Strategic Flood Risk Assessment

Epsom and Ewell Borough Council

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Project Manager:	Richard Collins
Author:	Charlie Wheatley
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Jacobs U.K. Limited

Simpson House
6 Cherry Orchard Road
Croydon CR9 6BE
United Kingdom
T +44 (0)20 8686 8212
F +44 (0)20 8681 2499
www.jacobs.com

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Glossary

Term	Definition
Adaptation	Adjustments to natural or human systems in response to actual or expected climatic factors or their effects, including from changes in rainfall and rising temperatures, which moderate harm or exploit beneficial opportunities (NPPF definition).
Annual Chance	Annual Exceedance Probability e.g. 1% annual chance is equivalent to 1% (1 in 100) probability of flooding occurring in any one year (or, on average, once in every 100 years)
Anthropogenic	Originating in human activity (particularly in relation to climate change)
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
DCLG (now MHCLG)	Department of Community and Local Government (now Ministry of Housing, Communities and Local Government)
Defra	Department of Environment, Food and Rural Affairs
Development	The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding with an annual probability of 1 in 20 (5%) or more.
DTM	Digital Terrain Modelling. DTMs are topographic models of the bare Earth that can be manipulated by computer programs. DTM files contain elevation data of terrain in a digital format that relates to a rectangular grid. Vegetation, buildings and other cultural features are removed digitally - leaving just the underlying terrain
EA	Environment Agency
Epsom and Ewell Critical Drainage Areas (EECDAs)	Areas which are likely to be most at risk of flooding from local sources (surface water, groundwater and ordinary watercourses) and where sustainable drainage solutions should be a priority. These areas have been termed Epsom and Ewell Critical Drainage Areas or EECDAs to differentiate them from Critical Drainage Areas that can be designated by the Environment Agency. The Environment Agency has not designated any Critical Drainage Areas in the borough of Epsom and Ewell.
Flood and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which (partly) is to clarify the legislative framework for managing surface water flood risk in England.
Flood Storage Area	Land which provides a function of flood conveyance and/or storage, either through natural processes, or by design
Flood Map for Planning (Rivers and Sea)	Nationally consistent delineation of ‘high’, ‘medium’ and ‘low’ probability of fluvial flooding, published on a quarterly basis by the Environment Agency
Fluvial	Of, relating to, or inhabiting a river or stream.
Formal Flood Management Asset	A feature or structure built and maintained specifically for the purpose of flood risk management
Functional Floodplain (Zone 3b)	NPPF Flood Zone, defined as areas in which water has to flow or be stored in times of flood.
GEMS	Groundwater Emergence Maps. GEMs were created by Jacobs as part of a groundwater flooding scoping study, which was commissioned by Defra and set out to provide information on the scale, distribution and nature of groundwater flooding in England. The maps have been produced at a national / regional scale and define broad areas susceptible to groundwater flooding (where groundwater is thought to be at or close to the ground surface in an exceptionally wet winter), based upon geological and topographical data. Properties within the areas identified could be susceptible to anything from groundwater emergence into basements / cellars and underground services; to flooding above the ground surface or incursion into properties. However, unlike the data for fluvial flooding in this report, there is currently no associated estimate of an annual probability exceedance (The probability of it occurring in any one year) available for the GEMs
Green Infrastructure	A network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities (NPPF definition).

Term	Definition
Habitable Room	A room used as living accommodation within a dwelling but excludes bathrooms, toilets, halls, landings or rooms that are only capable of being used for storage. All other rooms, such as kitchens, living rooms, bedrooms, utility rooms and studies are included in this definition.
LiDAR	Light Detection and Ranging. LiDAR is a technology that employs an airborne scanning laser rangefinder to produce detailed and accurate topographic surveys. LiDAR can be used to accurately measure the topography of the ground, even where overlying vegetation is quite dense.
Informal Flood Management Asset	A feature or structure that provides a flood defence function, however has not been built and/or maintained for this purpose (e.g. boundary wall)
Surrey County Council (SCC)	Surrey County Council – the Local Authority responsible for taking the lead on local flood risk management in its administrative area.
Epsom and Ewell Borough Council (EEBC)	Epsom and Ewell Borough Council – the borough council and local planning authority for Epsom and Ewell. Under the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009.
Local Plan	The plan for the future development of the local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004. Current core strategies or other planning policies, which under the regulations would be considered to be development plan documents, form part of the Local Plan. The term includes old policies which have been saved under the 2004 Act. (NPPF definition)
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. N.B. Main River designation is not an indication of size, although it is often the case that they are larger than Ordinary Watercourses.
National Planning Policy Framework (NPPF)	National planning policy, published by the Government in March 2012. It replaces most of the previous Planning Policy Statements, including that regarding flood risk (PPS25).
National Planning Practice Guidance (NPPG)	Supporting guidance to the NPPF, published by the Government in March 2014 as an online resource, available at: (http://planningguidance.planningportal.gov.uk/). It replaces previously published Government guidance, including that regarding flood risk.
Neighborhood Plans	A plan prepared by a Parish Council or Neighborhood Forum for a particular neighborhood area (made under the Planning and Compulsory Purchase Act 2004).(NPPF definition)
Ordinary Watercourse	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a “small” river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.
Planning Policy Statement (PPS)	A series of statements issued by the Government, setting out policy guidance on different aspects of planning. The majority of PPSs have now been replaced by the National Planning Policy Framework, including PPS25 regarding flood risk.
Pluvial (Flooding)	In hydrology, pluvial refers to any water that brought about by precipitation. Pluvial flooding is usually associated with high intensity rainfall events (typically >30mm/h) but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen, developed or otherwise has low permeability resulting in surface water flow and ponding in depressions in the topography.
PPG25	Planning Policy Guidance 25: Development and Flood Risk, Office of the Deputy Prime Minister (ODPM), 2001, replaced by PPS25.
PPS25	Planning Policy Statement 25: Development and Flood Risk – previous government planning policy regarding flood risk, which has now been replaced by the National Planning Policy Framework.
Permitted Development (PD)	Permitted Development rights allow for some minor development, such as certain sizes of building extension, without the requirement to submit an application for planning permission.

Term	Definition
Previously Developed (Brownfield) Land	Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or has been occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill purposes where provision for restoration has been made through development control procedures; land in built-up areas such as private residential gardens, parks, recreation grounds and allotments; and land that was previously-developed but where the remains of the permanent structure or fixed surface structure have blended into the landscape in the process of time. (NPPF definition)
Residual Risk	A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the design process
Risk of Flooding from Surface Water (RoFSW) Mapping	Risk of Flooding from Surface Water mapping published by the EA, updated as new data becomes available from them and LLFAs, see uFMfSW
Strategic Environmental Assessment (SEA)	A procedure (set out in the Environmental Assessment of Plans and Programmes Regulations 2004) which requires the formal environmental assessment of certain plans and programmes which are likely to have significant effects on the environment. (NPPF definition)
Supplementary Planning Document (SPD)	Documents which add further detail to the policies in the Local Plan. They can be used to provide further guidance for development on specific sites, or on particular issues, such as design. Supplementary planning documents are capable of being a material consideration in planning decisions but are not part of the development plan. (NPPF definition) SPDs are not subject to independent examination before adoption by a local planning authority.
Sustainability Appraisal (SA)	Appraisal of plans, strategies and proposals to test them against broad sustainability objectives. The SEA forms part of the SA.
Sustainable Development	“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (The World Commission on Environment and Development, 1987).
Sustainable Drainage System (SuDS)	Term covers the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. (Based on NPPF flood risk guidance text)
Threshold	The lowest point of the door entrance to the house.
UKCIP	United Kingdom Climate Impacts Programme. UKCIP provides scenarios that show how our climate might change and co-ordinates research on dealing with our future climate. UKCIP shares this information, free of charge, with organisations in the commercial and public sectors to help them prepare for the impacts of climate change
Updated Risk of Flooding from Surface Water Mapping (uFMfSW)	Under their strategic overview role for flood risk in England and Wales the EA produced and regularly update the map of flood risk from surface water In 2010 the Flood and Water Management Act (FWMA) defined ‘surface runoff’ in the following terms: "The flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which: (a) is on the surface of the ground (whether or not it is moving), and (b) has not yet entered a watercourse, drainage system or public sewer." Now referred to as the Risk of Flooding from Surface Water mapping (RoFSW)
UKWIR	United Kingdom Water Industry Research. UKWIR was set up by the UK water industry in 1993 to provide a common research programme for UK water operators. UKWIR's members comprise 24 water and sewerage undertakers in England and Wales, Scotland and Northern Ireland.
Zone 1 Low Probability	NPPF Flood Zone, defined as areas outside of Zone 2 Medium Probability. This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Zone 2 Medium Probability	NPPF Flood Zone which comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year.
Zone 3a High Probability	NPPF Flood Zone which comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year.

Executive Summary

A Level 1 Strategic Flood Risk Assessment (SFRA) was developed for the Borough of Epsom and Ewell in 2008. The SFRA has been updated to reflect changes to legislation, planning policy, guidance on the consideration of the predicted impact of climate change and flood risk data. This updated SFRA presents the updated data, its implications for flood risk and planning policy in the borough and reflects changes to the management of flood risk within the planning system.

The primary objective of the Epsom and Ewell SFRA is to support the Local Plan in respect of the development and review of policies related to flood risk management and for the allocation of land for future development. The SFRA has a broader purpose however, providing a robust depiction of flood risk across the borough, it can:

- Inform the development of Epsom and Ewell Borough Council (EEBC) policy that will underpin decision making within the borough, particularly within areas that are affected by (and/or may adversely impact upon) flooding;
- Assist the development management process by providing a more informed response to development proposals which may be affected by flooding, influencing their acceptability and design;
- Identify and implement strategic solutions to flood risk, providing the basis for possible future flood attenuation works by a range of agencies with responsibility for flood risk management;
- Support Surrey County Council (SCC) in their role as Lead Local Flood Authority (LLFA); and
- Support and inform the Council's emergency planning response to flooding.

This is a Level 1 SFRA and as such addresses the requirements of the Sequential Test, which will assist the council to guide development to areas of lower flood risk. Should EEBC progress further with potential allocation sites a Level 2 SFRA may be required to address the requirements of the Exception Test.

The following actions have been undertaken to assess flood risk within the borough:

- The identification of flood risk zones 1, 2, 3a and 3b (functional floodplain);
- Identification of locations of flood risk from other sources (ordinary watercourses, groundwater, sewers, reservoirs and canals);
- Identification of locations at risk of surface water flooding (termed Epsom and Ewell Critical Drainage Areas or EECDA), outside fluvial risk areas;
- The consideration of the impact of climate change upon flood risk within the borough; and
- Identification of areas protected by existing flood defences and that could be at risk should they fail.

The SFRA makes a number of planning policy recommendations in Section 7 for adoption by EEBC when considering development and flood risk. The SFRA also provides guidance for actions that local communities could take to reduce flood damage. In addition, the report provides guidance for emergency planning within the borough on infrastructure and vulnerable institutions within Flood Zones.

Finally, in Section 8.1 the report provides guidance on how the SFRA should be monitored and reviewed to ensure it remains current.

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1. Introduction

1.1 Background

The Borough of Epsom and Ewell lies within the county of Surrey. The borough covers an area of approximately 3,407 hectares and has a population of approximately 75,100 (source: 2011 Census) with an estimated 29,800 households.

Urban areas account for approximately 50% of all land coverage in the borough. Open spaces account for 42% of the borough, most of which is classified as metropolitan green belt due to the borough being on the urban fringe of Greater London. Transport, buildings, and other, non-specified, land uses account for the remaining 8%.

The topography of the borough can be divided between the Epsom Downs in the south of the borough and the flatter, lower-lying land in the north. The Epsom Downs are an area of chalk upland that is part of the greater North Downs. They run in a south-west to north-easterly direction across the borough and the land is largely dedicated to Epsom Racecourse, as well as a golf course and areas for walkers. The north of the borough is largely urbanised with the key communities being the town of Epsom and the village of Ewell.

The solid geology in the borough is of four separate strata. The higher ground in the south-east of the borough is made up of cretaceous chalk. The Thanet Sand formation and the Lambeth Group, bands which are both present in the heart of the borough, border the chalk. London Clay makes up the solid geology of the north-western half of the borough. There are drift deposits of gravels within the clay, some of which may be terrace gravels left behind when the River Thames changed its course during an ice-age.

The principal watercourse in the borough is the Hogsmill River. The source of the Hogsmill is in Ewell village. From here, the river flows north-west towards the borough boundary and its confluence with the Bonesgate Stream and then on to the River Thames at Kingston-upon-Thames. The majority of other watercourses within the Borough are tributaries of the Hogsmill Stream, including the Horton Stream, Green Lanes Stream and Ewell Court Stream. Beverley Brook, a tributary of the River Thames, rises around Cuddington Recreated Ground in Worcester Park immediately to the east of Epsom North Character Area. A branch of Beverley Brook extends slightly into the north-east corner of the borough.

1.2 Overview of Flood Risk within the Borough

The watercourses in the borough that pose significant flood risk to buildings and infrastructure are the Hogsmill River and its tributaries, which include the Bonesgate Stream, the Horton Stream, Green Lanes Stream and Ewell Court Stream. Most of the Ewell Court Stream and lengths of Green Lanes Stream are culverted.

These watercourses are predominantly urban. The Hogsmill River, Green Lanes Stream and Ewell Court Stream all either originate in built-up areas or have their source just outside development. The exception to this is the Horton Stream, which largely flows through open space to the west of Epsom.

The fluvial (river) flood risk mapping (Figure 102) indicates that a relatively small proportion of the borough is susceptible to river flooding, with the extents of Flood Zones 2, 3a, and 3b being largely confined to the areas adjoining the river corridors.

The various ways in which flooding can occur are known as flood mechanisms. It is found helpful to consider this using a Source-Pathway-Receptor approach, where:

- The source is where the floodwater originates from;
- The pathway is the route it is likely to take to cause flooding; and

- The receptor is the place of impact and is often where damage is realised.

The Hogsmill catchment spreads wider than the Epsom and Ewell Borough boundary. Although no watercourses are present in the upper reaches of the Hogsmill catchment, a considerable contributing area exists in the Boroughs of Reigate and Banstead and Sutton. The contributing area of both of these boroughs is already highly developed and thus runoff in extreme events is significant to flood risk within the borough.

Of equal importance within the borough is the risk of localised flooding. Incidents of this nature can arise from sewer flooding, the blockage (or limited capacity) of culverts, or rapid runoff during intense rainfall (often referred to as 'flash flooding'). The most recent event of this kind occurred in July 2007 and, through discussions with the Council, incidents of localised flooding throughout the borough have been identified in Figure 104.

In addition to surface water flooding, some of the most recent flood events in the Borough were those of groundwater flooding in 2000, 2002 and 2014. Flooding caused by groundwater can be localised, occur with little warning, last for extended duration and at any location within high risk areas, causing much damage to property and severe disruption. It is essential to ensure that future planning decisions acknowledge this and do not inadvertently increase the potential risk of localised flooding.

1.3 Flood Risk Management

Flooding has received widespread media attention in recent years and potential associated issues with the cost of and obtaining property insurance as well as the fear of future flooding are well-known. Organisational responsibilities for managing flood risk have changed substantially in the last few years. The following figure provides definitions produced by Jacobs of the principal local sources of flooding referred to in this SFRA.

Local Flood Risk

The Borough of Epsom and Ewell and their partners have responsibilities for managing local flood risk, i.e. flood risk from sources other than Main Rivers, the sea and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses.

Surface runoff – rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer. Note that the term 'surface water' is used generically to refer to water on the surface and is often associated with periods of intense rainfall.

Groundwater – water which is below the surface of the ground and in direct contact with the ground or subsoil. It is most likely to occur in areas underlain by permeable rocks, called aquifers.

Ordinary watercourse – all watercourses that are not designated Main River, and which are the responsibility of Lead Local Flood Authorities and riparian owners

It is essential that future planning decisions do not inadvertently increase the potential risk of localised flooding and, where possible, seek to improve flood risk management. Specific recommendations have been provided within the SFRA to guide the design of future development accordingly.

1.4 Flood Risk and Spatial Planning

The National Planning Policy Framework (NPPF) requires that local planning authorities prepare a Strategic Flood Risk Assessment (SFRA) in consultation with the EA and others. The primary purpose of a Level 1 SFRA is to determine the variation in flood risk across the borough, based upon data from a variety of sources

for the Council to apply the Sequential Test[1] for new development. Robust information on flood risk is essential to inform and support the Council's revised flooding policies in its emerging Local Plan and to inform the decision-making process in the allocation of sites for development. It also provides guidance to developers on planning requirements and recommendations for council policy.

This report (and the supporting mapping) represents the Level 1 SFRA[2], and should be used by the Council to inform the application of the Sequential Test (see Section 6.2). Following the application of the Sequential Test, it may be necessary to develop a more detailed SFRA[3] should it be shown that any further proposed allocations fall within a flood affected area of the borough. The more detailed (Level 2) SFRA should consider the risk of flooding in greater detail within a local context to ensure that the site can be developed in a safe and sustainable manner.

Knowledge exists with respect to flood risk within the borough, provided largely in the form of records of observed flooding and provided from a variety of sources. The Epsom and Ewell SFRA has gathered and built upon this existing knowledge, underpinning the delineation of the borough into zones of 'high', 'medium' and 'low' probability of fluvial flooding, in accordance with the NPPF, and together with the identification of Epsom and Ewell Critical Drainage Areas (EECDA). These zones have then been used to provide a robust and transparent evidence base for the development of flooding related policy, and the allocation of sites for new development as part of the Local Plan.

