels which are either at or very near (within 0.025m of) the ground surface

13.3 Sequential Testing

The SFRA does not include the Sequential Test of the development sites that were screened. However, Appendix K summarises the flood risk to the potential and confirmed development sites and provides evidence for use in the completion of the Sequential Test.

NPPF Planning Practice Guidance for Flood Risk and Coastal Change describes how the Sequential Test should be applied in the preparation of a Local Plan Review. The assessments undertaken for this SFRA will assist Maidstone Borough Council in the preparation of the Sequential Test.

13.4 Cumulative impacts of development on flood risk

Cumulative impacts are defined as the effects of past, current and future activities on the environment. Under the 2018 NPPF, strategic policies and their supporting Strategic Flood Risk Assessments, are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para 156).

When allocating land for development, consideration should be given to the potential cumulative impact on flood risk within a catchment. Development increases the impermeable area within a catchment, which if not properly managed, can cause loss of floodplain storage, increased volumes and velocities of surface water runoff, and result in heightened downstream flood risk. Whilst individual development with appropriate site mitigation measures should not result in measurable local effects with respect to hydrology and flood risk, the cumulative effect of multiple development may be more severe at downstream locations in the catchment. Locations where there are existing flood risk issues with people, property or infrastructure will be particularly sensitive to cumulative effects.

The cumulative impact should be considered throughout the planning process, from the allocation of sites within the Local Plan, to the planning application and development design stages.

The cumulative impacts will be considered in more detail on an individual site basis within the Level 2 SFRA, where necessary. In addition, site-specific FRAs must consider the cumulative impact of the proposed development on flood risk within the wider catchment area if there are potentially material effects.

As part of the Level 1 SFRA, an assessment of the cumulative effects within catchments in Maidstone has been undertaken.

13.4.1 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.

13.4.2 Datasets

Catchments

The WFD river catchments defined in the River Basin Management Plans and LIDAR data were used to divide Maidstone Borough into manageable areas on which to base a 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 the Maidstone borough that are likely to experience the greatest pressure for future growth, all potential future development sites received for consideration though the Call for Sites 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 for 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 the entire footprint will be developed.

Historic Flood Risk

A historic flood risk score was derived for each catchment within the study area using the total current area of building footprint within the Environment Agency's historic flood map in 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 area of building footprint within the merged 1% AEP surface water flooding extent and Flood Zone 3a for each catchment
- Total area of building footprint within the merged 0.1% AEP surface water flooding extent and Flood Zone 2

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.

13.4.3 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

13.4.4 Conclusions of the Cumulative Impact Assessment

A summary of the Cumulative Impacts Assessment results is shown in Figure 13-2. The Cumulative Impact Assessment highlights areas where there is a high chance of encountering cumulative effects from planned development. In these catchments this should be considered by developers and specifically addressed within FRAs for proposed development.

Including consideration of cumulative effects requires that FRAs should assess:

- The location and sensitivity of receptors to cumulative effects and the mechanisms that potentially result in flooding (e.g. locations that are reliant on the performance of pumped drainage systems to manage flood risk, locations where existing flooding is experienced and can be exacerbated by relatively small changes in flood flow magnitude, volume or flood duration, etc)
- The potential quantum of proposed cumulative development within a River Basin and assessment of the effect on sensitive receptors of the cumulative benefit afforded by piecemeal mitigation at the respective allocation sites.
- The requirement for measures to address potential cumulative effects (these can be both 'on-site' measures and contributions to strategic 'off-site' measures)
- The opportunity to integrate site mitigation measures with strategic flood risk management measures planned in the River Basin
- The long-term commitments to management and maintenance

13.4.5 Next steps

The Cumulative Impact Assessment is used in the following ways:

- The assessment highlights the catchments in the borough where the cumulative impacts of development on flood risk could potentially be greatest. Developers and Maidstone Borough Council should take the assessment into consideration when identifying appropriate sites for development.
- For sites in catchments identified as being at high or medium risk of cumulative impacts FRAs should contain an assessment of the potential

cumulative impacts of development further as outlined within Section 13.4.4.

- For sites taken forward to a Level 2 SFRA, the cumulative impacts of development are considered in further detail.

