

THIS PDF VERSION IS DATED APRIL 2018. ANY FURTHER UPDATES SINCE APRIL 2018 ARE REFLECTED IN THE ONLINE VERSION OF THE SFRA

<https://westlondonsfra.london/>

STRATEGIC FLOOD RISK ASSESSMENT - LEVEL 1

FOR

**LONDON BOROUGHS OF BARNET, BRENT, EALING, HARROW,
HILLINGDON AND HOUNSLOW**



Prepared by: Mike Mair and Damon Reid-Williams
Reviewed by: Michael Arthur
Director: Simon Jones

Date: April 2018

Version: 1.4

Version	Date	Details	Prepared by	Reviewed by	Approved by
1.2	March 2018	Minor corrections / revisions to website – Final Draft	Damon Reid-Williams / Mike Mair	Michael Arthur	Michael Arthur
1.3	April 2018	Revisions following review of final draft	Damon Reid-Williams	Michael Arthur	Michael Arthur
1.4	April 2018	Final revisions following agreement use of Flood Zones 3a/b fo surface water	Damon Reid-Williams	Michael Arthur	Michael Arthur

Limitations

Metis Consultants Limited (Metis) have prepared this Website (westlondonsfra.london) for the use of the West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow (hereinafter 'the Client'). No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by Metis.

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

The work described in this Website is based on the conditions encountered and the information available during the period of production. The scope of this Website and the services are accordingly factually limited by these circumstances.

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

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Website, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. Metis specifically does not guarantee or warrant any estimate or projections contained in this Website.

The Client should take appropriate professional legal advice prior to implementing any recommendations made within this Report Website may impact on the legal exposure of the Client.

Copyright

© This Report is the copyright of Metis Consultants Limited. Any unauthorised reproduction is strictly prohibited.

Contact Details

Metis Consultants Ltd.
Spencer House
23 Sheen Road, Richmond
London, TW9 1BN
United Kingdom

T: 020 8948 0249
E: info@metisconsultants.co.uk
W: www.metisconsultants.co.uk

Contents

User Guide	v
Glossary	vii
Acronyms and Abbreviations	x
Executive Summary	xii
1. Introduction	1
1.1. Overview.....	1
1.2. Objectives	1
1.3. Document Structure	2
1.4. Local Plans	3
1.5. Planning Application Considerations.....	3
2. Planning and Policy Framework.....	4
2.1. Overview.....	4
2.2. Key Policies and Requirements	4
3. Sources and Assessment of Flood Risk.....	20
3.1. Overview.....	20
3.2. Responsibilities	20
3.3. Fluvial Flooding.....	22
3.4. Tidal Flooding	23
3.5. Surface Water and Ordinary Watercourse Flooding	24
3.6. Groundwater Flooding	24
3.7. Sewer Flooding	25
3.8. Artificial Sources Flooding	25
3.9. Historic Flooding.....	26
3.10. Impacts of Climate Change – All Sources of Flood Risk.....	26
3.11. Functional Floodplain.....	27
3.11.1 Definition.....	27
3.11.2 Interpretation - Approach	30
3.11.3 Interpretation - Examples	Error! Bookmark not defined.
4. Flood Risk Assessment Guidance.....	32
4.1. Overview.....	32
4.2. Developer Guidance	47
4.2.1. Application of the Sequential and Exception Tests	47
4.2.2. Sustainable Drainage Systems (SuDS)	49
4.2.3. Site-Specific Flood Risk Assessment (FRA)	50
4.2.4. Drainage Strategy.....	50
4.2.5. Flood Risk Management Structures and Features	51
4.2.6. Borough-Specific Requirements.....	51
4.3. Developer Management Guidance.....	55
4.3.1. Application of the Sequential and Exception Tests	55
4.3.2. Sustainable Drainage Systems (SuDS)	56
4.3.3. Site-Specific FRAs	57
4.3.4. Drainage Strategy.....	57
4.3.5. Flood Risk Management Structures and Features	58
4.3.6. Borough-Specific Requirements.....	58
4.4. Planning Policy Guidance.....	59