1.5 The Need for an Updated SFRA

It is understood that EEBC are currently updating their Local Plan and following discussions with the EA the Council were advised that the 2008 Level 1 SFRA for Epsom and Ewell should be updated to reflect changes to national planning policy, any updates to mapping of flood risk, recent flood events and the outputs of the Epsom and Ewell Surface Water Management Plan (SWMP) produced for the Council by Jacobs in 2011.

As stated above, an up-to-date SFRA is required to support planning policy development in the borough. The 2008 SFRA requires updating because:

- New flood risk data is available to contribute to the analysis of flood risk across the borough:
    - Since 2008 the EA has completed updates to its hydraulic modelling indicating fluvial flood risk probability. This updated modelling has resulted in changes to the extent of Flood Zones adopted in this SFRA;
    - The outputs of the Epsom and Ewell SWMP are now available to inform risk of flooding from surface water; and
    - Other flood risk datasets used to interrogate flood risk in the borough have evolved or been added to - including the EA RoFSW mapping (significant advances have been made in the prediction of surface water flooding and overland flow paths since the publication of the 2008 SFRA), EA flood zones, and local historical flooding records.
- Since 2008, responsibility for management of flood risk in the UK has changed with the introduction of the Flood and Water Management Act (FWMA) in 2010;

[1] Details of the Sequential Test and its application are further detailed in the 'Flood Risk and Coastal Change' section of the national Planning Practice Guidance available online at http://planningguidance.planningportal.gov.uk/
[2] The requirements of a Level 1 SFRA are further detailed in the 'Flood Risk and Coastal Change' section of the national Planning Practice Guidance available online at http://planningguidance.planningportal.gov.uk/
[3] The requirements of a Level 2 SFRA are further detailed in the 'Flood Risk and Coastal Change/ section of the national Planning Practice Guidance available online at http://planningguidance.planningportal.gov.uk/

- Since the publication of the original SFRA the NPPF and supporting Guidance have been produced. The updated SFRA will address the requirements of these documents; and

- In February 2016 the EA published updated guidance[4] on the consideration of the predicted impact of climate change upon flood risk for use in Flood Risk Assessments and SFRAs. This SFRA provides the necessary information for these updated factors to be included in the application of the Sequential Test.

1.6 Consultation and Co-operation

Consultation and co-operation has formed a key part of the development of the updated EEBC SFRA. This is particularly important in light of the 'Duty to Cooperate' brought in by the Localism Act 2011 (Section 110). In addition, paragraph 157 of the NPPF states that Local Plans should *"be based on co-operation with neighbouring authorities, public, voluntary and private sector organisations".*

The NPPG states that the following organisations/roles should be involved in preparing the SFRA:

- Environment Agency;

- Lead Local Flood Authorities (LLFA), in this case SCC;

- Emergency response (role within EEBC);

- Drainage authority (role within EEBC under the Land Drainage Act 1991); and

- Internal drainage boards (where appropriate) – not applicable for in this borough

The NPPG also requires consultation with Thames Water as the sewage undertaker and Sutton and East Surrey Water as a local water supply company, so that the SFRA '*takes account of any specific capacity problems and of the undertaker's drainage area plans'*. Historic flooding records within the borough have been requested from these companies to inform the SFRA.

In addition, the Development Planning and Emergency Planning functions of EEBC were consulted to seek their feedback on specific issues throughout the development of the SFRA and have co-operated fully in the process. The key roles played by the EA and EEBC's Emergency Planning function with regard to fluvial flooding and flooding from local sources, respectively, are such that they are in a key position to lead in providing advice on such issues. EEBC and the EA were closely involved in ensuring that this SFRA integrates with the advice, guidance and services they already provide and are proposing to provide with respect to flooding.

The watercourses within the borough all drain northwards into the Hogsmill River. The Hogsmill flows through the northern boundary of the borough and continues north-west through the London Borough of Kingston upon Thames before its confluence with the Thames. Future development has the potential to impact upon the flow regimes in the Hogsmill and have subsequent impacts on Kingston upon Thames, consequently consultation with local authorities downstream on the Hogsmill may be required. Any impact upon flow regimes caused by development within the borough is unlikely to cause more than minimal impacts upon the River Thames, given the comparison in flows, so consequently consultation with local authorities downstream on the Thames would not be required.

Although no issues with cross-border management of flows are known to EEBC or were highlighted through the consultation on this updated SFRA, it is imperative that all local authorities clearly understand the core

[4] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

issues that flood risk raises within their respective areas and the potential subsequent effects to other local authority areas, and adapt their decision-making accordingly. They must be aware of the impact that planning policies and development management decisions may have, not only locally, but upon adjoining Boroughs – such as Kingston upon Thames.

1.7 Future Development in Epsom and Ewell Borough

Epsom and Ewell Borough is attractive with a high quality of life. It has easy access to the City of London and the wider South-East region making it popular with commuters to London. The borough contains areas of designated Metropolitan Green Belt and the Epsom Downs fall into designated Areas of Great Landscape Value (AGLV).

There is an increasing pressure on the Borough to deliver high numbers of housing units within its boundaries. Historically development has been focused on Previously Developed Land within the urban areas of Epsom and Ewell and the former 'hospital cluster' of West Park and St Ebbas. Because of the general development pressure, the SFRA will consider flood risk throughout each character area and not particular development sites.

2. Approach to the Strategic Flood Risk Assessment

2.1 Role of the SFRA

The important role of SFRAs in the local plan process is set out in the NPPG[1]. It states that '*local planning authorities should use the Assessment to:*

- *Determine the variations in risk from all sources of flooding across their areas, and also the risks to and from surrounding areas in the same flood catchment;*
- *Inform the sustainability appraisal of the Local Plan, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased;*
- *Apply the Sequential Test and, where necessary, the Exception Test when determining land use allocations;*
- *Identify the requirements for site-specific flood risk assessments in particular locations, including those at risk from sources other than river and sea flooding;*
- *Determine the acceptability of flood risk in relation to emergency planning capability;*
- *Consider opportunities to reduce flood risk to existing communicates and developments through better management of surface water, provision for conveyance and of storage for flood water'.*

The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. where possible prioritise development away from areas that are susceptible to flooding. The NPPF stipulates the application of a sequential approach to site allocation – seeking development sites within areas of lowest flood risk in the first instance (Flood Zone 1 – low probability of flooding). Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites i.e. within areas that may potentially be at greater risk of flooding – Zones 2 (medium probability), 3a (high probability) or 3b (functional floodplain) be contemplated, taking account of the vulnerability of the proposed land use.

The Sequential Test, which is set out in the NPPF with further detail provided in the NPPG, must be utilised in both allocating sites and determining applications. Tables 1 to 3 in the NPPG stipulate 'appropriate' land uses for each Flood Zone. Land uses are divided into five 'vulnerability classifications', detailed in Table 2 of the NPPG:

- Essential Infrastructure;
- Highly vulnerable;
- More vulnerable;
- Less vulnerable; and
- Water-compatible development.

Table 3 of the NPPG (reproduced in this SFRA as Table 2-1) identifies types of development (by vulnerability classification) that should not be permitted in particular Flood Zones. It also identifies circumstances in which the 'Exception Test' must be passed for development not initially permissible in that zone, where, following application of the Sequential Test, no sites are available in zones with lower flood risk.

Table 2-1: NPPG Table 3 - Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
2	Appropriate	Exception Test Required	Appropriate	Appropriate	Appropriate
3a	Exception Test Required*	Not Appropriate	Exception Test Required	Appropriate	Appropriate
3b	Exception Test Required*	Not Appropriate	Not Appropriate	Not Appropriate	Appropriate*
* Conditions may be applicable (refer to NPPG)					

Paragraph 102 of the NPPF states that 'For the Exception Test to be passed: *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and a site-specific flood risk assessment must demonstrate 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 latter point includes a requirement to take account of the future risk from climate change over the lifetime of the development.

This Level 1 SFRA provides the information required to enable EEBC to apply the Sequential Test and to identify whether the Exception Test will be required.

In addition to providing the information required to apply the Sequential Test, this document also contains a series of general recommendations for local planning policy and development management. Overlaps with emergency planning are also discussed.

2.2 Methodology for the Level 1 SFRA

In accordance with the NPPF a Level 1 SFRA should collect and refine data in order to define the flood zones. The SFRA should provide the basis of applying the Sequential Test based on this identification of Flood Zones.

The adopted methodology for this Level 1 SFRA is summarised in the subsequent sections.

2.2.1 Data Collection

This involves the collection and review of data pertaining to known and predicted flood risk and current planning policy within the borough. This has been collected from a number of sources including EEBC, the EA, Thames Water, Sutton and East Surrey Water, and SCC.

2.2.2 Assessment of Flood Risk

The extent and probability of flood risk within the borough has been categorised and assessed for the SFRA. The following actions have been undertaken:

- The identification of flood risk zones 1, 2, 3a and 3b (functional floodplain);
- Identification of locations of flood risk from other sources (ordinary watercourses, groundwater, reservoirs, canals); and
- Identification of locations at risk of surface water flooding, termed CDAs, particularly outside fluvial risk areas.

2.2.3 Climate Change

Climate change has the potential to significantly increase the consequences of flooding within the borough. The assessment of fluvial flood risk has taken into account the estimated impact of climate change up to the year 2115[5]. This has been assessed for changes in rainfall leading to an increase in fluvial flood risk due to higher river levels. This has the potential to increase the current risk of flooding through an increase in rainfall frequency and intensity.

2.2.4 Outputs

The following outputs have been produced as part of this SFRA report:

- Delineation of Flood Risk Zones (to comply with the Sequential Test);
- Maps indicating areas at risk of flooding;
- Assessment of residual risk of flooding;
- Maps of EECDAs;
- Suggested policies and guidance for the local planning authority on the management of flood risk in the borough; and
- Guidance for developers and EEBC planning officers dealing with applications.

2.3 A Living Document

The previous (2008) and this (2018) Epsom and Ewell SFRA were informed by existing knowledge with respect to flood risk within the borough. They were based upon emerging and existing policy guidance, which for the 2008 SFRA included PPS25 (December 2006) and the supporting Practice Guide Companion to PPS25 (draft, February 2007). PPS25 and supporting documents have now been superseded and the current SFRA (2018) was developed in accordance with the NPPF and supporting guidance documents.

[5] This is based on the river Hogsmill detailed modelling increasing the existing 1% (1 in 100) event peak flow rates by factors specified in the Environment Agency's guidance issued in February 2016

3. The Planning Framework

3.1 Introduction

This Section provides a brief overview of the strategy and policy context relevant to flood risk in the borough.

The success of the SFRA is heavily dependent upon the ability of the Council to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning policies and development management recommendations (refer to Section 7). The NPPF provides guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish 'sound' planning policies that will ensure future sustainability with respect to flood risk.

The policy framework informing the development of this Level 1 SFRA has changed significantly since the previous SFRA was published in May 2008. At the national level, Planning Policy Statement 25 (PPS25) (regarding flood risk) and its supporting guidance was replaced by the NPPF in 2012 and its associated guidance. The previous regional planning policy: The South-East Plan, no longer exists. At the local level, Unitary Authorities and County Councils, such as SCC, have been given new responsibilities through the Flood and Water Management Act 2010 with regard to managing local flood risk and best practice and knowledge with regard to the production of SFRAs continues to evolve.

3.2 National Planning Policy

National planning policy is set out in the NPPF, which was published by the Government in March 2012. It forms a more succinct replacement for numerous topic-specific Planning Policy Statements (PPSs), including PPS25 on flood risk. The NPPF is accompanied by the online NPPG[6], first published in March 2014, which provides further guidance on specific issues, including flood risk, and replaces all previously published national planning guidance. The NPPF covers a full range of planning issues drawing on the central issue of sustainable development. Central themes include the re-use of previously developed land of low environmental value, promoting economic growth and high-quality design, and transitioning to a low carbon future, including taking full account of flood risk.

The NPPF underpins the process by which local planning authorities are to account for flood risk as an integral part of the planning process. The overarching aims set out by the NPPF for the management of flood risk at a planning authority level are encapsulated in Paragraph 100 of the document:

"*Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:*

- *Applying the Sequential Test;*
- *If necessary, applying the Exception Test;*
- *Safeguarding land from development that is required for current and future flood management;*
- *Using opportunities offered by new development to reduce the causes and impacts of flooding; and*
- *Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations."*

[6] http://planninggidance.planningportal.gov.uk/

The Sequential Test and Exception Test are explained further in Section 7.2.

These aims effectively set the scope for the specific outcomes of the SFRA process. The SFRA in turn then informs planning and development management decisions to ensure that the aims set out above can be achieved.

The NPPF states that '*a sustainability appraisal which meets the requirements of the European Directive on strategic environmental assessment should be an integral part of the plan preparation process, and should consider all the likely significant effects on the environment, economic and social factors'* (paragraph 165). The purpose of Sustainability Appraisal (SA) is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans. The SA developed in conjunction with the new planning policy documents for Epsom and Ewell Borough will be informed by the information and recommendations contained in this updated SFRA.

It is important to reiterate that the NPPF covers a range of planning issues – not just flood risk. The formulation of council policy and the allocation of land for future development must also meet the requirements of other elements of the NPPF, including (for example) with regard to environmental protection, housing and economic growth. The provision of sustainable development requires the balancing of a range of social, economic and environmental factors.

The SFRA aims to assist in this process through the provision of a clear and robust evidence base upon which informed decisions can be made.

In December 2014, the Secretary of State for Communities and Local Government published a written statement (HCWS161) setting out the Government's continuing commitment to protect people and property from flood risk. Local planning policies and decisions on planning applications relating to major development are required to ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate. The policies contained in the written statement came into effect on 6 April 2015.

3.3 Regional Planning Policy

The 2008 SFRA referenced the 'South East Plan'[7] which was intended to propose the region's vision for the proceeding 20 years until 2026. However, this was replaced by national planning policy with the publication of the NPPF in 2012.

3.4 Adopted Local Planning Policy

The Epsom and Ewell Core Strategy[8] which was adopted on 24 July 2007 is one of the Local Plan planning documents, which provide the local policy framework for the borough and set out the Council's policies and proposals for development and land use in the borough.

The Core Strategy identifies the key issues and the social, economic and environmental objectives for the future development of the borough up to 2022, and a strategy to achieve them. It is central to the delivery of sustainable development and creating sustainable communities. Policy CS6 within the Core Strategy document details Flood Protection Policy with regard to Planning Policy.

The Epsom Town Centre Area Action Plan[9] (2011) was developed to produce a detailed vision for the future of Epsom Town Centre for the proceeding 15 to 20 years, establishing a framework to show how change will take place, and how it will be managed and delivered. This document highlights that the 2008 SFRA identified

[7] South East Regional Assembly (2006) The South East Plan: A Clear Vision for the South East, The Draft South East Plan, SERA
[8] Core Strategy 2007, Local Development Framework, Epsom and Ewell Borough Council
[9] Plan E, Epsom Town Centre Area Action Plan, 2011, Epsom and Ewell Borough Council

a significant area of Epsom Town Centre as a CDA at specific risk from rain water flooding. The Action Plan identifies 'Strategic Opportunity Sites' and location-specific policies pertaining to each site which give broad direction on flood risk in relation to development in these areas.

The Epsom and Ewell Development Management Policies Document[10] (published September 2015) has been produced to:

- *"support the strategic objectives and deliver the vision of the Core Strategy by promoting and enabling development that delivers the Spatial Strategy;*
- *Along with the Core Policies, set criteria by which planning applications and site allocations will be considered and determined"*

Policy DM19 within the Development Management Policies Document outlines the policy that will be taken by the Borough Council with regards to 'Development and Flood Risk', including stating that a sequential approach will be taken in the allocation of sites and when determining planning applications, as well as setting out the conditions which must be met in order for developments considered at flood risk to be supported (aligning with NPPF policy). Policy DM19 also sets out Council expectations with respect to development restricting surface water run-off through the incorporation of SuDS, and also support for development seeking to restore areas of functional floodplain.

3.5 Regional and Local Flood Plans

3.5.1 Epsom and Ewell SWMP

The SWMP for Epsom and Ewell was developed in 2011[11]. The SWMP uses data and hydraulic modelling to understand the causes and effects of local sources of flooding – that from sewers, drains, groundwater, and runoff from land, small watercourses and ditches that occurs as a result of heavy rainfall. The plan also seeks to manage surface water over the longer-term through the work of a range of bodies, including EEBC, the EA, and Thames Water. It includes potential high-level solutions to the flooding problems identified. The SWMP collated historic records of flooding within the borough which has been utilised as part of this SFRA.

The outputs of the hydraulic model developed for the SWMP have been utilised to identify areas at risk of rainfall generated surface water flooding within the borough and define CDA. The SWMP modelling methodology differs from that used to produce the RoFSW mapping therefore this SFRA includes both. However, because the SWMP mapping is believed to contain greater local detail than that included in the RoFSW, and includes an allowance for the predicted impact of climate change, it has been adopted as the principal source to infer surface water flood risk across the borough for this updated SFRA.

The SWMP also divided the borough into CDAs; these delineated the borough into sub-areas and estimated the damages that could result from flooding. However, these are not the same as the CDAs that could be defined by the EA or the EECDA defined as part of this study (see Section 4.9).

3.5.2 Surrey County Preliminary Flood Risk Assessment

In order to provide better and more comprehensive management of flood risk, the Flood and Water Management Act 2010 assigned new responsibilities to local authorities. As a result, SCC works in partnership with the EA, water companies and others to manage various aspects of flood risk.