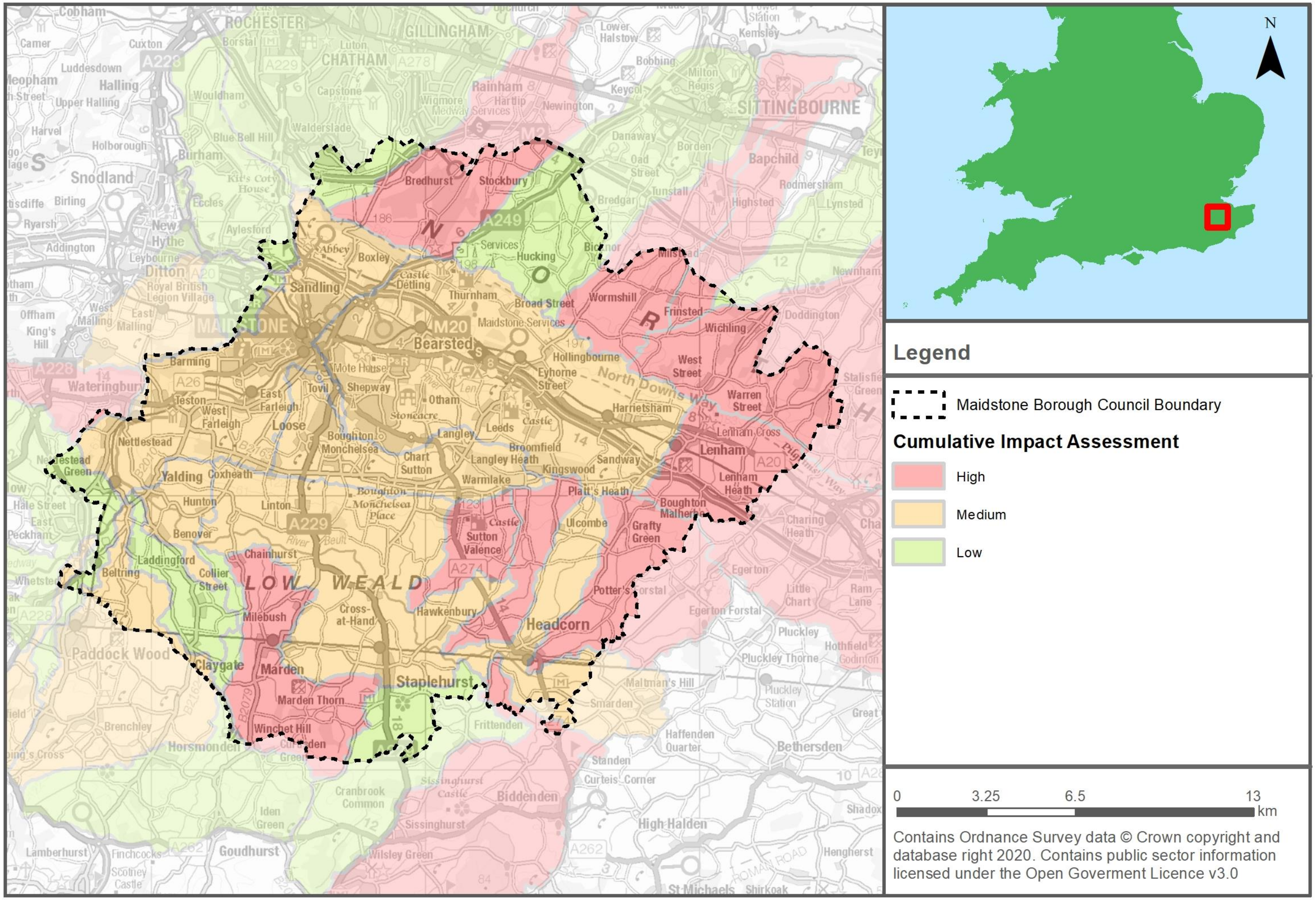

Figure 13-2: Cumulative Impacts Assessment

14 Level 2 sites assessment

This section sets out the reasons why selected sites were taken forward to a Level 2 Assessment and the information which can be found in the site summary tables and mapping.