4.4.1.	Application of the Sequential and Exception Tests	59
4.4.2.	Flood Risk Management Structures and Features	60
4.4.3.	Local Policy Recommendations.....	61
5.	Policy Recommendations	62
5.1.	Overview.....	62
5.2.	The Impact of Future Growth on Flood Risk.....	62
5.3.	Recommended Policies	65
6.	Review and Next Steps	70
6.1.	Review & Update - Technical Content.....	70
6.2.	Review & Update - Mapping	70
6.3.	Level 2 SFRA Recommendations	71

Appendix A – SFRA Level 2 – Screening Assessment

User Guide

This Strategic Flood Risk Assessment Level 1 Report has been produced with the main end users in mind - developers, planning consultants and Local Planning Authority officers. The information below can be used to aid the reader in identifying where key information is held within this document, and what purpose the information within each section has with regards to flood risk, planning applications and developments.

Section	Summary of Content	Flood Risk Information	Applicants (Developers / Planners)	LPA Officers
1	Introduction			✓
2	Planning and Policy Framework		✓	✓
3	Sources and Assessment of Flood Risk	✓	✓	✓
4	Flood Risk Assessment Guidance		✓	✓
5	Policy Recommendations			✓
6	Review and Next Steps			✓

Section	Summary of Content	Flood Risk Information	Applicants (Developers / Planners)	LPA Officers
Appendix A	SFRA Level 2 – Screening Summary		✓	✓
Web Map Information	Interactive Web Maps The fiver Interactive Web Maps which provides flood information on the different sources of flooding which affect the Boroughs: <ul style="list-style-type: none"> • Policy Web Map • Fluvial & Tidal Flood Risk Web Map • Surface Water Flood Risk Web Map • Sewer, Groundwater & Artificial Flood Risk Web Map • Flood Management Infrastructure Web Map 	✓	✓	✓
Web Map Information	Flood Risk Data Sources	✓		✓
Checklist	Flood Risk Assessment Template		✓	
Checklist	Surface Water Evaluation Appraisal Template		✓	

Glossary

Term	Definition
Aquifer	Underground layers of saturated rock through which water can readily move. Water can be transmitted to the surface via natural springs and wells.
Catchment	An area which drains to a specific watercourse, or a given point on a watercourse, waterbody or other body of water.
Critical Drainage Area	Specific geographic areas (usually catchment areas) that have been identified as having multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) during heavy weather periods, leaving people, property and local infrastructure at risk. These areas are defined by a Borough's Surface Water Management Plan (SWMP) and does not include areas with critical drainage problems as designated by the EA.
Development	Defined as one (or more) of the following: <ul style="list-style-type: none"> • Building operations, which includes structural alterations, construction, rebuilding, and most demolition. • Material changes of use of land and buildings. • Certain engineering operations such as groundworks. • Mining operations. • Other operations normally undertaken by a person carrying on a business as a builder. • Subdivision of a building (including any part it) used as a dwelling for use as two or more separate dwelling houses.
Drainage Strategy	A report analysing surface water flood risk for the proposed site and the surrounding area. The strategy should analyse water behaviour around the site, establishing runoff rates, flow pathways and flood depths under different rainfall events. The strategy should also investigate the impacts that the proposed development will have on the site, and provide measures to ensure the site is compliant with national and local policy requirements.
Dry Island	An area in Flood Zone 2 or 3 surrounded by land which has a higher risk of flooding.
Exception Test	Defined within the Flood Risk and Coastal Change Planning Practice Guidance , this is a method carried out for certain development sites following the application of the Sequential Test. The Exception Test is designed to demonstrate and help ensure that flood risk will be managed satisfactorily, while allowing necessary development to proceed in situations where suitable sites at lower risk of flooding are not available.
Flood Risk	A combination of the probability and the potential consequences of flooding from all sources. This includes flood risk from rivers and the sea, directly from rainfall on the ground surface (surface water runoff), rising groundwater, overwhelmed sewers and drainage systems, the overtopping of reservoirs, canals and lakes, and other artificial sources.
Flood Risk Assessment	A site-specific study to assess current and future flood risk for a proposed development area. The Assessment should demonstrate how flood risk will be managed now and in the future during the lifetime of the proposed development.
Flood Storage Compensation	Replacing floodplain storage lost through development by reducing nearby ground levels to provide more volume. Compensatory storage provided must equal or exceed the storage lost to reduce the chances of local or downstream flood risk increasing.
Flood Zone	A geographic area with a defined flood risk and accompanying designated annual probability of flooding, primarily from river ('fluvial') flooding or sea ('tidal') flooding. Flood Zone definitions are set by the National Planning Policy Framework, Flood Risk and Coastal Change Planning Practice Guidance and Local Planning Authorities.
Flood Zone 1	Defined in the Planning Practice Guidance as land that has a 'Low Probability' of fluvial or tidal flooding. There is a less than 1 in 1,000 (< 0.1%) annual probability of river or sea flooding.
Flood Zone 2	Defined in the Planning Practice Guidance as land that has a 'Medium Probability' of fluvial or tidal flooding. There is a 1 in 100 to 1 in 1,000 (1% to 0.1%) annual probability of river flooding, or a 1 in 200 to 1 in 1,000 (0.5% to 0.1%) annual probability of sea flooding.