[10] Development Management Policies Document, 2015, Epsom and Ewell Borough Council
[11] Epsom and Ewell Surface Water Management Plan, April 2011, Jacobs

The Preliminary Flood Risk Assessment (PFRA) for Surrey[12] was published in 2011. The PFRA reviews existing available flood data and seeks to predict the location and likelihood of local sources of flooding, from a range of sources, in the future, taking into account factors such as climate change.

In addition to enabling SCC to comply with their legal requirements as the LLFA, the PFRA sought to establish productive working partnerships with a range of organisations in relation to flood risk to ensure a co-ordinated approach to the management of local flood risk across London.

The PFRA forms a key data source for this updated SFRA. It is understood that the 2011 is in the process of being updated by SCC.

3.5.3 Surrey County Local Flood Risk Management Strategy 2017-2032

A Local Flood Risk Management Strategy (LFRMS) for Surrey County was first published in December 2014. Since that time the landscape of local flood risk management has changed and has necessitated an updated LFRMS[13], which was published in 2017.

Under the FWMA, each LLFA is required to develop a FRMS. The objective of the FRMS is to tackle 'local' flood risk (e.g. surface water, groundwater and ordinary watercourses) as opposed to Main River fluvial flooding. In addition, it will identify short-term (2 years) measures to tackle flood risk and agree the principles for the longer-term management of flooding in the borough. The FRMS seeks to bring together all the Flood Risk Management Authorities that contribute to the mitigation of flood risk within Surrey.

[12] https://www.surreycc.gov.uk/__data/assets/pdf_file/0004/16753/PFRA.pdf
[13] https://www.surreycc.gov.uk/__data/assets/pdf_file/0005/136724/Surrey-Local-Flood-Risk-Management-Strategy-FINAL_v2.pdf

4. Data Collection and Methodology

4.1 Overview

This Section details the data used to develop this SFRA and the methodology used to analyse and identify the risk of flooding.

The flood risk knowledge within the borough includes (but is not limited to):

- Experience of council engineers and staff, local councillors and others;
- Records and information on past flooding from all sources (primarily river, surface water, groundwater and sewers);
- Flood Map for Planning (Rivers and Sea) and the RoFSW showing areas most susceptible to local flooding. We have used the latest information as of the date of creation of this document, which is updated by the EA regularly; and
- Previous studies such as the PFRA and SWMP.

The application of this data has facilitated the delineation of zones of 'high', 'medium' and 'low' probability of fluvial flooding, CDAs and formulation of planning and development management recommendations. A summary of the findings based on the analysis is provided in Section 5.

4.2 Consultation

Consultation has formed a key part of the data collation phase for the SFRA. The following key stakeholders have been consulted during the current study:

4.2.1 Epsom and Ewell Borough Council

- **Planning***:* Consulted to identify areas under pressure from development and/or regeneration
- **Land Drainage and highways**: Consulted to identify areas potentially at risk from river flooding, groundwater flooding and surface water problems
- **Emergency Planning**: Consulted to discuss the Epsom and Ewell Council's existing emergency response to flooding

4.2.2 Environment Agency

The EA has been consulted to source specific flood risk information to inform the development of the SFRA. In addition, the EA is a statutory consultee under the NPPF and, therefore, must be satisfied with the findings and recommendations for sustainable flood risk management into the future. For this reason, the EA has been consulted during the development of the SFRA.

4.2.3 Thames Water

Thames Water is responsible for the management of surface water drainage network and sewerage within the borough. SCC is responsible for highway drainage, the majority of which drains to the Thames Water network, with the remaining highways drainage going directly to ordinary watercourses. Thames Water was consulted to discuss the risk and number of incidences of localised flooding associated with the existing drainage/sewer

system. As a matter of policy, Thames Water is unable to release any specific locations of known flooding incidents related to their urban drainage and sewerage network. This is due to data confidentiality. However, through consultation with Thames Water, EA historic flood risk mapping a national Groundwater Study and from local knowledge, general areas at risk from surface water, foul, and groundwater have been identified and mapped in Figures 101-117 of this document.

The Hogsmill Integrated Urban Drainage Defra Pilot Study, to which Thames Water is a partner, enabled the mapping of areas likely to be at risk from exceedance of the surface water system.

4.2.4 Sutton and East Surrey Water

Sutton and East Surrey Water supply water within the borough and do not manage waste or drainage. However, they do utilise the water resources from the aquifer beneath the North Downs. The rate of abstraction and consequential maintenance of groundwater levels has a direct impact on the potential for groundwater flooding. The volume of surface water runoff from the chalk upper catchment could be reduced if aquifer recharge could be improved. This would have the double benefit of increasing scarce water resources and reducing flood risk. Sutton and East Surrey Water have previously indicated that they are willing to actively cooperate in such schemes.

4.2.5 Surrey County Council

SCC Highways have been consulted regarding highway drainage within the borough as part of the Defra IUD Pilot Study. SCC have provided highways flood data including records of historic flood incidents and Wet Spot data.

4.3 Detailed Hydraulic Modelling

The previous SFRA relied upon a number of sources for flood risk mapping including the Hogsmill Flood Risk Management (FRM) Strategy Study, the Hogsmill Integrated Urban Drainage (IUD) Defra Pilot Study and the Section 105 Flood Mapping Study. These studies have generally incorporated the development of detailed hydraulic models, which provide a more robust understanding of the localised fluvial flooding regime.

Since 2008 the key sources of information for fluvial and surface water flood risk have been updated (see Section 1.5). This updated SFRA relies upon the latest hydraulic model of the Hogsmill River produced by the EA in 2015. This model was used to delineate flood zones across the borough and to identify the predicted impact of climate change on fluvial flood risk. The EA provided further flood extents for three events; the 1% (1 in 100) annual chance event including uplifts of 25, 35 and 70% in accordance with the latest EA guidance for a 100-year planning horizon.

It should be noted that the detailed hydraulic models developed on behalf of the EA assume ‘typical’ conditions within the respective river systems that are being analysed. The predicted water levels may change if the operating regimes of the rivers involved are altered (e.g. engineering works which may be implemented in the future), culverts are permitted to block, the condition of the river channel is allowed to deteriorate, or, simply, the climatic inputs to the watercourse vary over space and time.

4.4 Historic Flooding

Areas within the borough that are known to have experienced flooding, from all sources, in recent years have been identified. These have been highlighted in the adjoining flood incidence map (see Figure 104) and discussed in Section 5. Sources of historic flooding information included in this SFRA are described in Table 4-1. The cause (and affected area) of each incident is not directly known in many cases.

It is important to highlight that, within the study area, recent incidents of flooding have been attributed to sources other than rivers. Some flood incidences were the result of groundwater flooding or flooding exacerbated by groundwater. The July 2007 flood incidences were directly attributable to a period of short, intense, rainfall, which caused surface water flooding. Some of this surface water flooding is from rainfall runoff flowing overland where there is no drainage network from the North Downs into Epsom. Within the urban area where there is a drainage network, the volume of surface water exceeds the capacity of the sewers and continues to flow overland.

Table 4-1: Historic Flood Information

Historic Flooding Data	Time period covered by dataset	Data Source
Groundwater Flood Incidents 2000, 2002 & 2014		2000 & 2002 data: EEBC 2014 data: Epsom & Ewell Multi Agency Flood Plan[14]
Highways Flood History: - **External Property Flooding** (Indicative) (Identified roads which may have been affected by flooding, where properties have been reported to have been flooded externally within ~50cm of the road) - **Internal Property Flooding** (Indicative) (Identified roads which may have been affected by flooding, where properties have been reported to have been flooded internally within ~50cm of the road) - **Highways Flood Enquiries** - **Surrey Wetspots** (The location of a flood incident that has been reported and status of location) - **Historic Flooding Incidents** (Indicative) (All non-point location specific reporting flooding incidents)		SCC
July 2007 Flood Incidents (divided by whether incidents affected property)		EEBC
Historic Sewer Flooding Incidents (indicative)	1991 - 16/01/18	Thames Water

4.5 Delineation of Flood Zones 1, 2 and 3

The risk of an event (in this instance a flood event) is a function of both the probability that the flood will occur, and the severity of the consequences. This SFRA endeavours to assess the likelihood (or probability) of fluvial (river) flooding, categorising the borough into zones of low, medium and high probability. It should be noted that this delineation does not incorporate the risk of flooding from other sources, which also pose a risk. It then provides recommendations to assist EEBC to manage the consequence of flooding in a sustainable manner, for example through the restriction of vulnerable development in areas of highest flood risk.

[14] Multi Agency Flood Plan (Version 2.2 Draft, 2018), Epsom & Ewell Borough Council

To this end, a key outcome of the SFRA process is the establishment of the Sequential Test in accordance with the NPPF. To inform the planning process, it is necessary to review flood risk across the area, categorising the area is terms of the likelihood (or probability) that flooding will occur. The borough has been delineated into the fluvial Flood Zones in accordance with the NPPF. The delineation of Zones 1, 2 and 3a is based on the EA's Flood Map for Planning (Rivers and Sea), whereas Zone 3b has been derived separately.

The EA's Flood Map for Planning (Rivers and Sea), available on its website[15], shows the natural floodplain, ignoring the presence of defences, and therefore areas potentially at risk of flooding from rivers. The Flood Map shows the area that is susceptible to a 1% (1 in 100) annual chance of flooding from rivers in any one year. It also indicates the area that has a 0.1% (1 in 1000) annual chance of flooding from rivers in any given year. This is also known as the Extreme Flood Outline. The Flood Map outlines for the borough have been produced from a combination of a national generalised computer model and available historic flood event outlines. The EA's knowledge of the floodplain is continually being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. The EA has an ongoing programme of improvement, and updates are made on a quarterly basis. Since the previous SFRA was produced in 2008 updates have resulted in alterations in Flood Zone extent from the previous SFRA to the current version.

The derivation of Flood Zone 3b is summarised below and presented in Figure 102. Changes to the delineation of flood zones since the 2008 SFRA are summarised in Section 5.3.

Flood Zone 1 – Low Probability

Flood Zone 1 (FZ1) Low Probability comprises land assessed as having a less than 1 in 1000 annual probability of river flooding (< 0.1%). For SFRA purposes, this incorporates all land that is outside the Zone 2 and Zone 3 flood risk areas. It is important to note that land within Flood Zone 1 may still be vulnerable to flooding from other sources e.g. surface water.

Flood Zone 2 – Medium Probability

Flood Zone 2 (FZ2) Medium Probability comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) in any year. In other words, land situated between Zones 1 and 3a. Zone 2 Medium probability is based on the most recent (updated quarterly) EA Flood map for Planning (Rivers and Sea).

Flood Zone 3a – High Probability

Flood Zone 3a High Probability comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (> 1%) in any year. Zone 3a High Probability is based on the most recent (updated quarterly) EA Flood Map for Planning (Rivers and Sea).

Flood Zone 3b – Functional Floodplain

Flood Zone 3b (FZ3b) Functional Floodplain is defined in Table 1 of the NPPG as those areas in which "*water has to flow or be stored in times of flood*". The definition of functional floodplain remains somewhat open to subjective interpretation, but the NPPG requires that the boundaries shown in the SFRA should be as agreed with the EA. The NPPG states that "*the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood alleviation scheme) in an extreme (01% annual probability) flood, should provide a starting point for consideration and*

[15] http://www.environment-agency.gov.uk/

discussion to identify the functional floodplain" (NPPG, SFRA guidance, paragraph 015). The guidance (paragraph 015) further clarifies that:

'*The area identified as function floodplain should take into account the effects of defences and other flood risk management infrastructure. Areas which would naturally flood, but which are prevent from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as function floodplain.'*

In addition, the guidance states that areas intended to flood, such as upstream flood storage areas (FSA), should also be identified as functional floodplain.

Flood extent outputs from the EA's Hogsmill River hydraulic model (produced in 2015) run for the 5% (1 in 20) event have been used to define Flood Zone 3b.

4.6 Dry Islands

There are areas within the borough which, while located within Flood Zone 1, would be surrounded by floodwater during a flood event. For this reason, development proposals in these 'dry island' areas should be accompanied by a flood evacuation plan suitable for the NPPF category into which the surrounding area falls. For example, a development proposal on a dry island site that is categorised as Zone 1 Low Probability, but wholly surrounded by the 1% (1 in 100) annual chance floodplain, should be accompanied by a flood evacuation plan appropriate to Zone 3a High Probability.

The 'Dry Islands' identified in the borough are largely limited to areas which have been developed as residential areas and include:

- Small areas in the vicinity of Colne Crescent to the north of the borough, directly south-west of the confluence of the Bonesgate Stream and the Hogsmill River;
- Small area to the west of the confluence of Greens Lane Stream and Hogsmill Stream;
- Small area of a playing field between the Hogsmill Stream and a drain, to the west of Meadow Walk; and
- Areas around the southern extent of the Flood Zone associated with Greens Lane Stream in the vicinity of Andover Close, Almond Road, Appleby House Care Home, Epsom Primary and Nursey School, Hurt Road, Lower Court Road, Court Recreation Ground to the south of Pound Lane, and parts of Blenheim High School site and nearby playing fields

4.7 Consideration of Climate Change

There is clear scientific evidence that global climate change is happening now and cannot be ignored. Further information is provided in Section 5.5. Changes in the extent of inundation due to climate change are likely to be negligible in well-defined valleys, but could be dramatic in very flat areas. Changes in the depth of flooding under the same allowance will increase the probability of a given flood. This means that a site currently located within a lower risk zone (e.g. Zone 2) could in future be re-classified as lying within a high risk zone (e.g. Zone 3a). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding.

In February 2016 the EA updated its guidance on the allowances to be made for the predicted impact of climate change. Of particular relevance to this SFRA is the revised guidance on:

- Peak river flow;

- Peak rainfall intensity; and
- Sea levels.

4.7.1 Peak River Flow and Fluvial Flood Risk

The allowance to be made for the predicted impact of climate change on peak river flows throughout the UK is subject to the location (river basin district[16]), timescale (design-life) to be considered and the vulnerability classification (see Paragraph 66 of the NPPG) of the proposed development. The borough is located within the River Thames Basin District, therefore the uplift factors to be applied are summarised in Table 4-2. As future developments in the borough will have a range of projected design life and vulnerability classifications the highest climate change uplift requirements have been highlighted in this SFRA.

Table 4-2: Recommended Peak Flow Climate Change Allowances for the Borough

Allowance	2015 to 2039	2040-2069	2070-2115
Upper End	25%	35%	70%
Higher Central	15%	25%	35%
Central	10%	15%	25%

Future Flood Zone 3a extent has been estimated using the Hogsmill River hydraulic model outputs with a range of uplift factors applied as per the 100-year design life horizon included in .

4.7.2 Peak Rainfall Intensities

The updated NPPG guidance requires the testing of two uplift factors, 'Upper End' and 'Central' across all of England as summarised in Table 4-3. As future developments in the borough will have a range of projected design life and vulnerability classifications the highest climate change uplift requirements have been highlighted in this SFRA. SFRAs and site-specific FRAs are expected to test the impact of both allowances to understand the potential range of impact based on the design-life of the proposed development.

Table 4-3: Recommended Climate Change allowances for Peak Rainfall Intensity

Allowance	Total potential change (1961-90 baseline)		
	2015 to 2039	2040-2069	2070-2115
Upper End	10%	20%	40%
Central	10%	10%	20%

The SWMP hydraulic model included an allowance for climate change by increasing the rainfall for the 1% (1 in 100) annual chance event by 28%. While this does not match those required by the NPPG (as indicated in Table 4-3 it provides an initial indication that would have to be updated in support of a future planning application.

[16] http://www.gov.uk/government/publications/flood-risk-assessments-river-basin-district-maps

4.8 Surface Water Flooding

Please refer to Figures 105 - 108.

In the 2008 SFRA, areas at risk of surface water flooding were identified using JFLOW flood mapping. This mapping was used as a basis for defining CDAs within the borough, these have been superseded by the outputs of the SWMP and the RoFSW.

The Epsom and Ewell SWMP involved the development of a detailed two-dimensional hydraulic model to better understand the locations and mechanisms of surface water flooding and inform identification and development of mitigation options. This model is of a higher resolution than the EA RoFSW model and is therefore believed to more accurately map surface water flood risk across the borough.

Both the RoFSW mapping and the SWMP modelled surface water flood extents are included in the Figures of this updated SFRA (see Figure 106 for a comparison). As the SWMP modelled flood extents are believed to be more accurate than the EA RoFSW, the 1% (1 in 100) annual chance event flood extent (for flood depths greater than 50mm to account for property thresholds) has been utilised to delineate the EECDAs. Also available from the SWMP dataset are the modelled surface water flood extents for a 1% (1 in 100) annual chance event plus a 28% climate change uplift in rainfall (see Figure 105). Within the 2011 SWMP Report the reasoning behind the 28% climate change uplift is explained:

"the UKCP09 climate change predictions for the Borough, with a time horizon of 2080 using the high emission scenario and 50% percentile values could increase rainfall intensity of 28%. This is interpreted as a 28% increase in rainfall depth values across all simulated events".

This climate change uplift does not match the national guidance of testing the 'upper end' and 'central allowance' climate change uplifts of 20% and 40% respectively; however, it does provide an indication of additional areas of risk in order to inform potential planning applicants.

4.9 Areas of Critical Drainage

Please refer to Figures 107 -108.

Based on the Epsom and Ewell SWMP, a number of residential and commercial properties in the borough could be at risk of flooding from local sources (principally surface runoff generated by intense rainfall, groundwater and ordinary watercourses). In areas susceptible to local flooding, the volume of runoff and sufficiency of the drainage, ordinary watercourse and sewer systems are critical to determining the degree of flood risk. For this reason, this SFRA has delineated CDAs across the borough. The EA has the ability to delineate CDA to cover such areas, but as is the case across much of the country, has not current done so within the borough. Locally designated CDAs are subject to local policy requirements and do not necessarily require EA consultation unless they meet other pre-existing criteria.