14.1 Introduction

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. It should be noted that the actual risk is the predicted flooding including for the presence of the effect of flood defences and other flood risk management measures, whereas Flood Zones describe the risk without taking account of the effect of flood defences and flood risk management measures (where there are no flood defences or flood risk management measures the actual risk is the same as shown on the Flood Zones). Having understood the risk, the assessment identifies, as appropriate outline arrangements so development can be implemented safely and remain safe over the intended life.

The Level 2 assessment provides an understanding of actual risk, and so in circumstances where there are existing flood risk management measures, it is important to understand the level of protection these afford and how the standard of protection changes over time as a consequence of climate change effects.

Analysis of the Environment Agency's Spatial Flood Defences layer indicates that there are no formal flood defences within the Local Plan Review area. However, defences are located both upstream (Leigh FSA and East Peckham FSA) and downstream (tidal flood walls/embankments) and the effects of these should be assessed.

There are also locations where the risk of flooding from surface water and groundwater must be evaluated, together with the commitment to measures that maintain the safety of development over the intended life. The Level 2 assessment also provides further information on flood depths, extent of flooding, flood velocities and flood hazard for the present day situation as well as flood extents for climate change conditions, allowing the change over the lifetime of proposed development to be understood.

The focus of the Level 2 assessment is to provide evidence to support planning decisions about the design and location of any development. The principles and approach adopted for the assessment should also be applied to windfall sites (proposed development not included in the plan), particularly with respect to providing evidence within Flood Risk Assessments (FRAs) that flood risk will be appropriately managed over the life of proposed new development.

In Maidstone Borough, not all development can be allocated outside of flood risk areas. Therefore, a Level 2 SFRA was required in addition to the Level 1 assessment.

Sites identified within the 2019 Call for Sites were provided by Maidstone Borough Council for assessment in the SFRA. In the Level 1 assessment, a site screening of 377 sites provided by Maidstone Borough Council was conducted. Details of this can be found in Section 13.

Sites considered for a Level 2 Assessment were based on the following criteria:

- Less than 90% of the site is in the Environment Agency's Flood Zone 1
- Greater than 10% of the site is at risk of flooding during the 1% AEP surface water flood event as shown in the Environment Agency's Risk of Flooding from Surface Water map.
- An Environment Agency historic flood incident intercepts the site.

Following the Level 1 assessment analysis, it was identified that 72 sites fitted these criteria. Of these 72, Maidstone Borough Council identified 55 sites which would not be taken forward due to other site consideration.

Of the remaining 17 sites, three were identified to have a flood risk in a confined area. Maidstone Borough Council confirmed that a detailed Flood Risk Assessment and a sequential approach to development should be undertaken at a site level for these sites. The three sites and the justification for their exclusion from a Level 2 assessment are provided in Table 14-2. Appendix L highlights the area of each site which is at risk of flooding and to aid the sequential approach to development at a site level.

Table 14-1: Sites with an isolated area of flood risk which were not taken to a Level 2 assessment

Site Name	Justification for not performing a Level 2 Assessment
Maidstone AEC	Greater than 10% of the site is within the in 1% AEP surface water flood extent. The site is at risk from surface water flooding, this may be mitigated by adopting a sequential approach to the site layout.
Staplehurst Golf Course	Over 90% of the site is within Flood Zone 1, the site area is quite large (20.06 ha) and it should be possible to adopt a sequential approach to the site layout.
Land at Bydews Farm	Over 90% of the site is within Flood Zone 1, the site area is quite large (27.37 ha) and it should be possible to adopt a sequential approach to the site layout.

The sites included in the Level 2 SFRA are listed in Table 14-2 which also provides justification as to why these sites were considered in the Level 2 SFRA.

Table 14-2: Level 2 sites and reason for inclusion in the Level 2 assessment

Site Name	Reason for Level 2 Assessment
Land at Rush Farm, Staplehurst	Less than 90% of the site is in Flood Zone 1 and greater than 10% of the site is within the in 1% AEP surface water flood extent.
34- 35 High Street, Maidstone	Less than 90% of the site is in Flood Zone 1 and greater than 10% of the site is within the in 1% AEP surface water flood extent.
Len House	Less than 90% of the site is in Flood Zone 1, greater than 10% of the site is within the in 1% AEP surface water flood extent and the site is intersected by an Environment Agency historic flood outline.
Gala Bingo and Granada House	Less than 90% of the site is in Flood Zone 1, greater than 10% of the site is within the in 1% AEP surface water flood extent and the site is intersected by an Environment Agency historic flood outline.
Maidstone Riverside	Less than 90% of the site is in Flood Zone 1 and the site is intersected by an Environment Agency historic flood outline.
Mill St Car Park	Less than 90% of the site is in Flood Zone 1
Golf Course Car Park Staplehurst	Less than 90% of the site is in Flood Zone 1
Land north &	Less than 90% of the site is in Flood Zone 1 and the site is