Term	Definition
Flood Zone 3	Defined by the Environment Agency as land that has a greater than 1 in 100 (> 1%) annual probability of river flooding, or a greater than 1 in 200 (> 0.5%) annual probability of sea flooding.
Flood Zone 3a (fluvial / tidal)	Defined as the following: <ul style="list-style-type: none"> Land within modelled fluvial flood risk extents predicted for up to, and including, 1 in 100 year return period events Land within modelled tidal flood risk extents predicted for up to and including 1 in 200 year return period events Refer to Section 3.11 for full information.
Flood Zone 3a (surface water)	Refer to Section 3.11 for full information.
Flood Zone 3b (fluvial / tidal)	Refer to Section 3.11 for full information.
Floodplain	An area of land which experiences flooding when flood management infrastructure exceeds capacity. In these times, water either flows over this area of land or is stored on them.
Greenfield Runoff Rate	The rate at which rainfall runs off from an undeveloped, naturally permeable site.
Local Lead Flood Authority	As defined in the Flood and Water Management Act (2010) as the unitary authority (or county council if there is no unitary authority) that leads in managing local flood risks. For further information, see Table 3-1 which contains highlights Risk Management Authorities and their responsibilities.
Main River	A statutory type of watercourse designated as such by the Environment Agency in England and Wales. These watercourses tend to be larger rivers and streams but are not exclusively so. The Environment Agency has powers to carry out maintenance and operational works on these watercourses, including flood defence works.
Major Development	Defined in the Town & Country Planning (Development Management Procedure) Order 2015 as one of the following: <ul style="list-style-type: none"> For residential developments, the provision of 10 or more dwellings, or a site of 0.5 hectares or more. For non-residential development, new floorspace of 1,000 square metres or more, or a site of 1 hectare or more. Developments that use land for mineral-working deposits, or the winning and working of minerals. A waste development.
Minor Development	For the purposes of the planning applications and development requirements in this SFRA, Minor developments within the flood risk management context are developments which are not classified as Major and: <ul style="list-style-type: none"> Impact the flood plain and / or Impact the footprint of the building(s) and / or Development within the curtilage of an existing dwelling
Ordinary Watercourses	A watercourse that is not designated as a Main River. It includes rivers, streams, land and roadside ditches, drains, cuts, culverts, dikes, sluices, some sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.
Residual Risk	Defined in the Planning Practice Guidance as the risks that remain after applying the sequential approach and taking steps to mitigate against flood risk.
Risk Management Authorities	Defined within the Flood and Water Management Act (2010) , these include Lead Local Flood Authorities, highway authorities, water and sewerage companies, plus the Environment Agency.
Sequential Test	Defined within the Flood Risk and Coastal Change Planning Practice Guidance , this is a sequential approach which aims to steer new development to areas with the lowest probability of flooding.