The EECDAs have been designated based on areas predicted to flood from a 1% (1 in 100) annual chance surface water event, based on the Epsom and Ewell SWMP modelled flood extents, for modelled flood depths greater than 50mm and within Flood Zone 1.

4.10 Flood Defences

Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flood. They are generally categorised as either 'formal' or 'de facto' defences. A formal defence is a structure that was built specifically for the purpose of flood defence and is maintained by its respective owner, which could be the EA, a Local Authority, or an individual riparian (riverside) owner. A de facto flood defence is a structure that has not been specifically built to retain floodwater and is not maintained

for this specific purpose, but may afford some protection against flooding, such as railway embankments, for example.

No formal flood defences have been identified within the borough.

No de facto flood defences have been identified in the borough as part of the SFRA process. However, as the definition provided above illustrates, de facto flood defences may be present, that would provide some flood defence function at a local level. For example, the railway lines that dissect the borough may well act as a de facto flood defence, holding up flood waters and overland flow on their upstream side. This was the case in Epsom town centre in 2007.

4.11 Flood Warning

Please refer to Figure 111.

The EA operates the Floodline Warnings Direct[17] service to warn homes and businesses of potential flooding. Within the borough there are Flood Alert areas on the Hogsmill River, and Ewell Court, Beverley Brook, and Hogsmill Streams. Environment Agency Flood Warning Areas within the borough are described in the Epsom and Ewell Multi Agency Flood Plan[14] within a table which is reproduced in this document as Table 4-4. Section 5.3.1 summarises the extent of fluvial flood risk in the borough.

Table 4-4: Environment Agency Flood Warning Areas

Flood Warning Area Code	Flood Warning Area	Description (within the borough)
064FWF33Ruxley	River Hogsmill and its tributaries from Ewell to Kingston	The upper reaches of the River Hogsmill flow through a mixture of open space and residential areas. The natural river course has largely been straightened and / or replaced. Areas of risk include West Ewell – Ruxley Road, Huntsmoor Road, Bridle Close, Curtis Road and Wey Court.
064FWF40WorcsPrk	Beverley Brook from Worcester Park to New Malden	The Beverley Brook rises in Cuddington Recreation Park and flows towards the Thames

4.12 Dam Breach

Following a recommendation in the Pitt Review, the EA has provided Reservoir Flood Maps[18] for those reservoirs which it regulates under the Reservoirs Act 1975. These show the likely extent of flooding resulting from a dam breach which could be caused by extreme rainfall or floods, as well as structural failure. For this SFRA a review has been undertaken of the information available on the EA's website to assess the potential area of risk of a reservoir embankment breach, see Section 5.

4.13 Groundwater Emergence Maps

The Groundwater Emergence Maps (GEMS) were created by Jacobs as part of a groundwater flooding scoping study, which was commissioned by Defra and set out to provide information on the scale, distribution and nature of groundwater flooding in England. The maps have been produced at a scale suitable for national assessment and, as such, do not pinpoint sites where groundwater flooding will occur. Instead, they define broad areas of risk based on geology and topography. Properties within the zone could be expected to

[17] https://fwd.environment-agency.gov.uk/ap/olr/home
18 http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=reservoir#x=357683andy=355134andscale=2

experience anything from groundwater emergence into cellars to surface flooding and incursion into properties. The GEMS inform this SFRA to indicate those areas of the borough within the broad areas of risk.

4.14 Topography

The EA has used LiDAR DTM for the detailed river and floodplain modelling, which provides a three-dimensional representation of the land form. Although the majority of the borough is now covered by this set of LiDAR data, unfortunately there remains gaps in this data towards the south-east of the borough.

4.15 Geology

Geological information has been provided by EEBC, which provides an overview of the solid geology of the area, see Figure 110.

4.16 Integrated Drainage Flood Management Techniques

Although not actually termed flood defence, the integrated urban drainage approach, can utilise other techniques to control water closer to source to manage flood risk.

Recent studies set out to understand the mechanisms by which flooding occurs, where the risk areas are and to identify where flood risk management techniques could work. These studies have mapped overland flow paths, where surface water is most likely to flow, local depressions in the ground which cause ponds to form, changes of slope which affects the depth of flooding and types of geology which could lead to groundwater flooding. It is important that these areas are reserved as open space of existing or future flood management functions.

The Defra IUD Pilot study partnership enabled the EA river models and Thames Water's surface water network model to be used in a more integrated way to understand flood mechanisms and to develop techniques.

The developed techniques include:

- Utilising open-spaces to interrupt the surface water drainage pipe network (never combined or foul network), and/or surface water overland flow which has exceeded the network capacity, to temporarily hold and attenuate flood flows. These sites may be dual purpose and be an opportunity to remain as amenity for recreation or diversified habitat.
- Reserving corridors where overland flow routes are.
- Modifying road infrastructure to act as flow routes in extreme events.
- Utilising open-spaces to attenuate overland flow on chalk geology to reduce flood risk and improve aquifer recharge.
- Timing the abstraction of water resources to drawdown the water table to reduce flood risk and improve scarce water resources at the same time.

5. Flood Risk in Epsom and Ewell Borough

5.1 Overview

The following maps accompany this SFRA:

- **Figure 101** is a general location plan of the borough which also indicates topography and Character Areas within the borough;
- **Figure 102** focuses on fluvial flooding and identifies the river centrelines, FZ2, FZ3a, FZ3a (with 70% climate change uplift), and FZ3b;
- **Figure 103** focuses on fluvial flooding and shows the extent of FZ3a under three climate change scenarios (+ 25, 35, 70%)
- **Figure 104** provides a summary of historic flooding locations, including local incidents of flooding recorded by the EA, EEBC, SCC, and Thames Water;
- **Figure 105** focuses on surface water flood risk identified by the Epsom and Ewell SWMP hydraulic model based on three events: 3.33% (1 in 30), 1% (1 in 100), 1% (1 in 100) + 28% climate change uplift;
- **Figure 106** Comparison of 1% (1 in 100) annual chance surface water even extent from the SWMP and RoFSW;
- **Figure 107** Critical Drainage Areas (extent)
- **Figure 108** Critical Drainage Areas (indicating depth)
- **Figure 109** Vulnerable Sites (includes emergency services and vulnerable institutions in relation to Rivers, Flood Zones and Critical Drainage Areas;
- **Figure 110** indicates the geology of the borough, the risk of groundwater flooding indicated by the EA AStGWF, groundwater emergence map extent, and EEBC recorded groundwater flooding incidents;
- **Figure 111** indicates the EA's Flood Warning and Alert areas within the borough;
- **Figure 112** Epsom North (Fluvial flood risk, Critical Drainage Areas, and Historic Flooding);
- **Figure 113** Epsom West (Fluvial flood risk, Critical Drainage Areas, and Historic Flooding);
- **Figure 114** Ewell (Fluvial flood risk, Critical Drainage Areas, and Historic Flooding);
- **Figure 115** Epsom Town Centre (Fluvial flood risk, Critical Drainage Areas, and Historic Flooding);
- **Figure 116** Epsom East (Fluvial flood risk, Critical Drainage Areas, and Historic Flooding); and
- **Figure 117** Epsom South (Fluvial flood risk, Critical Drainage Areas, and Historic Flooding);

A relatively small percentage of properties within the borough are at risk of flooding from rivers. However, the urbanised areas, steep topography and potential rainfall runoff from the Epsom Downs introduces a relatively high susceptibility to surface water, groundwater and localised flooding in certain parts of the borough. The

risk of flooding posed to properties arises from a number of sources including river flooding, surface water, localised runoff, and sewer flooding. However, the most significant of these is surface water runoff on a large scale. The watercourses in the borough that pose significant flood risk to buildings and infrastructure are the Hogsmill River and its tributaries, which include the Bonesgate Stream, the Horton Stream, Green Lanes Stream and Ewell Court Stream Most of the Ewell Court Stream and lengths of Green Lanes Stream are culverted.

These watercourses are predominantly urban. The Hogsmill River, Green Lanes Stream and Ewell Court Stream all either originate in built-up areas or have their source just outside development. The exception to this is the Horton Stream, which largely flows through open space to the west of Epsom. Some of the course of the Horton Stream is through the Horton Park County Club golf course, though, so it is likely that it is actually closely managed. Also, recent developments have seen the Horton Stream culverted in places.

Therefore, the communities of Epsom and Ewell borough are dissected by the Hogsmill River and its tributaries. Given the proximity of development to the watercourses, it might be expected that a considerable amount of buildings and infrastructure would be at risk. The flood risk mapping actually shows that a relatively small proportion of the borough is susceptible to river flooding, with the extents of Flood Zones 2, 3a and 3b being largely confined to the areas adjoining the river corridors. However, it is important to note that even though a relatively small proportion of the borough is at risk of fluvial flooding, the consequence of flooding to homes and businesses can be severe. 95% of the damage sustained by residential property as a result of flooding occurs in the first 200mm (depth) of water above the threshold of the building. Even if flooding is shallow, it can cause substantial damage.

The Hogsmill catchment extends beyond the borough boundary. Although no watercourses are present in the upper reaches of the Hogsmill catchment, a considerable contributing area exists in the Boroughs of Reigate and Banstead and Sutton. The contributing area of both of these boroughs is already highly developed and thus runoff in extreme events is significant to flood risk within the borough. Future development within Epsom and Ewell borough, as well as in adjoining areas, could reduce flood risk through sustainable drainage measures. Planning decisions taken outside the borough may strongly influence flood risk within it.

It is important to note that flooding within the borough can arise from sources other than rivers. It is essential that the Council are aware of other, more localised, sources of flood risk, including sewer, surface water and groundwater flooding and that these localised sources of flooding can cause significant damage and disruption.

With regard to sewer and surface water flooding, less extreme events are often the result of causes that can be overcome through the regular maintenance of the drainage system. However, flooding caused by storm events greater than 6.6% (1 in 15) annual chance cannot be so readily managed. Outputs from the Hogsmill IUD suggested that most surface water sewers are only approximately designed to the 6.6% rainfall event and, therefore, any storm event greater than this will cause the sewers to surcharge and flooding will occur. Upgrading undersized drainage system may be a possible solution, but this can either increase flood risk downstream or may not be economically viable. The introduction of more pro-active drainage management which optimises the use of control at source and management of exceedance flows overland by infrastructure management is the sustainable way forward. Flooding of this nature need not preclude development, but developers need to be aware of relevant sources, pathways and receptors and plan development to accommodate flood flows which will occur. It is important that all sources of flood risk are acknowledged at the planning stage and addressed in the design process. If this does not happen, the likelihood and severity of flooding may increase, which is unacceptable in terms of sustainable development. The current minimum standard of protection that Thames Water will accept, in terms of site drainage and protection is the 3.3% (1 in 30) event. This means that site drainage has to accommodate the 3.3% (1 in 30) rainfall event before any surcharging or flooding of the sewer network. It should also be known that developments currently have the ‘right to connect’ to the sewer network, but this right is soon to be removed and only sewers of a certain standard will be allowed to connect to the sewerage network. This should pressure developers to take more responsibility for the drainage of their sites and utilise more source control of surface water.

Although the Thames Water network may only be designed to withstand the 3.3% (1 in 30) event before surcharging, The NPPF requires control of up to the 1% (1 in 100) event plus climate change allowance for the discharges (rates and volumes) from the site, as well as consideration of exceedance routing for more extreme events. Rates should preferably be controlled to Greenfield conditions. Climate change for these events is then considered in the additional storage volumes required on site and not to an increase discharge rate.

Records exist of surface water flooding and recent observed events (such as those of July 2007) have permitted accurate mapping of areas where surface water flooding has occurred. See Figure 104.

Surface water flood extents taken from the EA's RoFSW and the SWMP data have been analysed to identify areas at risk from surface water flooding within the borough.

The risk of groundwater flooding is typically variable and heavily dependent upon local geological, topographical and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate. Even with a carefully monitored network of boreholes, it can be difficult to tell when and where groundwater flooding will occur. Nevertheless, areas at risk of groundwater flooding in the borough have been identified. The sources of recent groundwater flood events have been mapped and, in combination with GEMs there is a strong indication of where groundwater flooding may arise (See Figure 110). Mitigation to reduce groundwater flooding may be achieved by managed abstraction by Sutton and East Surrey Water who could strategically draw down the water table in drawing their water resources.

The mechanisms of flooding within the Hogsmill catchment, and therefore relevant to Epsom and Ewell borough, are detailed in Table 5-1, below. The format follows the EA's Source – Pathway – Receptor model.

5.2 Historic Flooding

5.2.1 Fluvial Flooding

Fluvial flooding has occurred from the Green Lane Stream at Upper Court Road in Epsom.

5.2.2 Surface Water and Localised Flood Risk

Records of surface water flooding provided by EEBC and SCC indicate numerous surface water flooding incidents widely distributed throughout the borough, with higher concentrations of incidents recorded within central and northern regions of the borough.

5.2.3 Groundwater

Groundwater flooding incidents have been recorded throughout the borough, with the majority of these incidents occurring in a cluster in character area 'Epsom Town Centre'.

5.2.4 Sewer Flooding

A record of historic sewer flooding incidents throughout the borough since 2001 have been provided by Thames Water, detailing the location of the incident by the initial part of the postcode where the incident took place. According to this data, a total of 19 historic sewer flooding incidents have occurred across the borough since 2001.

5.3 Predicted Flooding

5.3.1 Fluvial Flooding

The probability of fluvial flooding within the borough has been delineated into zones of high, medium and low likelihood.

As a catchment, the Hogsmill is not characterised by broad, flat and open floodplains that allow for extensive flooding. The floodplains are, instead, quite narrow. This, in combination with the fact that the watercourses in the borough are relatively small and closely managed in their urban locations, results in the risk of fluvial flooding being largely confined to areas immediately adjoined to the river corridors. The exception to this is the fluvial flooding projected to occur around the intermittently culverted Greens Lane Stream, where allocated Flood Zones stray from land immediately adjacent to the watercourse.

The probability of fluvial flooding is presented in Figure 102-103. The primary risk to property from fluvial flood events is predicted to be:

- In the areas upstream of and between the confluences of Horton Stream and Bonesgate Stream;
- From the Hogsmill River;
- From the Ewell Court Stream, which is almost entirely culverted;
- From Greens Lane Stream, lengths of which are culverted.

Aside from small changes to the extents of the modelled Flood Zones, there is only one significant alteration to the prediction of fluvial flood risk from the 2008 SFRA. In the 2008 SFRA Flood Zones were not present in the upper reaches of the Green Lanes Stream. In the current SFRA updated modelling now includes land adjacent to much of the Green Lanes Stream and to the south east of the stream along Pound Lane (seemingly closely aligned to an Ordinary Watercourse (labelled ‘Drain’ on OS mapping) in this area).

5.3.2 Surface Water

The EA and EEBC have been consulted to identify known areas of surface water flooding within the borough. These drainage problems may be attributed to inundation due to poor maintenance, culvert and sewer blockages, or increased surface water flow during heavy rainfall. Issues of this nature are often relatively localised, affecting an unpredictable number of properties.

Prior to July 2007, there had been no recent, significant, incidences of flooding due to the incapacities of the surface water drainage network and the sewerage systems. On 20 July 2007 the south-east of England experienced a series of very heavy localised storms. The borough was not too badly affected, but there were still incidences of flooding as a result of these storms reported across the borough.

Much of the rain that fell during the 20 July event could not infiltrate into the ground. This is, in part, due to the fact that infiltration capacity decreases very rapidly during storms, but it is also down to the fact that south-east England had already endured one of the wettest summers on record and local soils would already have been saturated. Similarly, in urban areas, the heavy rainfall could not be accommodated by the surface water sewers. Consequently, much of the rain that fell was transported as surface water flow and this would have followed the natural depressions and surface water flow paths, which are defined by the local topography, until they reached obstacles or depressions.

The current SFRA updates the prediction of surface water flooding and flow paths from that included in 2008. Since then new modelling has bene developed nationally (RoFSW) and the SWMP have provided further

detail. Even so these are an indication and not definitive as surface water flooding can be influenced by local features such as walls, buildings, kerbs and other infrastructure that could not be represented at a suitable scale in a hydraulic model

The EA RoFSW mapping is a national dataset of predicted surface water flooding for the 3.33% (1 in 30), 1% (1 in 100) and the 0.1% (1 in 1000) annual chance rainfall events.

The Epsom and Ewell SWMP study included more detailed modelling of surface water flow paths and rainfall events. This SFRA has utilised the 3.33% (1 in 30), 1% (1 in 100) and 1% (1 in 100) annual chance + 28% climate change rainfall events (where projected flood depths are lower than 50mm deep these were not shown in the Appendices). The 1% (1 in 100) annual chance event has been used to define CDAs within Flood Zone 1. The SWMP modelled flood extents are favoured in the analysis of surface water flood risk as this modelling is believed to be of higher accuracy than the national RoFSW modelled extents. In addition, the SWMP modelled flood extents include mapping for a 1% (1 in 100) annual chance rainfall event + 28% climate change uplift, whereas the EA RoFSW mapping does not provide any indication of how climate change may affect flood extents in the future. When compared (see Figure 106) the 1% (1 in 100) annual chance rainfall event modelled flood extent produced in both datasets appear, for the majority of the borough, to concur, following similar flow routes

It is essential to ensure that future development does not exacerbate existing flooding problems. Flood Risk is a material planning consideration and should be assessed prior to planning permissions being granted. Also, strict planning conditions should be placed upon developers to ensure that best practice measures are implemented to mitigate any potential increase in loading upon existing drainage system(s).