Site Name	Reason for Level 2 Assessment
south of Kenward Road Yalding	intersected by an Environment Agency historic flood outline.
Maidstone West	Less than 90% of the site is in Flood Zone 1 and the site is intersected by an Environment Agency historic flood outline.
Land at Hartley Dene	Greater than 10% of the site is within the in 1% AEP surface water flood extent
Land at Linden Farm	Greater than 10% of the site is within the in 1% AEP surface water flood extent
Land at Old Ham Lane, Lenham - Old Goods Yard	Greater than 10% of the site is within the in 1% AEP surface water flood extent
Maidstone East	Greater than 10% of the site is within the in 1% AEP surface water flood extent and the site is close to the River Medway and bridge infrastructure
Maidstone East Station (within Maidstone East Site 146)	Site is close to the River Medway and bridge infrastructure

14.2 Site summary tables

As part of the Level 2 SFRA, detailed site summary tables have been prepared for each of the sites brought forward for the Level 2 analysis (Appendix M). Table 14-3 details the information set out in the summary tables. Additionally, each site summary table provides more detailed information on:

- the resolution and detail of the analysis used to assess the flood risk (more detailed data and higher resolution flood modelling has been prepared so appropriate evidence is available to consider the implications of satisfying the Exception Test);
- the severity and extent of actual flood risk across proposed sites;
- the site-specific flood risk assessment requirements; and
- the implications for the preparation of local policies to provide for sustainable developments as well as reducing flood risk to existing communities.

Table 14-3: Information content of the Level 2 site summary tables

Section	Information
Site details	OS Grid reference Area Current land use (greenfield or brownfield) Proposed site use Flood risk vulnerability Topography
Sources of flood risk	Existing watercourses Flood history Fluvial risk Surface water risk

	Groundwater risk Reservoir risk
Flood risk management infrastructure	Defences Residual risk
Emergency planning	Flood warning Access and egress
Climate Change	Modelled increases in flood extent compared to the 1% AEP fluvial, and the implications for the site. Modelled impact of climate change on surface water risk and the implications for the site. Please note that the River Medway is tidally influenced up to East Farleigh. Therefore, there may also be a tidal climate change flood risk for some sites. However, the fluvial climate change flood risk is predicted to be significantly larger. When bringing sites forward, the effect of tidal climate change should be considered, e.g. tide locking of surface water drainage.
Requirements for drainage control and impact mitigation	Bedrock geology Superficial Geology Soils Groundwater Source Protection Zone Historic Landfill Site Broadscale assessment of possible SuDS Cumulative impacts of development
Recommendations for Local Plan policy:	Sequential Test and Exception Test requirements Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers

14.3 Accompanying mapping

To accompany each site summary table, higher resolution flood mapping has been prepared. The mapping is intended to be read alongside the appropriate site summary table. Flood risk information on the higher resolution mapping includes:

- **Site boundary**
- **Environment Agency Flood Zones 2, 3a and 3b (functional floodplain)** - these are used to identify the requirements for a Flood Risk Assessment and to support the Sequential Test and Exception Test. Further details on these are provided in the Sequential Test and Exception Test requirements section of each site sheet.
- **Modelled Fluvial 1% AEP plus 35% and 70% flood extents showing the predicted actual risk (if available)** – these are used to consider the potential effects of climate change on development. The allowances selected are based on the type of development being assessed. The Environment Agency provide guidance on this through the **Flood risk assessments: climate change allowances**[104] webpage.