Term	Definition
Strategic Flood Risk Assessment	A study carried out by one or more Local Planning Authorities to assess the risk of flooding from all sources, now and in the future, in a given geographical area. The Assessment takes into account the impacts of climate change and assesses the impact that development and land use changes in the area will have on flood risk.
Sustainable Drainage Systems	A sequence of measures and techniques designed to manage surface water runoff. The management practices and structures mimic natural processes to control flow rates, improve water quality, and improve water drainage and groundwater recharge.

Acronyms and Abbreviations

Acronym	Term
BRN	Blue Ribbon Network
CDA	Critical Drainage Area
CIL	Community Infrastructure Levy
CFMP	Catchment Flood Management Plan
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EU	European Union
FCERM	Flood and Coastal Erosion Risk Management
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FRMS	Flood Risk Management Strategy
FRR	Flood Risk Regulations 2009
FWMA	Flood and Water Management Act 2010
GLA	Greater London Authority
IDP	Infrastructure Delivery Plan
LFRMS	Local Flood Risk Management Strategy
LLFA	Local Lead Flood Authority
LPA	Local Planning Authority
LSDAP	London Sustainable Drainage Action Plan
NLWA	North London Waste Authority
NPPF	National Planning Policy Framework
OPDC	Old Oak and Park Royal Development Corporation
PDL	Previously Developed Land
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBD	River Basin District
RBMP	River Basin Management Plan
REMA	Revised Early Minor Alterations
RFCC	Regional Flood and Coastal Committee
RFRA	Regional Flood Risk Appraisal
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
S106	Section 106 (of the Town and Country Planning Act 1990)
SFRA	Strategic Flood Risk Assessment
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TE2100	Thames Estuary 2100 Plan
TTD	Thames Tidal Defence

WFD	Water Framework Directive
WLA	West London Alliance
WLWA	West London Waste Authority
WLWP	West London Waste Plan

Executive Summary

The West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow (hereinafter 'the Boroughs') have commissioned the production of a joint Level 1 Strategic Flood Risk Assessment (SFRA). The combined area features several cross-boundary Environment Agency-designated Main Rivers, including the Dollis Brook, Duke of Northumberland's River, River Brent, River Crane, River Colne, River Lee, River Pinn, River Thames and Yeading Brook. These rivers cross boroughs that make up six of the seven local authorities that form the West London Alliance (WLA). Due to these established associations, groupings, and shared borough boundaries, a joint SFRA is beneficial for all Boroughs.

This document and mapping provides consistency and clarity, and sign-posting to common policies and requirements. A joint SFRA also enables the identification of potential improvements which the Boroughs are recommended to adopt and enforce through their future Local Plans to improve local flood risk whilst promoting sustainable development. The Boroughs have delivered the SFRA in an innovative format as a website (for the text content) and a web map (for the supporting flood risk information). This format allows for efficient update of content in the future and ensures that the best available information is presented in a dynamic format.

The overarching aim of this SFRA is to provide the evidence base for ensuring development is steered away from areas identified most at risk from all sources of flood risk, reducing the risk of flooding to residents and buildings. This is required to provide an update to existing borough specific SFRAs, which were predominantly completed in 2008.