The EA and SCC as the LLFA strongly advocates the use of SuDS. A wide variety of SuDS techniques are available, potentially providing both water quality and water quantity improvement benefits on a site by site basis throughout the borough. Wherever possible within brownfield areas, the developer should seek to reduce the rate and volumes of runoff from the site to the equivalent greenfield rates. Collectively, the effective application of SuDS as part of all future development has the potential to reduce the risk of flooding within the borough.

5.3.3 Groundwater

Many of the reports of groundwater flooding in the borough have arisen in the areas at the northern foot of the downs, at the junction between the permeable chalk and the less permeable and impermeable strata in the north-west of the borough. The beds of cretaceous chalk within the downs act as an aquifer and are capable of storing and transporting groundwater flow. During sustained periods of heavy rainfall the chalk aquifers become saturated and springs will occur at the junction between the permeable chalk aquifer and impermeable or less permeable strata.

This report has also reviewed the local outputs of the Groundwater Emergence Maps (GEMs). The local outputs of the GEMS broadly follow the junction between the impermeable and permeable strata of the borough. The maps identify all recent, reported, incidences of groundwater flooding and report groundwater flood history related to drift gravel deposits. This SFRA also considers the EA's Areas Susceptible to Groundwater Flooding (AStGWF) which was produced to indicate whether there may be a risk of flooding from groundwater to an area.

As with surface water flooding, groundwater flooding may not preclude development. However, in accordance with NPPF, future development will require an appropriate Flood Risk Assessment (FRA) at the planning application stage that is commensurate with the level of flood risk posed to the site. The FRA should incorporate a site based assessment of the potential risk of groundwater flooding to the site, confirming the likelihood and/or severity of this source of flood risk. Where a potential risk of groundwater is identified, it may be appropriate to (for example) incorporate flood proofing measures and/or the raising of entry thresholds to

mitigate possible damages. Safe and dry access would be required. The adopted design will need to ensure that it does not result in any worsening to the risk posed to adjoining properties.

Another consideration with respect to groundwater is the effectiveness of SuDS. The design of proposed developments should carefully consider the impact that raised groundwater levels may have upon the operation of SuDS during periods of heavy rainfall.

5.3.4 Sewer Flooding

Historic records of instances of sewer flooding has been provided by Thames Water from 1991 onwards as presented in Table 5-1 to the present day (see Figure 104).

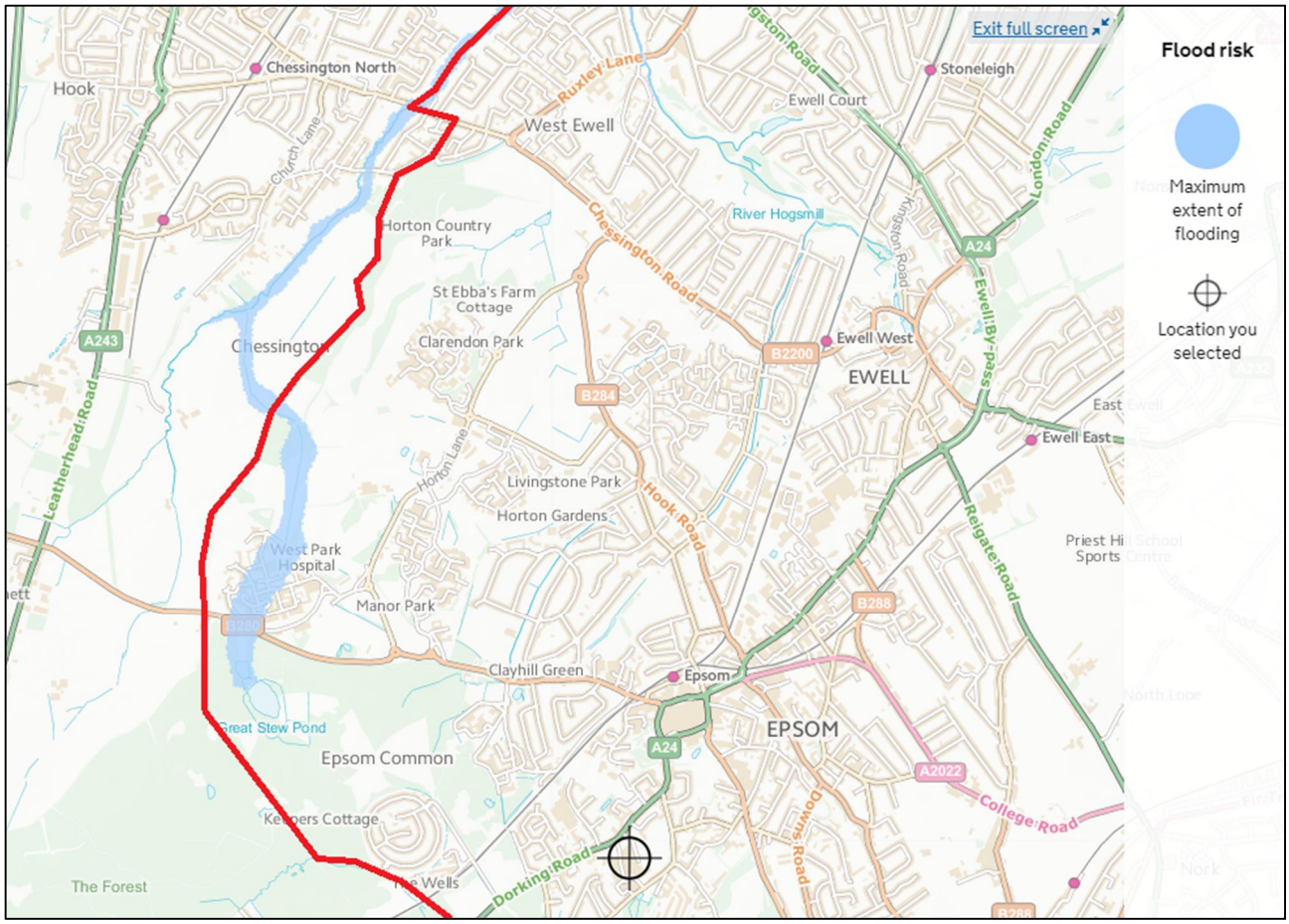
Table 5-1: Sewer Flooding History

Post Code	Internal flooding to property			External flooding property/areas			Total
	AI (2 in 10)	BI (1 in 10)	CI (1 in 20)	AE (2 in 10)	BE (1 in 10)	CE (1 in 20)	
KT1 3	0	0	0	0	0	0	0
KT1 4	0	0	1	0	0	0	1
KT100	0	0	0	0	0	0	0
KT109	0	0	0	0	0	1	1
KT138	0	0	0	0	0	1	1
KT146	0	0	4	0	0	1	5
KT153	0	0	0	0	0	0	0
KT171	0	0	2	0	1	1	4
KT172	0	0	1	0	0	1	2
KT173	0	0	0	0	1	2	3
KT174	0	0	0	0	1	0	1
KT187	0	0	0	0	0	0	0
KT190	0	0	0	0	0	1	1
KT198	0	0	1	0	1	0	2
KT199	0	0	0	0	4	2	6
Grand Total	**0**	**0**	**9**	**0**	**8**	**10**	**27**

5.3.5 Reservoir Failure

With regard to risk of flooding from reservoirs, according to the EA Flood Map for Planning a relatively small area in the west of the borough is threatened by dam breach flooding from Great Stew Pond located in Epsom Common (See Figure 5-1). The area immediately to the north of Great Stew Pond, including a residential area and also West Park Hospital, is in the area considered threatened if the water containment in this location were to fail.

Figure 5-1: EA Flood Map for Planning showing Flood Risk from Reservoir Failure



Source: Environment Agency Website, March 2018

5.4 Summary of Flood Risk by Character Area

5.4.1 Overview

It is essential that both the Council and prospective developers are fully aware of the potential risk that flooding may pose to future development within specific areas of the borough. It is equally important that the Council and developers have a thorough understanding of the potential impacts that future development may have upon the flooding regime. To this end, the following section provides an overview of the potential risks of flooding posed to the borough.

Since the southern half of the borough is largely designated as Metropolitan Greenbelt and the northern half is already urbanised, the scope for development clearly leans towards the regeneration of brownfield sites. There are 'opportunity sites' identified in Plan E (Epsom Town Centre Area Action Plan[19]) and the current development plan directs development towards the most sustainable built up areas (specifically Epsom Town Centre).

This section considers flood risk for each character area:

[19] Plan E, Epsom Town Centre Area Action Plan, 2011

- Epsom North (Cuddington, Ewell Court, Auriol and Stoneleigh wards);
- Epsom West (Ruxley Court and Stamford wards);
- Ewell (West Ewell and Ewell wards);
- Epsom Town Centre (Town Centre ward);
- Epsom East (Nonsuch and College wards); and
- Epsom South (Woodcote ward).

The discussion provided below should be read in conjunction with the flood maps accompanying this report. Surface water flood depths referred to in the following sections pertain to the 1% (1 in 100) annual chance rainfall event modelled as part of the Epsom and Ewell SWMP study (see Figure 108). Collectively these will provide an overview of the nature and scale of the potential flood risk posed to the site under consideration. This should inform the scope of the detailed Flood Risk Assessment, highlighting the significant local issues that must be considered as part of the site design process. The maps and supporting discussions can be used as tools to inform spatial planning. It is essential that site allocations steer development towards areas of lowest risk (as depicted by the flood maps) unless there are exceptional circumstances in which other non-flooding related planning constraints outweigh the risk of flooding.

It is important to recognise that the localised flooding incidents listed are only those that have been recorded by Thames Water or notified to EEBC or SCC by the local community. This is not intended to be an all-encompassing record of localised flooding problems throughout the borough. **Prospective developers should contact the following organisations for information: EEBC, the EA, Thames Water, Sutton and East Surrey Water and SCC as part of the detailed Flood Risk Assessment process to confirm whether their site has been affected by localised flooding historically.**

Irrespective of the knowledge (or otherwise) of historical flooding, all future development can potentially influence the local flooding regime. It is essential that a 'best practice' approach is adopted in all instances. **Developers are required to provide a sustainable drainage solution that will ensure that the runoff from the site does not exceed the maximum for Greenfield runoff rates and volumes, with actual rates and volumes to be agreed by the EA and SCC as the LLFA for all 'major[20]' planning applications. The site design should also consider the routing of surface water overland, both when the capacity of the drainage system is exceeded and those that enter the site from elsewhere.** It is essential that this does not endanger property either within, or outside of, the site boundaries.

In relation to brownfield sites, runoff rates and volumes need to be agreed with SCC as the LLFA. The developer is expected to follow DEFRA's 'Non-statutory standards for sustainable drainage systems'[21]: "*for developments which were previously developed, the peak runoff event must be as close to reasonably practical be to the undeveloped Greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event*".

[20] A major development consists of 10 or more dwellings, or a site over 0.5ha where the number of dwellings is not known, or a building greater than 1,000m^2, or a site over 1ha.
[21] Non-statutory Technical Standards for Sustainable Drainage Systems, Defra, 2015

5.4.2 Epsom North

See Figure 112

The character area of Epsom North comprises the area to the north-east of the Hogsmill River, which extends to the borough boundary and Nonsuch Park. The area is influenced by the right bank of the Hogsmill River and almost the entire length of the Ewell Court Stream.

The floodplain of the Hogsmill River, according to the flood modelling, largely lies within a buffer-strip of green space that has been created either side of the watercourse. This area is known locally as the Hogsmill Open Space. Flood Zone 3b lies almost entirely within the Hogsmill Open Space, although does encroach into a residential area around Bridle Close and Huntsmoor Road.

The Ewell Court Stream is almost entirely culverted and Flood Zone 3b is only shown to be out of bank in open space and, therefore, is of no risk to property. This suggests that the culvert has at least the capacity to carry a 5% annual chance (1 in 20) flow. Conversely, Flood Zone 3a impacts extensively on properties in Briarwood Road, Stoneleigh Park Road, Preston Drive and Manor Drive following the path of the stream from Nonsuch Park to the Hogsmill.

There are a number of areas at risk from surface water flooding that have been designated as EECDAs. The primary notable surface water flowpath within the Character Area flows in a north-easterly direction from the Hogsmill floodplain with associated diverging and converging flowpaths, affecting properties on a number of roads including: Salisbury Road, Sterry Drive, Thorndon Gardens, Cromwell Road, Old Malden Lane, Ruxley Lane, Tealing Drive, Riverview Road, Mortimer Crescent, and Grafton Road. This flowpath threatens Linden Bridge School located on Graften Road.

A second, much shorter, flowpath is identified towards the south of the Character Area. This flowpath originates around the northern extent of Ewell Park Way and flows north-west through properties and allotment gardens before being halted by the railway embankment causing an area of pooling of around 1m depth. Properties on Park Avenue West and Clandon Close are threatened by this flowpath.

5.4.3 Epsom West

See Figure 113

The character area of Epsom West comprises the western area of the borough. It is bounded by the Bonesgate Stream in the north-west, West Ewell to the north and Epsom town centre to the east.

Flooding in the area is influenced by the right bank of the Bonesgate Stream, the Horton Stream and the Green Lanes Stream. The latter two flow through the area for most of their length.

Within Epsom West, the areas of Flood Zone 3b and Flood Zone 3a associated with the Bonesgate Stream show a very minimal number of properties flooding. However, Flood Zone 2 shows properties in Greenlands Lane and Colne Court, which are upstream of the confluence with the Hogsmill, as being at risk of flooding.

As in 2008, no flood risk mapping is available for the Horton Stream up-river of West Ewell. As the stream reaches Chessington Close, properties are shown to be within Flood Zone 3b and at Scotts Farm Road property is shown to be within Flood Zone.

In 2008 Flood Zones were not present in the upper reaches of Green Lanes Stream. However, updated Flood Zones show Green Lanes Stream floodplain running approximately adjacent to the majority of the watercourse – which is intermittently culverted. In the upper reaches of Green Lanes Stream the Flood Zone does not extend far enough from the watercourse to threaten many properties, although some properties located on

West Hill and on Christ Church Mount are located within Flood Zone. As Green Lanes Stream runs behind Kendor Avenue and then is re-culverted around the convergence of Kendor Avenue and Upper Court Road, the Flood Zone extent widens and threatens a significant number of properties nearby and to the east including properties on Horton Hill, Kendor Avenue, Upper Court Road, Holland Close, Lower Court Road, Hook Road, Hurst Road, East Way, Blakeney Close, and Almond Road. Green Lanes Stream returns to open watercourse around Pound Lane.

Also differing from the 2008 SFRA, there now exists a Flood Zone aligned to a labelled drain emerging to the north of Court Lane and running in a north-easterly direction along the northern edge of Court Recreation Ground before appearing to join Green Lanes Stream around Pound Lane. It is unknown whether this Drain is connected upstream to Green Lanes Stream. Flood Zone 3a and Flood Zone 3b associated with this drain comprise a large extent of the nearby Court Recreation Ground and the Flood Zone threatens a number of properties in this area including properties on East Way, Pound Lane, and the Business Centre situated on Longmead Road.

The SWMP-based EECDAs indicate a number of areas at risk of surface water flooding:

- Two defined surface water flow paths aligned roughly parallel to each other originate towards the centre of the Character Area and flow in a north-easterly direction, one of these is approximately aligned with the upper Reaches of Horton Stream, through several residential areas including threatening some properties on Horton Lane and Manor Crescent. Further north along these flowpaths several other properties are threatened including properties on Oakwood Avenue, South View, Hendon Gove, Janner Way, and McKenzie Way.

- Another distinct surface water flow path threatening property flows through the west of the Character Area. This flowpath runs northward from Great Stew Pond in Epsom Common, and through a residential area threatening properties on Richmond Crescent, Glanville Way, Miller Place, Longland Place, Osborne Way, and also New Epsom and Ewell Cottage Hospital.

To the south of the start of Greens Lane Stream a surface water flow path runs south to north threatening properties on East Dean Avenue.

Smaller surface water flowpaths and ponding threaten properties throughout the Character Area.

5.4.4 Ewell

See Figure 114

The Ewell character area is almost entirely urbanised. It comprises the area on the southern (left) bank of the Hogsmill, from its source to its confluence with the Horton Stream. The Ewell character area also extends northwards to Stoneleigh and arches around the north-east sector of Epsom town centre. On the southern boundary are Epsom Town Centre and Epsom West.

Downstream of the confluence of the Horton Stream and Hogsmill River, there is no flood risk indicated by the flood risk mapping. The Green Lanes Stream extends from its confluence with the Hogsmill River to just south of the Chessington Road and Longmead Road junction. Property is shown to be within Flood Zone 3a and Flood Zone 2 on Green Lanes and just south of Chessington Road. From Green Lanes Stream to the source of the Hogsmill River at Ewell Ponds (Bourne Hall), property is at risk from Flood Zones 3a and 2. On the left bank of the Hogsmill, north of Bourne Hall, property is at risk from Flood Zone 2. In the 2008 SFRA, the JFLOW modelling indicated significant property flooding ‘upstream’ of Bourne Hall and the source of the Hogsmill, all the way to the character area boundary with Epsom East, and this area was designated as a CDA. In the current SFRA, updated Flood Zone information indicates that this area, previously designated a CDA, is now

in an area of Flood Zone 2 (and Flood Zone 3a + climate change). This Flood Zone threatens a large number of properties.