104 Environment Agency (2016) Flood risk assessments: climate change allowances, available at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances [Accessed 10/06/2020]

- **Modelled Tidal 0.5% AEP 2095 and 2120 EPOCH Higher Central and Upper End flood extents (if available)** - these are used to consider the potential effects of climate change on development. The allowances selected are based on the type of development. The Environment Agency provide guidance on this through the *Flood risk assessments: climate change allowances*[1] webpage.
- **Modelled 1% AEP fluvial/0.5% tidal depth, velocity and hazard outputs (if available)** – these are used to describe the site-specific risk of flooding including depth, velocity and hazard.
- **Risk of Flooding from Surface Water 3.33%, 1% and 0.1% AEP flood extents –** these are required to support the exception test. It is important that surface water management is considered and therefore the Risk of Flooding from Surface Water (RoFSW) dataset has been used to identify those sites which are potentially at risk of flood from surface water.
- **Risk of Flooding from Surface Water 1% AEP depths and velocities –** these are used to describe the site-specific risk of flooding from surface water including the depth and velocity.
- **Risk of Flooding from Surface Water 1% AEP plus 20% and 40% climate change uplifts –** these are used to show the potential risk of flooding from surface water, taking into account the potential future flood risk as a result of climate change.
- **JBA Groundwater flood risk mapping displaying predicted groundwater levels from the surface during 1% AEP groundwater event –** this dataset is used to identify areas at potential groundwater flood risk to support the assessment of flood risk from other sources.

15 Summary

15.1 Overview

This Level 1 and 2 SFRA delivers a strategic assessment of all sources of flooding in the Local Plan Review area. It also provides an overview of policy and provides guidance for planners and developers. The study area comprises the administration area of Maidstone Borough Council.

15.2 Sources of flood risk

The sources of flood risk in Maidstone have been assessed, further information on the data sources used can be found in Section 6 and the findings can be found in Section 7. A summary is outlined below.

15.2.1 Historic flooding

There have been several recorded flood incidents across the borough. The most recent flood events have been during the winters of 2013/14 and 2019/20. Flows along the River Medway were amongst the highest ever recorded due to a series of storms causing heavy rainfall and caused widespread fluvial flooding in Maidstone Borough were Laddingford, Yalding, Collier Street and Maidstone. In winter of 2019/2020, prolonged heavy rainfall caused fluvial flooding in Yalding, Collier Street and East Farleigh.

The Environment Agency's Recorded Flood Outline mapping can be found in Appendix A.

15.2.2 Fluvial flood risk

The primary source of fluvial flood risk to the borough is the River Medway and its major tributaries, the River Beult and River Teise, which are of fluvial influence in the south and west of the borough.

Flood Zone mapping and climate change mapping of the fluvial flood risk in the Local Plan Review area has been prepared as part of the SFRA and can be found in Appendices C and D.

15.2.3 Tidal flood risk

The River Medway is tidally influenced in the north of the borough with the tidal limit at Allington Sluice. However, despite the presence of Sluice gates at Allington, tidal backwater effects can influence water level depths upstream during extreme events and it has been known for the backwater effect to reach as far upstream as East Farleigh[105].

The Environment Agency's recorded flood outline dataset indicates the last known tidal flood event in the borough occurred in 1927 when there were no raised flood defences.

Flood Zone mapping and climate change mapping of the tidal flood risk in the Local Plan Review area has been prepared as part of the SFRA and can be found in Appendices C and D.

15.2.4 Surface water flood risk

The Environment Agency's Risk of Flooding from Surface Water mapping predominantly follows topographical flow paths of existing watercourses, dry valleys or roads with some isolated ponding located in low lying areas. Three Stage 2 Surface Water Management Plans were prepared in 2017 for the settlements of Staplehurst, Headcorn and Marden.

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105 Mott Macdonald (2008) Maidstone Borough Council: Strategic Flood Risk Assessment

The Risk of Flooding from Surface Water maps are shown in Appendix E with surface water climate change mapping available in Appendix F.

15.2.5 Groundwater flood risk

The JBA Groundwater Flood Map shows that a large proportion of Maidstone Borough is at risk from groundwater flooding, with the most vulnerable areas around Eyhorne Street, Harrietsham, Lenham Heath, Marden and Staplehurst.

The JBA Groundwater Flood Map can be found in Appendix G.

15.2.6 Sewer flood risk

Historical incidents of sewer flooding are detailed by the Southern Water SIRF and a summary can be found in Table 7-2. This database records incidents of flooding related to public foul, combined or surface water sewers and identifies which postcode areas have been impacted by flooding. A total of 131 incidents have been recorded.