In terms of surface water flooding the SWMP-based EECDAs indicate a number of areas at risk of flooding from surface water which are distinct from the areas threatened by fluvial flooding. The majority of these areas within Ewell are relatively small flowpaths or areas of ponding which do not threaten large numbers of properties.

However, there are two flowpaths originating in the south of the Character Area which threaten property located on multiple roads; one flow path originates around Epsom Road and flows north-west threatening properties located on Hessle Grove, Nursery Close, West Gardens, Corbet Road, West Street, and Gibralter Crescent. The other flowpath flows into the Ewell Character Area from Epsom East and flows northwards threatening a significant number of properties across multiple roads including Langton Avenue, Hampton Grove, St James Avenue, Reigate Road, and Stane Way. Where this flowpath meets Reigate Road a Superstore is threatened by surface water flood depths of approximately 1m across the entire site for the 1% (1 in 100) annual chance Rainfall Event.

5.4.5 Epsom Town Centre

See Figure 115

The character area of Epsom Town Centre is entirely urbanised. It comprises the commercial centre and a large industrial area that includes Surrey Business Park. It is bounded by Ewell, Epsom West, Epsom South and Epsom East character areas.

There are no watercourses within Epsom Town centre. However, at the northern extent of the Character Area there are a small number of properties on Temple Road and Hook Road threatened by Flood Zones associated with watercourses in Epsom West.

In terms of surface water flooding the SWMP-based EECDAs indicates two significant flow paths threatening property within the Character Area:

- One flowpath runs south to north approximately through the middle of the Character area, threatening a large number of properties along The Parade and High Street (including Council Offices and a Library), Adelphi Road, Chase Road, and Hook Road.

- A second flowpath flows in a north-westerly direction from the south-east corner of the Character Area threatening properties located on Church Road, Wyeth's Road, Pikes Hill, Upper High Street, Hawthorne Place, East Street, Victoria Place, and a Gas Holder Station situated to the north-east of Adelphi Road. This flowpath meets the railway line embankment and flows north-east along the embankment further threatening properties on Winter Close and Conifer Park, as well as an industrial estate.

5.4.6 Epsom East

See Figure 116

The character area of Epsom East contains the Epsom Downs, farmland, Cuddington Golf Course, Nonsuch Park and the urban areas of south-east Epsom and East Ewell. It is bounded by the Boroughs of Sutton and Reigate and Banstead to the east and all character areas except Epsom West.

Ewell Court Stream originates in the northern region of Epsom East in Nonsuch Park, and the associated Flood Zone does not threaten any property. Although Hogsmill Stream does not extend into Epsom East, the

associated Flood Zone does encroach into the Character Area. This extent of Flood Zone 3a and Flood Zone 2 threatens a large number of properties from Burford Lane north-west through The Bridle Path, Cheam Road, Nonsuch Court Avenue, Boleyn Avenue, and Howard Avenue.

SWMP surface water flood mapping indicates one main surface water flow path through the Character area spanning from around Drift Bridge farm at the south of Epsom East northwards primarily through farmland and Cuddington Golf Course before flowing through a residential area but largely remaining on Abinger Avenue.

In the east of the Character Area a surface water flow path runs northward through the Sports Ground in the south-east corner of the Character Area towards Cuddington Croft Primary School, and further north running through a number of properties on Holmwood Close and up through Nonsuch High School and beyond, meeting fluvial floodplain in the north of Epsom East.

5.4.7 Epsom South

See Figure 117

The character area of Epsom South is largely made up of open space, with only Langley Vale by Epsom racecourse and the Woodcote area in the north being urbanised. It is bounded by the Boroughs of Reigate and Banstead and Mole valley on its southern perimeter.

Much of the Epsom South overlies the North Downs chalk aquifer. This area suffers little flood risk but contributes most significantly to flood risk in Epsom town.

There are no watercourses within Epsom South and no associated Fluvial Flood Risk.

In terms of surface water flooding the SWMP-based EECDAs indicates one main flow path spanning from the southern extent of the Character Area northwards through the Golf Course and then through Woodcote and towards Epsom Town Centre. This flow path threatens a number of properties along Barons Hurst, Woodcote Hurst, Woodcote Green Road, Woodcote Road, and Woodcote Close. It also threatens Epsom General Hospital.

A smaller surface water flow path originates around Chalk Lane and flows north-east through St Martins Church Of England Junior School and northwards threatening a number of properties on Ladbroke Road and Ashley Road.

A second flowpath originates at the eastern edge of Epsom Common and flows northwards, eventually flowing into Epsom West. This flowpath threatens properties on Oakmead Green, Hylands Close, Dorking Road, and White Horse Drive (including Rosebery School).

Another flowpath to the north-east of Epsom South threatens properties located on Woodcote Road, Elmslie Close, Dorking Road, and Woodcote Close.

5.5 Impact of Climate Change upon Flood Risk

There is clear scientific evidence that global climate change is happening now. It cannot be ignored. Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however, the broad trends are in accordance with projections from climate models, suggesting partly anthropogenic causes.

Greenhouse gas levels in the atmosphere are likely to cause higher winter rainfall in the future. Past Greenhouse gas emissions mean some climate change is inevitable in the next 20–30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

There is enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example, we understand rain storms may become more intense, even if we cannot be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 20% (1 in 5) annual chance or less) could increase locally by 40%. If emissions follow a medium future scenario, UKCP09 projected changes for the borough by the 2050s relative to the recent past are that winter precipitation will increase by around 16% (central estimate).

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in wet spells may increase river flooding in both rural and urbanised catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected. Rising river levels may increase local flood risk away from major rivers because of interactions with drains, sewers and smaller watercourses.

Changes in the extent of inundation due to climate change on fluvial flooding are likely to be negligible in well-defined valleys, but could be dramatic in very flat areas. Changes in the depth of flooding under the same allowance will increase the probability of a given flood. For example, a site currently located within a lower risk zone (e.g. Zone 2) could in future be re-classified as lying within a high risk zone (e.g. Zone 3a). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding.

We have mapped the EA modelled 1% (1 in 100) annual chance + 35% climate change uplift fluvial flood extent to indicate the potential impact of climate change on Flood Zone 3a. However, this only displays modelled flood extent, whilst climate change may also lead to increases in depth and hazard.

In the same way surface water flooding has the potential to be altered by the impacts of future predicted climate change and EECDAs could increase in extent and/or depth of flooding with climate change. The EECDAs defined in this SFRA are based on the Epsom and Ewell SWMP hydraulic model extent for the 1% (1 in 100) annual chance event. The SWMP study also produced modelled flood extents for the 1% (1 in 100) annual chance event + 28% Climate Change uplift (see Figure 105). Although this +28% Climate Change uplift does not match the current national guidance of +20% and +40%, comparing these extents can provide an indication of how surface water flood extent can be expected to alter as a result of climate change.

It is essential that developers consider the possible change in flood risk over the lifetime of the development as a result of climate change. For planning purposes, the EA assume that the ‘lifetime of development’ equates to 100 years for residential development, and 60 years for commercial development.

In planning terms, it is essential that EEBC consider their response to the potential impacts of climate change within the borough. While the impact of climate change may in some areas not markedly increase the extent of, for example, Zone 3a, within that Zone the extent of lower severity flood events could increase significantly. Furthermore, there could be an increase in localised surface water issues. It is essential therefore that the development management process (influencing the design of future development within the borough) carefully mitigates against the potential impact that climate change may have upon the risk of flooding.

For this reason, all of the development management recommendations set out in Section 8 require all floor levels, access routes, drainage systems and flood mitigation measures to be designed with an allowance for

climate change within Zones 3b, 3a and 2, as well as within EECDA in Zone 1. This provides a robust and sustainable approach to the potential impacts that climate change may have upon the borough over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

6. Residual Flood Risk

It is essential that the risk of flooding is minimised over the lifetime of the development in all instances. It is important to recognise that flood risk can never be fully mitigated, and there will always be a residual risk of flooding.

This residual risk is associated with a number of potential risk factors including (but not limited to):

- A flooding event that exceeds that for which the local drainage system has been designed;
- The residual danger posed to property and life as a result of flood defence failure;
- The residual risk of fluvial flooding that exceeds the design return period of a defence; and
- General uncertainties inherent in the prediction of flooding.

It is important to understand that flood risk cannot be entirely removed; at some point an event greater than those considered occurs or an unforeseeable situation develops that causes flooding. Understanding the flood mechanisms and likely flow paths can enable suitable contingency and emergency plans to be developed to reduce the impact of residual risk to receptors.

The modelling of flood flows and flood levels is not an exact science. Therefore, there are inherent uncertainties in the prediction of flood levels used in the assessment of flood risk. The adopted flood zones underpinning the borough are largely based upon the detailed flood mapping within the area. Whilst these provide a good depiction of flood risk for specific modelled conditions, all detailed modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response.

Taking a conservative approach for planning purposes, the EA advises that finished floor levels are raised to a minimum of 300mm above the peak design flood level (including climate change) when advising developers.

7. Sustainable Flood Risk Management

7.1 Overview

This Section highlights the role of various parties in relation to flood risk and offers recommendations for each to ensure that flood risk is managed in a sustainable manner into the future.

The risk of flooding can never be completely eliminated, but the likelihood and consequences of flooding can be minimised through good management. One of the key aims of the EA's National Flood and Coastal Erosion Risk Management Strategy is to improve flood risk management in a sustainable way. In other words, the risk of flooding must be reduced now, but in a way which does not compromise the interconnected needs of the economy, society and environment in the future. Indeed, one of the defined roles of local authorities in the Flood and Water Management Act 2010 is for them to aim to make a contribution towards the achievement of sustainable development.

The primary purpose of the SFRA is to inform decision making as part of planning policy and development management processes, taking due consideration of the scale and nature of flood risk affecting the borough. Responsibility for flood risk management resides with all tiers of government, and indeed individual landowners and applicants, as outlined below.

7.2 Responsibility for Flood Risk Management

There is no statutory requirement for the Government to protect property against the risk of flooding. Nevertheless, the Government recognises the importance of safeguarding the wider community and, in doing so, the economic and social well-being of the nation. Following the Pitt Review into the flooding of summer 2007 and subsequent Flood Risk Regulations 2009 and Flood and Water Management Act 2010, new responsibilities for managing flood risk have been assigned to local authorities, the EA and others.

A number of partners manage flood risk within the borough, the key responsibilities of the primary groups relevant to this SFRA are:

- **Environment Agency:** Provides a strategic overview of all sources of flooding. Under its permissive powers, it is responsible for flood risk management activities on Main Rivers, regulating reservoir safety, and working in partnership with the Met Office to provide flood forecasts and warnings. It assists the spatial planning and development management process through the provision of information and advice regarding flood risk and related issues.

- **Surrey County Council:** As Lead Local Flood Authority, SCC is responsible for coordination of local flood risk management across its administrative area. This includes development, maintenance, application and monitoring of a strategy for local flood risk management, a duty to maintain a register of structures or features which have a significant effect on flood risk and a duty to aim to contribute towards the achievement of sustainable development.

- **Epsom and Ewell Borough Council:** EEBC is the Local Planning Authority for the borough and so is responsible for carrying out a SFRA which should consider the risk of flooding throughout the borough and inform the allocation of land for future development, development management policies and sustainability appraisals. EEBC is responsible for determining local planning applications and must consult with the EA, where appropriate, when making planning decisions. EEBC will also consult with SCC as the LLFA on all 'major' planning applications (see Section 5.4.1).

- **Landowners** have the primary responsibility for protecting their land against the risk of flooding. They are also responsible for managing the drainage of their land such that they do not adversely impact upon adjoining properties.

The EA has updated its "Living on the Edge" guide in 2013 that provides specific advice regarding the rights and responsibilities of property owners, the EA and other bodies. The guide is targeted at owners of land situated alongside rivers or other watercourses, and is a useful reference point outlining who is responsible for flood defence, and what this means in practical terms. It also discusses how stakeholders can work collaboratively to protect and enhance the natural environment of our rivers and streams. This guide can be found on the EA's website[22].

7.2.1 The Sequential Test

Historically, urbanisation has evolved along river corridors due to the rivers providing a critical source of water, food and energy. This leaves many areas of England with a legacy of urban centres that, because of their close proximity to rivers, are at risk of flooding.

The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. steer urban development away from areas that are susceptible to flooding. The NPPF stipulates the application of a sequential approach to site allocation – seeking development sites within areas of lowest flood risk in the first instance (Flood Zone 1 – low probability of flooding). Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at greater risk of flooding – Zones 2 (medium probability), 3a (high probability) or 3b (functional floodplain)) be contemplated, taking account of the vulnerability of the proposed land use. In simple terms, this requires planners to seek to allocate sites for future development within areas of lowest flood risk in the initial instance. Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated.

The fundamental part of this sequential approach is referred to as the Sequential Test. The process for this test is indicated in Figure 3.1 of the NPPG (Application of the Sequential Test).

It is important to highlight that the SFRA does not attempt and, indeed, cannot fully address the requirements of the NPPF Sequential Test. It is necessary for the Council to demonstrate that sites for future development have been sought within the lowest flood risk zone (i.e. Zone 1 Low Probability). Only if it can be shown that suitable sites are not available within this zone can alternative sites be considered within the areas that are at greater risk of possible flooding (i.e. Zone 2, and finally Zone 3).

Table 3 of the NPPG (reproduced here as Table 2-1) identifies types of development (by vulnerability classification) that should not be permitted in particular Flood Zones. It also identifies circumstances in which the 'Exception Text' must be passed for development not initially permissible in that zone, where, following application of the Sequential Test, no sites are available in zones with lower flood risk.

The Sequential Test should be applied to development within Flood Zones 2 and 3. Where there are no reasonably available alternative sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed, the flood risk vulnerability should be checked for compatibility with the Flood Zone, and where indicated the Exception Test should be applied. A sequential approach should be used in areas known to be at risk from other sources of flooding. This may involve seeking opportunities to 'swap' more vulnerable allocations at risk of flooding with areas of lesser vulnerability that are situated on higher ground. below.

22 https://www.gov.uk/government/organisations/environment-agency

7.2.2 The Exception Test

It is recognised that only a relatively small proportion of the borough is situated within Zone 3a High Probability. Prohibiting future residential development in this zone is unlikely to have a detrimental impact upon the economic and social welfare of the existing community. However, there may be pressing planning 'needs' that may warrant further consideration of areas for development. Should this be the case, the Council and potential future developers are required to work through the Exception Test where applicable, but only after previously doing the sequential test.

Paragraph 102 of the NPPF states that 'For the Exception Test to be passed: *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and a site-specific flood risk assessment must demonstrate 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 latter point includes a requirement to take account of the future risk from climate change over the lifetime of the development.

A planning solution to removing flood risk must be sought at each specific location in the initial instance, seeking to relocate the proposed allocation to an area of lower flood risk (i.e. Zone 1 Low Probability or Zone 2 Medium Probability) wherever feasible.

It will be the responsibility of the developer (in all instances within Zone 3 and 2) to demonstrate compliance with the Sequential Test. This helps to avoid unnecessary effort and expenditure on sites that would not pass the Sequential Test. If the proposed development passes the Sequential Test, it is for the developer to put forward a detailed Flood Risk Assessment to demonstrate that (where appropriate) the risk of flooding has been adequately addressed in accordance with NPPF as part of the Exception Test.

The SFRA has provided specific recommendations that ultimately should be adopted as planning conditions for all future development. It is the responsibility of the prospective developer to build upon these recommendations as part of a detailed Flood Risk Assessment to ensure that the specific requirements of NPPF can be met.

Specific planning and development control recommendations for future development within the Borough are presented below.

An overview of flood risk throughout the borough has been provided in Section 5. Future planning decisions should consider the spatial variation in flood risk across the borough, as defined by the delineated flood zone that applies at the specified site location; and apply the recommendations provided below accordingly. NPPF advocates this approach, which applies equally to both allocating sites within emerging LDF and taking development control decisions on future windfall sites.

7.2.3 Reduction of Flood Risk Through Development

It is crucial to reiterate that the NPPF considers not only the risk of flooding posed to new development. It also seeks to positively reduce the risk of flooding posed to existing properties within the borough. It is strongly recommended that this principle be adopted as the underlying 'goal' for developers and Council development control teams within the Borough.

Developers should be encouraged to demonstrate that their proposal will deliver a positive reduction in flood risk to the borough, whether that be by reducing the frequency or severity of flooding (for example, through the introduction of SuDS), or by reducing the impact that flooding may have on the community (for example, through a reduction in the number of people within the site that may be at risk). This should not be seen as an

onerous requirement, and indeed if integrated into the design at the conceptual stage, will place no added demands upon the development and/or planning application process.

It should be an aim of Epsom and Ewell to change the character of the urban floodplain through re-development. This would reduce the consequences of flooding whilst supporting the regeneration, modernisation and growth of communities. This approach should include the provision of adequate space for river corridors within the urban environment by setting back buildings which would reduce flood risk and enhance biodiversity, amenity and provide sufficient space for maintenance access. SCC as the LLFA would expect property to be set back from the watercourse wherever practicable on a site-specific basis by a minimum of eight metres. This should be achievable through re-development, however, it must be recognised that this is a long-term objective.

Possible risk reduction measures for consideration may include the following:

- The integration of SuDS to reduce the runoff rate and volume from the site;
- A change in land use to reduce the vulnerability of the proposed development;
- A reduction in the building platform area and intensity of use. This is to prevent intensification through the addition of storeys (or other conversion) within the same footprint;
- The raising of internal floor levels and flood proofing (within existing buildings) to reduce potential flood damage. The EA advises that finished floor levels are raised to a minimum of 300mm above the peak design flood level (including climate change);
- The rearrangement of buildings within the site to remove obstructions to surface water flow paths;
- The placement of buildings to higher areas within the site to limit the risk of flood damage;
- For developments which were previously developed, the peak runoff rate from the development to any drain, must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event;
- Urban creep should be considered where appropriate and resilience built into the drainage system; and
- Consideration of climate change in line with latest EA guidance.

It is recommended that a clear statement be required within each and every detailed FRA that concisely summarises how a reduction in flood risk has been achieved within the proposed (re)development.

8. Recommendations and Policy for the Planning Authority

8.1 Revisions to Local Planning Policy Regarding Flooding

A number of current EEBC Local Development Framework documents, including the Core Strategy document, which outline the Borough's planning policy in relation to flooding (detailed in Section 3 of this SFRA), pre-date this SFRA and relevant policy contained in the NPPF.

RECOMMENDATION: EEBC should review their current planning policy in relation to flooding to ensure it is consistent with the NPPF, including in relation to flood risk assessments, sustainable drainage, green infrastructure and flood resilience. New or revised policy should reflect the findings and recommendations of this SFRA, including requiring applicants to consider the SFRA and its mapping, taking into account the impacts of climate change, as a starting point for the assessment of flood risk in relation to development or redevelopment proposals. Later in this report, Section 8.7 focuses on the need to seek opportunities and reduce flood risk where possible.

8.2 Site Allocations

The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. where possible steer urban development towards the areas of lowest flood risk. The NPPF stipulates the application of a sequential approach to site allocation, utilising the Sequential Test. A flow diagram demonstrating the application of the Sequential Test for a local plan site allocation is provided in the NPPG (Diagram 2 in Flood Risk and Coastal Change, Paragraph 021). Development sites should be allocated within areas of lowest flood risk in the first instance – in Flood Zone 1 (which relates to flooding from river and sea), but the NPPG stipulates that other sources of flooding must be considered, so EECDAs in Flood Zone 1 must be taken into account. Only if it can be demonstrated that there are no suitable sites within areas with the lowest flood risk (taking into account all sources of flooding) should alternative sites (i.e. within areas that may potentially be at greater risk of flooding) be contemplated, taking account of the vulnerability of the proposed land use. Tables 2 and 3 in the NPPG stipulate 'appropriate' land uses for each Flood Zone.

The priority is to allocate sites in areas with the lowest level of flood risk taking account of all sources of flooding, so sites in Flood Zone 1 unaffected by flooding from any source should be the priority for allocations. If sufficient sites in the most sustainable locations for development are not available in Flood Zone 1 (taking into account all sources of flooding), then sites with the lowest flood risk available within Flood Zone 2 should then be sought. If sufficient sites are also not available in Flood Zone 2, only then should sites within Flood Zone 3 be sought, with priority given to those with the lowest flood risk. The Exception Test should be applied where necessary.

Table 3 in the NPPG identifies types of development that should not be permitted in particular Flood Zones via the application of the Sequential Test (see Table 2-1). It also identifies types of development which may be allocated in zones of higher flood risk (from rivers and sea) via the application of the Exception Test.

Paragraph 102 of the NPPF states that 'For the Exception Test to be passed:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by a SFRA where one has been prepared; and
- a site-specific flood risk assessment must demonstrate 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 latter point includes a requirement for account to be taken to the future risk from climate change over the lifetime of the development. New development within Flood Zones 3b, 3b, 2 and EECDAs in Zone 1 must be designed to accommodate the predicted impacts of climate change, encompassing finished floor levels, access routes, drainage systems and flood mitigation measures.

The NPPG (SFRA guidance, paragraph 012) states that "where a Level 1 Assessment shows that land outside flood risk areas cannot appropriately accommodate all the necessary development, it may be necessary to increase the scope of the Assessment to a Level 2 to provide the information necessary for application of the Exception Test where appropriate".

The impact of a single development upon flood risk may be deemed insignificant. However if a number of such developments occur within the same catchment, collectively they could have a significant impact and increase flood risk. It is therefore important that EEBC consider the cumulative impact of their proposed allocation sites upon all sources of flooding.

RECOMMENDATION: Any future site allocations must be determined via the application of the Sequential Test, and the Exception Test if required, in line with Government guidance. The evaluation of potential sites should be guided by the mapping (taking into account climate change) and the findings presented within this Level 1 SFRA, including with regard to EECDA and, if necessary, supplemented by a more detailed Level 2 SFRA which covers all potential sources of flooding. Full account should be taken of all sources of flooding including from rivers, groundwater, sewerage and surface water, together with the potential effects of climate change on flood risk and impacts on and from existing flood management infrastructure (see Sections 4 and 5). The assessment will need to consider the collective impact of all the allocation sites upon flood risk. The NPPG highlights that a Level 2 SFRA may be required to provide the information necessary for the application of the Exception Test, but a Level 2 SFRA may also be required to assess flood risk from non-fluvial sources on some sites where the information in this Level 1 SFRA provides insufficient detail to enable the allocation to be determined. In this regard, whilst not a Level 2 SFRA, the information provided as Annex A of this SFRA will help inform these decisions.

8.3 Relocation of Unsuitable Existing Development

Paragraph 100 of the NPPF recommends that, where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, local authorities should seek to facilitate the relocation of development, including housing, to more sustainable locations.

RECOMMENDATION: EEBC, working in partnership with the EA and others, should seek to identify both existing development which is potentially at risk from future impacts of climate change and, if necessary, potential sites for relocating that development, taking into account the Sequential Test. More suitable alternative uses for such sites should be sought, taking account of Table 3 in the NPPG. The information contained in the SFRA can be used to assist this process.

8.4 Safeguarding

Paragraph 100 of the NPPF states that local authorities should safeguard land from development that is required for current and future flood management. Such land may take the form of multi-function green infrastructure.

A further consideration in Epsom and Ewell would be the possibility of storage of flood waters on open spaces to reduce flood risk downstream and potentially beyond the borough boundary, this could include the rural upstream (southern) areas of the borough.

RECOMMENDATION: In partnership with the EA and other local authorities downstream, EEBC should seek to identify land required for current and future flood management, and, if justified, safeguard it through planning

policy. This can include areas within or adjoining allocated development sites which are particularly suitable for flood management purposes. The information contained in the SFRA can be used to assist this process.

8.5 Epsom and Ewell Critical Drainage Areas

The NPPF requires a site-specific flood risk assessment for all development proposals "*in an area within Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency)*". The EA has not specified any CDA in the borough. However, areas which are likely to be most at risk of flooding from local sources have been identified as part of this SFRA. They have been termed 'Epsom and Ewell Critical Drainage Areas' (EECDAs) to differentiate them from those areas which could potentially be notified by the EA. The wording of the NPPF is such that it is not clear that an FRA would be required in a EECDA because they were not 'notified to the local planning authority by the EA'. However, current EEBC policy DM19 includes a requirement for an FRA for sites at risk from '*all sources*' of flooding, which would include the EECDA.

RECOMMENDATION: EEBC should retain a local policy requiring a site-specific flood risk assessment for all development on sites where drainage problems are identified by the EA or EEBC, which would include development in the EECDA identified in this SFRA. FRAs are particularly important in such areas as they have known localised flooding problems which can cause significant damage.

8.6 Best Practice

Current SCC policy contains detailed policies with regard to SuDS. In their role as Lead Local Flood Authority, SCC are responsible for managing flooding from local sources and provide a pre-application advice service. It is important that applicants are made aware of current best practice guidance with regard to sustainable drainage solutions to ensure that such information can be taken into account in development proposals. Best practice guidance on flood management is also published by the EA, National Flood Forum and others. In addition, this SFRA contains links to key information with regard to minimising flood risk in new and existing development.

SCC provides guidance for developers on the inclusion of SuDS measures within new development on their website[23].

While it is non-statutory, Susdrain includes technical standards[24] for SuDS measures produced by Defra and the Local Authority SuDS Office Organisation (LASOO).

RECOMMENDATION: Although links to some information are already publicised on the EEBC website, this should be extended to provide links of sources of current best practice with regard to SuDS and flood management to be utilised by applicants. It could also be utilised by EEBC officers seeking to evaluate FRAs and development proposals. It is anticipated that this information will also be included in the SuDS guide for developers.

8.7 Opportunities to Reduce Flooding

Paragraph 100 of the NPPF recommends that local plans should seek to reduce the causes and impacts of flooding by *'using opportunities offered by new development'*.

The NPPF requires local authorities to work with other local authorities and providers to assess infrastructure needs in their area, including with regard to flood risk (Paragraph 162).

[23] www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice

[24] www.susdrain.org/delivering-suds/using-suds/legislation-and-regulation/national-standards-for-sustainable-drainage.html

Opportunities to reduce flood risk can be informed by SCC's Local Flood Risk Management Strategy (see Section 2 of this document).

RECOMMENDATION: EEBC should:

- Work with other authorities and bodies, as appropriate, to identify specific flood risk infrastructure required within the borough. Surrey's Local Flood Risk Management Strategy, the information contained in the SFRA, and the potential solutions to surface water drainage problems identified in the SWMP, can be used to assist this process, although more detailed studies are likely to be required.

- Seek reasonable opportunities for flood risk reduction measures when identifying and allocating potential development sites; and

- Give consideration to a suitable generic policy to be contained within emerging Local Plan documents in respect of non-allocated sites where flood risk reduction measures should be sought.

This section may also be relevant to any neighbourhood plans proposed in future in the borough.

8.8 Planning Applications

Planning applications can be submitted both for sites allocated within development plans and other sites, known as windfall sites. Flood risk at windfall sites may not have been previously considered in detail by the local planning authority.

The NPPF[25] stipulates that a site-specific flood risk assessment is required for:

- development proposals on sites of 1 hectare or greater in FZ1;

- all proposals for new development (including minor development and change of use) in FZ2 and FZ3;

- all proposals for new development (including minor development and change of use) in an area within FZ1 which has critical drainage problems (as notified to the local planning authority by the EA); and

- where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding (groundwater or surface water flooding).

Table 8-1 summarises EEBC's requirements for site-specific FRAs. It is noted that the EA has not notified EEBC of any areas within FZ1 with critical drainage problems at present. However, areas which are likely to be most at risk of flooding from local sources, and where sustainable drainage solutions should be a priority, have been identified in this SFRA and have been delineated as EECDA. This is different from the CDA terminology used by the EA but nevertheless effectively means the same thing.

Flooding from local sources also occurs outside the mapped EECDAs within FZ1, but a FRA is not always required. In this respect, the NPPF requires a FRA for all sites greater than 1ha in area within Zone 1. FRAs for sites in Zone 1 should be proportionate to the level of risk and focus on records of past flooding and sustainable drainage solutions.

25 Footnote 20, page 24

The EA provides detailed Standing Advice, available online[26], to assist with both the development and evaluation of FRAs. This includes information on what FRAs should cover and what accompanying plans should be submitted. In addition to a Flood Risk Stranding Advice Tool for Local Planning Authorities, advice specific to the fluvial flood zone in which the proposed development lies and the broad size of the development is provided. For example, there is specific standing advice for proposed developments in fluvial FZ1 which are less than 1ha in size. It is also noted that a homeowner's guide to flood resilience has been published at http://www.knowyourfloodrisk.co.uk.

Table 8-1: Requirements of Flood Risk Assessments

Zone 3b Functional Floodplain		Zone 3a High Probability	Zone 2 Medium Probability	Epsom and Ewell Critical Drainage Areas	Zone 1 Low Probability
Existing Development	New Development				
Detailed FRA required				FRA required (proportionate to level of risk), should focus on records of past flooding and SuDS	FRA required (proportionate to level of risk) for all sites greater than 1ha in area, but should focus on records of past flooding and SuDS. Recommend that sites of 1ha or less carry out an assessment of localised flood risks

Policy DM19 requires the incorporation of SuDS in a development commensurate with its size and scale. The site-specific FRA must follow the Sequential Test, and if required the Exception Test, as noted above and detailed in the NPPF and its accompanying NPPG. The NPPF[27] stipulates that the FRA must demonstrate that:

- the development is appropriate in its proposed location, considering the proposed use and all potential sources of flooding;
- within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;
- the development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems; and
- The development will not increase flood risk elsewhere.

Paragraph 104 of the NPPF notes the following exceptions to this:

- The Sequential Test need not be applied where the proposed site is allocated in the development plan.
- The Sequential and Exception Tests should not be applied for applications for minor development and changes of use, 'except for any proposal involving a change of use to a caravan, camping or

26 www.gov.uk/planning-applications-assessing-flood-risk
27 Paragraph 103

chalet site, or to a mobile home or park home site, where the Sequential and Exception Tests should be applied as appropriate'.

The NPPF requirements are supplemented by planning policies in relation to flooding set out in local planning documents produced by EEBC and SCC, including with regard to FRAs, sustainable drainage and flood resilience. Relevant policies at the time of writing are set out in Section 2 of this SFRA. In its role as a statutory consultee for planning applications, the EA will provide comment on applications for sites at higher risk of flooding, although their role is set to decrease in the future.

A Site-Specific Flood Risk Assessment Checklist is provided by the Government[28] as part of the Planning Practice Guidance and should be used as the starting point for all site-specific FRAs.

It should be noted that since the policies outlined in DCLG (now MHCLG) Written Statement HCSWS161 on sustainable drainage systems came into effect on 6 April 2015, the local planning authority is required to consult the relevant lead local flood authority on the management of surface water in planning applications, and satisfy themselves that the proposed minimum standards of operation are appropriate. This policy applies to all developments of 10 homes or more and to major commercial development.

Developers should be aware that the EA are continually refining and updating the flood zone mapping. They should therefore consult with the EA to ensure that the latest extents are used when assessing the risk of flooding.

SCC require a surface water drainage strategy to be produced to support any major planning application. Major applications not including this will not be regarded as 'valid' applications. SCC provide a Surface Water Drainage Pro Forma which they recommend is completed to accompany the submitted drainage strategy. This document, and supporting 'Advice Note' is available online[29].

RECOMMENDATION: Applicants should use the Government's FRA checklist as the starting point for any flood risk assessment to be submitted with their planning application, utilising the information contained within this SFRA in both their FRA and design proposals; this will provide the evidence required to enable EEBC to undertake the Sequential Test if necessary. In this respect, as noted above, EEBC should consider a policy in the Local Plan which would require developers to utilise the checklist and review the SFRA as a starting point in relation to flood risk guidance. Equally, planning officers should use the information contained in the checklist, the NPPG and this SFRA to inform their evaluation of planning applications and any accompanying flood risk assessments. It should be noted that, in line with the NPPF, ALL sources of flooding must be considered, including from surface water and groundwater. When granting planning permission, the use of planning conditions and Section 106 agreements should be considered, where necessary, to prevent any increase in flood risk and to assist in securing flood risk reduction measures.

The SFRA mapping will be of particular use in identifying key information for the FRA, including Flood Zones, EECDA and flood management assets, but must be read in conjunction with the SFRA text. Sections 4 and 5 provide further information on flood risk in specific locations and highlight key issues to consider, including the potential effects of climate change on flood risk and location of flood management infrastructure. Further issues to take in to consideration in developing or evaluating an FRA are noted below.

It is important to note that the SFRA provides the most up-to-date information at the time of writing, but the data could change with time. The SFRA mapping is also taken at a borough-wide level and more localised mapping and flood history information will be needed to determine flood risk at particular sites. The EA and EEBC will be important sources for the latest data.

[28] http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastalchange/site-specific-flood-risk-assessment-checklist/
[29] https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice

Compliance with current planning policy in relation to flooding contained in the NPPF, and in planning policy documents produced by EEBC and SCC should be demonstrated by applicants in their planning applications and considered by planning officers in their determination of applications, including with regard to FRAs, sustainable drainage and flood resilience.

Key contacts:

- National Planning Policy Framework and Planning Practice Guidance – http://planningguidance.planningportal.gov.uk/
- Environment Agency – https://www.gov.uk/government/organisations/environment-agency
- Surrey County Council – https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice
- Know Your Flood Risk - http://www.knowyourfloodrisk.co.uk

8.9 Restriction of Permitted Development Rights

Permitted Development (PD) rights allow for some minor development, such as certain sizes of building extension, without planning permission. The NPPG (Flood risk guidance, paragraph 047) states that minor developments, some of which are covered by PD rights such as small extensions, are *'unlikely to raise significant flood risk issues unless they would:*

- have an adverse effect on a watercourse, floodplain or its flood defences;
- impede access to flood defences and management facilities; or
- where the cumulative impact of such developments would have a significant effect on local flood storage capacity or flood flows'.

Minor developments subject to PD rights, such as some extensions or paving over of gardens, therefore could raise flood risk and increase surface water run-off. Article 4 of the Town and Country Planning General Permitted Development Order provides a possible vehicle for the removal of PD rights in exceptional circumstances, which the NPPF[30] notes to be *'limited to situations where this is necessary to protect local amenity or the wellbeing of the area'*. This could include situations where minor permitted development has the potential to add to localised flood risk as highlighted above, such as from the cumulative impact of extensions within an area.

If there are areas of the borough where Permitted Development could lead to an increase in flooding an Article 4 Direction could be explored with the Development Management team. For example, the EECDA's may be locations where this could be considered. There would need to be a strong justification to support this and therefore the implementation of an Article 4 direction would need to be subject to further detailed investigation.