15.2.7 Flooding from reservoirs

Outlines from the Risk of Flooding from Reservoirs dataset (informed from the National Reservoir Inundation Mapping study) show worst case inundation extents of the reservoirs impacting the Local Plan Review area. The mapping can be found in Appendix H.

15.3 Flood defences

Analysis of the Environment Agency's Spatial Flood Defences layer indicates that there are no formal flood defences within the Local Plan Review area. However, the Leigh Flood Storage Area and the East Peckham Storage Area, along with downstream walls and embankments, offer protection from outside the borough.

A number of structures (walls and embankments) are present within the borough may provide a flood defence function although they are not considered to be formal flood defences. These structures are shown in Appendix I.

15.4 Key policies

There are many relevant regional and local key policies which have been considered within the SFRA (Section 2), such as the North Kent Rivers and Stour Catchment Flood Management Plans, Thames River Basin Management Plan, the Kent County Council Preliminary Flood Risk Assessment, the Kent Local Flood Risk Management Strategy and several Surface Water Management Plans. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

15.5 Development and Flood Risk

The Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments have been documented, along with guidance for planners and developers (Section 4). Links have been provided for various guidance documents and policies published by other Risk Management Authorities, such as the LLFA and the Environment Agency.

16 Recommendations

A review of national and local policies has been conducted against the information collected on flood risk in this SFRA. Following this, several recommendations have been made for Maidstone Borough Council to consider as part of Flood Risk Management in the study area.

16.1.1 For Maidstone Borough Council

Sequential and Exception tests

The SFRA has identified that areas of Maidstone Borough are at high risk of flooding from fluvial and surface water sources. Therefore, several proposed development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF. Maidstone Borough Council should use the information in this SFRA when deciding which development sites to take forward in the Local Plan Review.

In accordance with the NPPF guidance the Sequential Test should use the present-day flood zones for the consideration of site allocations and windfall sites. However, it is recommended that the Council gives consideration to the climate change maps to understand how the flood zones are predicted to change over the lifetime of the development. All other sources of flooding should also be considered as part of the Sequential Test.

The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. It is the responsibility of Maidstone Borough Council to be satisfied that the Sequential and Exception Tests have been passed.

Council review of planning applications

The Council should consult the Environment Agency's **Flood Risk Assessment: Local Planning Authorities**[106], last updated 1 March 2019, when reviewing planning applications for proposed developments at risk of flooding.

The Council will consult the relevant statutory consultees as part of the planning application assessment and they may, in some cases, also contact non-statutory consultees (e.g. Southern Water) that have an interest in the planning application.

Future flood management

For successful future flood risk management, it is recommended that local planning authorities adopt a catchment partnership working approach in tackling flood risk and environmental management.

16.1.2 For developers

Sequential approach to development

The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the borough.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site, for example by:

- Reducing volume and rate of runoff through the use of SuDS, as informed by the **Water, People, Places: A guide for master planning sustainable drainage into developments**[107], the **Kent County Council**

106 Department for Environment, Food & Rural Affairs and Environment Agency (2015) Review individual flood risk assessments: standing advice for local planning authorities, available at: https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities [Accessed 11/06/2020]

107 Lead Local Flood Authorities of the South East of England (2013) Water. People. Places., available at: https://www.kent.gov.uk/__data/assets/pdf_file/0007/23578/Masterplanning-for-SuDS.pdf [Accessed 11/06/2020]

Drainage and Planning Policy[108], **Kent County Council's Making it Happen**[109] guidance for the relevant wastewater treatment catchment

- Relocating development to zones with lower flood risk
- Creating space for flooding
- GI should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space
- Consideration must be given to the potential cumulative impact of development on flood risk.

Site-specific flood risk assessments

Site specific FRAs are required by developers to provide a greater level of detail on flood risk and any protection provided by defences and, where necessary, demonstrate the development passes part b of the Exception Test. The requirements for developers in preparing FRAs are set out in Section 9.4.

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extents (including latest climate change allowances), inform development zoning within the site and prove, if required, whether the Exception Test can be passed. Where a site-specific FRA has produced modelling outlines which differ from the Flood Map for Planning then a full evidence-based review would be required.