8.10 General Recommendations – Minimising Flood Risk and Impacts

When evaluating the flood risk of an existing or proposed development it is important to consider issues of flood resilience and flood resistance – minimising the likelihood of flooding, minimising impacts if the site does flood, and allowing a quick recovery after flooding. Such measures should also be included in the development of design proposals in planning applications, as relevant to the likely level of flood risk at a site. As noted above, the NPPF requires that planning applications demonstrate that the *'development is appropriately flood*

[30] Paragraph 200

resilient and resistant', that *'any residual risk can be safely managed'* and *'it gives priority to the use of sustainable drainage systems'*. Potential considerations include:

- A change in land use to reduce the vulnerability of the proposed development;
- Placing uses with greater vulnerability to flooding in higher areas within the site to limit the risk or extent of flood damage;
- Minimising / reducing impermeable surfaces (building footprints and areas of hardstanding);
- Raising internal floor levels above the predicted flood level to reduce the likelihood of the property flooding, taking into account any increase in flood level likely in future as a result of climate change;
- Arranging buildings and solid walls on site to remove obstructions to the overland flow paths of flood waters;
- Identifying potential sources of pollution in the event of flood and seeking to contain them;
- Ensuring there is a safe means of access and escape in the event of a flood;
- Developing a flood evacuation plan in the event of the threat of flood;
- Subject to matters relating to Building Control, raising electrical wiring and sockets to avoid damage to electrical systems in the event of flood, use of tiled or stone flooring etc;
- Consider urban creep in surface water drainage designs to mitigate the cumulative effects of permitted development; and
- The Predicted impact climate change in line with latest EA guidance and how the development incorporates this into finished flood levels, access routes, drainage systems and flood mitigation measures.

SuDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings.

SCC and the EA strongly advocate the use of SuDS. Policy DM19 of the EEBC Core Strategy and Development Control Policies DPD requires the incorporation of SuDS at a level appropriate to the scale and type of development unless there are practical reasons for not doing so.

A wide variety of SuDS techniques are available, potentially providing both water quality and water quantity improvement benefits on a site by site basis throughout EEBC. Wherever possible within brownfield areas, the developer should seek to reduce the rate of runoff from the site to the equivalent Greenfield runoff rates (i.e. the rate of runoff generated from the site assuming it were an open grassed area). Collectively, the effective application of SuDS as part of all future development has the potential to reduce the risk of flooding within the borough.

Indeed, reducing the rate of discharge from urban sites to Greenfield runoff rates is one of the most effective ways of reducing and managing flood risk within the borough. Although any reduction in the amount of water that originates from any given site is likely to be small, if applied to sites across the borough in a consistent way, the cumulative effect could be significant. There are numerous different ways that SuDS can be incorporated into a development and the most commonly found components of a SuDS system are described

in the following table. The appropriate application of a SuDS scheme to a specific development is heavily dependent upon the topography and geology of the site.

Table 8-2: Summary of Potential SuDS Measures to Reduce Flood Risk

SuDS Measure	Description
Pervious surfaces	Surfaces that allow inflow of rainwater into the underlying construction or soil.
Green roofs	Vegetated roofs that reduce the volume and rate of runoff and remove pollution.
Filter drain	Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration.
Filter strips	Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.
Swales	Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter.
Basins, Ponds and Wetlands	Areas that may be utilised for surface runoff storage.
Infiltration Devices	Sub-surface structures to promote the infiltration of surface water to ground. They can be trenches, basins or soakaways.
Bioretention areas	Vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground.

It should be noted that SuDS can have other benefits, depending upon the system installed, in addition to helping to minimise flood risk; these include helping to improve water quality by reducing pollutants, helping to recharge groundwater supplies, reducing the demand for potable water, improving wildlife habitats and helping to provide green corridors and improving local amenity. The cumulative benefits of numerous SuDS schemes over a number of sites in the borough could therefore be significant.

Table 8-3: Summary of Benefits of SuDS Measures

	SuDS technique	Flood Reduction	Water Quality Improvement	Landscape and Wildlife Benefit
Most Sustainable	Living roofs	ü	ü	ü
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	ü	ü	ü
	Filter strips and swales	ü	ü	ü
	Infiltration devices - soakaways - infiltration trenches and basins	ü	ü	ü
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paving	ü	ü	
Least Sustainable	Tanked systems - over-sized pipes/tanks - storms cells	ü		

There are numerous sources of best practice advice with regard to flood resilience and flood resistance measures, including SuDS. Examples are the EA standing advice for development of Flood Risk Assessments and the Know Your Flood Risk guide to flood resilience. These should be consulted in the production of all FRAs.

Key contacts:

- Environment Agency – https://www.gov.uk/government/organisations/environment-agency
- Surrey County Council – https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice
- Epsom and Ewell Sustainable Drainage System Guidance - https://www.epsom-ewell.gov.uk/residents/planning/planning-advice-services/sustainable-drainage-systems
- CIRIA[31] – www.susdrain.org
- Know Your Flood Risk - http://www.knowyourfloodrisk.co.uk

31 Construction Industry Research and Information Association

RECOMMENDATION: EEBC/SCC should encourage developers to consider flood resilience in their developments to permit a quick recovery post-flooding. EEBC/SCC should continue to mandate the use of SuDS in developments where practicable as indicated in current EEBC/SCC policy and by the EA.

8.11 Summary – Development Management Recommendations

The following table summarises the recommendations made in this SFRA regarding spatial planning and development management. It is important to note that the table is designed as a summary of issues covered elsewhere in the SFRA, NPPF and other guidance documents. It should not be relied upon in isolation when writing or evaluating a FRA.

The table is not intended to replace current planning policies within existing development plans prepared by EEBC/SCC, but it may be useful in their preparation of future planning policies relating to flood risk.

<table>
<tr><th rowspan="2">Requirements</th><th colspan="6">NPPF Flood Zone</th></tr>
<tr><th colspan="2">Zone 3b Functional Floodplain
(See Section 4.5)</th><th>Zone 3a High Probability
(See Section 4.5)</th><th>Zone 2 Medium Probability
(See Section 4.5</th><th>HCDAs [1]
(See Section 4.9)</th><th>Zone 1 Low Probability
(See Section 4)</th></tr>
<tr><td>Important Considerations</td><td colspan="2">Opportunities should be sought: to reduce overall level of flood risk in the area through layout and form of development and appropriate application of SuDS; and to relocate existing inappropriate development to land with lower probability of flooding. Sequential Test required (unless para.104 of NPPF applies)
Existing Development[32]: All existing ‘solid buildings’ that would otherwise be in Zone 3b, unless designed to allow the passage of water, together with any other land prevented from flooding in a 5% (1 in 20) annual chance event by the presence of solid buildings and existing infrastructure, are considered to be within Zone 3a for planning purposes.
Existing buildings and other land designed to flood will continue to be in Zone 3b.
New Development: Includes all new development on previously undeveloped land, or on surfaces that are currently permeable, or on surfaces that are currently impermeable but not designed to flood.</td><td>Opportunities should be sought: to reduce overall level of flood risk in the area through layout and form of development and appropriate application of SuDS; to relocate existing inappropriate development to land with lower probability of flooding; and to create space for flooding to occur.</td><td>Opportunities should be sought to reduce overall level of flood risk in the area through layout and form of development and appropriate application of SuDS.
Sequential Test required (unless para.104 of NPPF applies)</td><td>Important to check whether site is a ‘dry island’ (see Section 4.6).
EECDA have been identified which are likely to be most at risk of flooding from local sources. Local flooding must be considered as in integral part of the design process for all development.
Opportunities should be sought to reduce overall level of flood risk in the local area through layout and form of development and appropriate application of SuDS.
(See guidance provided by EA on CDAs - equally applicable here - and best practice guidance on SuDS)</td><td>Important to check whether the site is a ‘dry island’ (see Section 4.6).
It is important to recognise that sites within Zone 1 may be susceptible to flooding from other sources. Development may contribute to an increase in flood risk elsewhere if not carefully mitigated.
Opportunities should be sought to reduce overall level of flood risk in the area and beyond through layout and form of development and appropriate application of SuDS.</td></tr>
<tr><td>Appropriate Land Use (refer to Tables 2 and 3 of the NPPG)</td><td>Proactively seek a reduction in risk by reducing the vulnerability of the existing land use.</td><td>Water Compatible uses
Essential Infrastructure, if passes Exception Test.</td><td>Water Compatible or Less Vulnerable uses. More Vulnerable uses or Essential Infrastructure, if passes Exception Text.</td><td>Water Compatible, More Vulnerable or Less Vulnerable uses. Highly Vulnerable uses, if passes Exception Test.</td><td>No restrictions upon land use.</td><td>No restrictions upon land use.</td></tr>
<tr><td>Flood Risk Assessment (FRA)
(all sources of flooding)</td><td colspan="2">Detailed FRA required</td><td>Detailed FRA required</td><td>Detailed FRA required</td><td>FRA required (proportionate to level of risk) for sites in Flood Zone 1, but should focus on records of past flooding and SuDS.
Detailed FRA required for sites in Flood Zones 2 and 3</td><td>FRA required (proportionate to level of risk) for all sites greater than 1ha in area, but should focus on records of past flooding and SuDS. Recommend that sites of 1ha or less carry out an assessment of localised flood risks</td></tr>
</table>

Notes

General This table should be referred to in conjunction with reference to the rest of this SFRA report.

1 This includes areas in Flood Zone 1 that Epsom and Ewell have identified as being at risk of surface water flooding

32 Existing development specifically designed to allow the passage of flood water, such as buildings on stilts or car parks designed to flood

8.12 Flood Risk Assessment Requirements

A site-specific FRA is required[33] when development is:

- in flood zone 2 or 3 including minor development and change of use
- more than 1 hectare (ha) in flood zone 1;
- less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs); or
- in an area within flood zone 1 which has critical drainage problems as notified by the EA. This SFRA considers that the EECDA are equivalent to a CDA defined by the EA.

8.13 Local Community Actions to Reduce Flood Damage

It is important to ensure a broad awareness with respect to flood risk, to enable communities to help themselves should a flood event occur. Advice is available on several websites, in particular those of the EA and SCC.

Key contacts:

- Environment Agency – https://www.gov.uk/government/organisations/environment-agency
- Surrey County Council – https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice

The EA advises everyone to check whether their property is at risk of flooding; this includes both residential and business premises. For those whose properties are at risk of flooding, the EA advises:

- sign up to their flood warnings;
- make a flood plan;
- prepare the property for flooding; and
- prepare a flood kit.

Information on all of the above can be found on the EA's website. It is also important for property owners to ensure that they have sufficient insurance to cover their property if damaged by flood.

8.14 Emergency Planning

The Council is designated as a Category 1 Responder under the Civil Contingencies Act 2004. As such, the Council has defined responsibilities to assess risk, and respond appropriately in case of an emergency, including (for example) a major flooding event. The Council's primary responsibilities are[34]:

- from time to time assess the risk of an emergency occurring;
- from time to time assess the risk of an emergency making it necessary or expedient for the person or body to perform any of his or its functions;

[33] https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment
34 Civil Contingencies Act 2004

- maintain plans for the purpose of ensuring, so far as is reasonably practicable, that if an emergency occurs the person or body is able to continue to perform his or its functions;
- maintain plans for the purpose of ensuring that if an emergency occurs or is likely to occur the person or body is able to perform his or its functions so far as necessary or desirable for the purpose of:
    - preventing the emergency,
    - reducing, controlling or mitigating its effects, or
    - taking other action in connection with it.

In addition to the EA fluvial flood warning service, the Flood Forecasting Centre is a partnership between the EA and the Met Office. The centre forecasts for all natural forms of flooding - river, surface water and groundwater. A daily Flood Guidance Statement provides information for Category 1 and 2 responders to help with emergency planning and resourcing decisions. It presents an overview of the flood risk across five days and identifies possible severe weather, which could cause flooding and significant disruption to normal life. These forecasts, combined with understanding of the areas at highest risk of local flooding through the EECDA maps, can inform emergency planning for all sources of flooding.

As water levels rise and begin to pose a risk to life and/or livelihood, it is the responsibility of the emergency services to coordinate the evacuation of residents. This evacuation will be supported by the Council. It is essential that a robust plan is in place that clearly sets out (as a minimum):

- roles and responsibilities;
- paths of communication;
- evacuation routes;
- community centres to house evacuated residents; and
- contingency plans in case of loss of power and/or communication.

Dry access (i.e. above flood level) should be sought wherever possible to ensure that all residents can be safely evacuated in times of flood. A Flood Evacuation Plan must be in place, suitable to the type of development, where there is no safe dry access to/from the site (i.e. access through Zone 1).

Emergency Planners have a role through the planning approval process to assess the adequacy of safe access plans for new developments. This will be particularly important for instances where developments pass the Exception Test and are located in a zone of higher flood risk than they would otherwise be. The emergency planners will have to take this into account to ensure the developer has considered this carefully in their proposals and that the plans are appropriate for future users.

Coordination with the emergency services and the EA is imperative to ensure the safety of residents in time of flood. Relatively few areas within the borough are at risk of river flooding (as indicated by the flood risk zones in the adjoining maps). Flooding of this nature will typically occur following relatively long duration rainfall events, and consequently forewarning will generally be provided to encourage preparation in an effort to minimise property damage and risk to life. It is worth highlighting however that the benefits of flood warning are often compromised to a large degree by the lack of ‘take up’ within the local community. This emphasises the extreme importance of raising local awareness with respect to the potential risks of flooding.

Areas suffering from localised flooding issues may be at greater risk due to the difficulty of forecasting intense rainfall which may lead to surface water flooding and the response of aquifers to above average long-term rainfall which may lead to groundwater flooding. Localised flooding caused by intense rainfall can occur rapidly and pose

a risk to life, particularly in confined spaces e.g. basement properties. Furthermore, the blockage of gullies and culverts as a result of litter and/or leaves is commonplace, and this will inevitably lead to localised problems that can only realistically be addressed by reactive maintenance.

It is noted, however, that the EA has recently introduced a Groundwater Flood Warning Service as an extension to its existing Floodline Warnings Direct service. This new service is available to areas which have previously been affected and already receive local information about groundwater flooding. The service will issue Flood Alerts when there is the possibility of flooding from groundwater, Flood Warnings in some areas when flooding of property is expected and support the dissemination of information through the website, flood wardens, flood action groups etc. The areas within the borough that are covered by both the Flood Warning and Flood Alert services are indicated in Figure 111.

It is recommended that the Council advises Surrey's Local Resilience Forum (LRF) of the risks raised in light of the updated EEBC SFRA, ensuring that the planning for future emergency response can be reviewed accordingly. This will inform the Surrey Community Risk Register[35].

8.15 Insurance

The Association of British Insurers (ABI) launched the Flood Re scheme in April 2016 to provide flood insurance coverage to domestic properties deemed to have a greater than 1.3% (1 in 75) annual chance event risk of flooding. In order to avoid incentivising the construction of new homes within the floodplain, the scheme does not provide coverage to properties built since 2009. The scheme website[36] sates that the scheme will be in place until 2039.

35 https://www.surreycc.gov.uk/__data/assets/pdf_file/0008/71729/surrey-community-risk-register-2017-2018.pdf
36 www.floodre.co.uk

9. Updating this SFRA

This SFRA provides a strategic overview of the spatial variation of flood risk throughout the borough at a particular point in time, building upon the best available information at that time.

The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the borough; with data continually changing as new flooding events occur and further modelling is undertaken, this knowledge is continually evolving. In addition, Government policy on flood risk continues to change, with significant changes to national and local policy evident between the publication of the previous SFRA in 2008 and the production of this update in 2018. Given that this is the case, a periodic review of this SFRA is imperative and it must be treated as a living document.

The following key questions should again be addressed as part of the SFRA review process:

Question 1

Has any flooding been observed within the borough since the previous review? If so, the following information should be captured as an addendum to the SFRA:

- Location of flooding (grid reference or street name);
- Date(s) of flooding;
- Source of flooding (e.g. surface water, main river, sewers etc);
- Pathway of floodwaters (e.g. along the particular streets);
- Receptors (e.g. properties flooded internally, road, gardens etc); and
- Frequency of flooding (e.g. once a year, during heavy rainfall etc).

Question 2

Have any amendments to the NPPF or the accompanying NPPG been issued since this document was published? If so, does it materially affect any relevant EEBC/SCC policy or the assessment or recommendations of this SFRA?

Question 3

Has the EA or SCC (as LLFA) issued any amendments to their flood risk mapping and/or guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within the borough, resulting in a change to the 5% (1 in 20) annual chance, 1% (1 in 100) annual chance or 0.1% (1 in 1000) annual chance flood outline? If yes, then the Zone 3b and Zone 3a flood outlines should be updated accordingly;
- Has any further detailed or revised mapping been produced for the borough resulting in a change to the EECDA? If so, then relevant maps should be altered accordingly;
- Has the assessment of the impacts that climate change may have upon rainfall and/or river flows over time altered? If yes, then a review of the impacts that climate change may have upon the borough is required; or

- Do the development management recommendations provided in the SFRA in any way contradict emerging EA advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques? If yes, then a discussion with the EA is required to ensure an agreed suite of development control requirements are in place.

It is highlighted that the EA updates the Flood Map for Planning (Rivers and Sea) on a quarterly basis[37]. If this has been revised within the borough, the updated Flood Zones will be automatically forwarded to the Council for their reference. It is recommended that only those areas that have been amended by the EA since the previous SFRA review are reflected in Zone 3 and Zone 2 of the SFRA flood maps. This ensures that the more rigorous analyses carried out as part of the SFRA process are not inadvertently lost by a simple global replacement of the SFRA flood maps with the Flood Map for Planning (Rivers and Sea).

Question 4

Has the implementation of the SFRA within the spatial planning and/or development management functions of the Council raised any particular issues or concerns that need to be reviewed as part of the SFRA process?

[37] Available here: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0andy=355134.0andscale=1andlayerGroups=defaultandep=mapandtextonly=offandlang=_eandtopic=floodmap

Figures