Although there are no formal flood defences in the borough, should defences form part of future development plans within the borough, it would be necessary that assessment of the 'residual' risk of defence failure (e.g. breach) be considered. It may also be important to understand how existing defences outside of the borough may influence flood risk at a future development site. The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities regarding emergency plans in case of reservoir breach.

All new development within the 1% AEP (Annual Exceedance Probability) flood extent including an allowance for climate change (for the lifetime of the development) must not normally result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage. Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided so the total volume of the floodplain storage is not reduced. Any flood risk management measures should be consistent with the wider catchment policies set out in the Catchment Flood Management Plan, Flood Risk Management Plan and Local Flood Risk Management Strategy.

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108 Kent County Council (2019) Drainage and Planning Policy, available at https://www.kent.gov.uk/__data/assets/pdf_file/0003/49665/Drainage-and-Planning-policy-statement.pdf [Accessed 11/06/2020]

109 Kent County Council, Making it Happen, available at: https://www.kent.gov.uk/about-the-council/strategies-and-policies/regeneration-policies/kent-design-guide/making-it-happen#tab-2 [Accessed 11/06/2020]

A **revised NPPF**[110] was published on 24 July 2018 (last updated June 2019) setting out the Government's planning policies for England and how these are expected to be applied. This revised framework replaces the previous NPPF published in March 2012.

There are also several guidance documents which provide information on the requirements for site-specific Flood Risk Assessments:

- **Site-specific Flood Risk Assessment: Checklist**[111]
- **Standing Advice on Flood Risk**[112]
- **Flood Risk Assessment for Planning Applications**[113]

It should be noted that the **UKCP18**[114] was published on 26 November 2018. The UKCP18 projections replace the UKCP09 projections and is the official source of information on how the climate of the UK may change over the rest of this century. The Environment Agency climate change guidance was updated in March 2020 and further updates are expected within the next year. When undertaking an FRA, please refer to the most up to date climate change allowances provided by the Environment Agency.

Developers should consult with Maidstone Borough Council, Kent County Council, the Environment Agency and Southern Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

Safe access and egress

Minimum finished floor levels for development is set out in Section 9.4.3. If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches.

Safe access and egress will need to be demonstrated at all development sites. Emergency vehicular access should be possible during times of flood.

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

Resilience measures will be required if buildings are situated in the flood risk area, and opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought.

Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFA for surface water management and ensure development proposals and applications are compliant with the **Kent County Council Drainage and Planning Policy** for the relevant catchment.

Future flood management

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and

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110 Ministry of Housing, Communities & Local Government (2019) Revised National Planning Policy Framework, available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed 15/05/2020]

111 Ministry of Housing, Communities & Local Government (2014) Flood risk and coastal change available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section [Accessed 04/06/2020]

112 Department for Environment, Food & Rural Affairs and Environment Agency (2019) Preparing a flood risk assessment: standing advice, available at: https://www.gov.uk/guidance/flood-risk-assessment-standing-advice [Accessed 04/06/2020]

113 Department for Environment, Food & Rural Affairs and Environment Agency (2017) Flood risk assessments if you're applying for planning permission, available at: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications, [Accessed 04/06/2020]

114 Met Office, UK Climate Projections, available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index, [Accessed 29/05/2020]

biodiversity/ ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted.

The information provided in the SFRA should be used as a basis for investigating potential strategic flood risk solutions within the study area. Opportunities could consist of the following:

- Catchment and floodplain restoration;
- Flood storage areas;
- Opening up culverts, weir removal, and river restoration;
- The Regional Habitat Creation Programme; and Green infrastructure.

16.2 Technical recommendations

16.2.1 Potential modelling improvements

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

Due to the publication of the UKCP18 the Environment Agency should be contacted for the latest guidance on climate change modelling outputs for FRAs.

16.2.2 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. This relates both to the current risk of flooding from a range of sources, and the potential impacts of future climate change.

Other datasets used to inform this SFRA may also be periodically updated and following the publication of this SFRA, new information on flood risk may be available from Risk Management Authorities.

It is recommended that the SFRA is reviewed internally, in line with the Environment Agency's Flood Zone map updates to ensure latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking for any new information available from RMAs including the Environment Agency, Maidstone Borough Council, Kent County Council and the Upper Medway Internal Drainage Board.

Appendices

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
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