The website is broken down into six sections:

- **Section 1 (Introduction)** provides an overview of the purpose and objectives of the SFRA.
- **Section 2 (Planning and Policy Framework)** provides an overview of the relevant national, regional, sub-regional and local policies relating to flood risk and associated requirements.
- **Section 3 (Sources and Assessment of Flood Risk)** provides an overview of the flood risk from all sources across the study area, including climate change implications where this information is available. This is supported by a series of web maps to present the flood risk information.
- **Section 4 (Flood Risk Assessment Guidance)** provides guidance for undertaking Flood Risk Assessments (FRA) at the site specific and strategic levels. Borough-specific guidance is included where any key differences exist. This is supported by checklists to assist applicants in completing compliant submissions for Flood Risk Assessments and Drainage Strategies.
- **Section 5 (Policy Recommendations)** provides a set of recommended site-specific and strategic policies. These recommendations are based on the findings of this SFRA, which the Boroughs are advised to incorporate into future versions of their Local Plans and/or associated guidance documents. Any opportunities for improved strategic flood risk management methods, including possible funding mechanisms, to assist with Boroughs growth delivery requirements are also highlighted.
- **Section 6 (Review and Next Step)** provides a summary of the proposed update schedule for the SFRA (the technical content and the mapping). Recommendations for the need to conduct a Level 2 SFRA are also included based upon the findings of flood risk screening assessments of current borough site allocations.

Key differences within this SFRA compared to the previous SFRA for all the Boroughs include:

- **Definition of the Flood Zone 3a:** Fluvial, tidal and surface water flood risks have been included within the Flood Zone 3a definition to reflect the significant nature of local flood risks within the heavily urbanised boroughs.
- **Application of the Sequential Test and Exception Test:** These two approaches include assessment of risk from all sources of flooding (not just fluvial and tidal as previously generally applied).
- **Site-Specific Flood Risk Assessments:** These will be required for all development proposals in Flood Zones 2, 3a and 3b – noting the definition of Flood Zone 3a in this SFRA includes surface water flood risk.
- **Drainage Strategies:** These are required for all **Major** developments not categorised as ‘Change of Use’. All Minor developments and developments categorised as ‘Change of Use’ or proposed changes to Previous Approvals which modify existing surface water drainage will also require a Drainage Strategy.

Future developments and climate change are some of the key factors that are increasing the risk of flooding events across the UK and globally. Several key drivers, including urban development expansion, could see an increase in flood risk from various sources. The pressure of accommodating more developments may mean a larger number of developments being proposed for sites within higher risk Flood Zone areas, placing them at greater risk of flooding. The impact of development and projected future population growth may not only have an impact on the flood risk presented by different flood sources, but present a greater overall flood risk to people and properties due to the accumulative risk from each source.

To meet flood risk mitigation requirements whilst facilitating housing development needs at all scales, strategic policy targeting the impact of future growth and climate change on flood risk is required. It is recommended that LPAs develop and implement policy that encourages opportunities for strategic flood risk management approaches which the boroughs’, in partnerships with other organisations (including other boroughs, developers and water companies), can deliver to facilitate development. These should include actively delivering strategic flood risk management projects that can be funded through the following sources and in partnership with relevant organisations:

- DEFRA’s Flood and Coastal Erosion Risk Management Grant in Aid
- Thames Regional Flood and Coastal Committee Local Levy funding
- Planning obligations under Section 106 of the Town and Country Planning Act 1990
- Community Infrastructure Levy under Part 11 of the Planning Act 2008

1. Introduction

1.1. Overview

The [National Planning Policy Framework's \(NPPF\)](#) accompanying [Flood Risk and Coastal Change Planning Practice Guidance \(PPG\)](#) highlights the role of Local Planning Authorities (LPAs) to utilise a risk-based approach to understand and manage flood risk from all sources. This includes the risks to and from surrounding areas in the same flood catchment. As a result, LPAs are required to produce Strategic Flood Risk Assessments (SFRA) to inform the preparation of Local Plans. The PPG defines a SFRA as:

“a study carried out by one or more LPAs to assess the risk to an area from flooding from all sources, now and in the future, taking account of the impacts of climate change, and to assess the impact that land use changes and development in the area will have on flood risk.”

The West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow (hereinafter ‘the Boroughs’) have commissioned the production of a joint Level 1 SFRA. The overarching aim of this SFRA is to provide the evidence base for ensuring development is steered away from areas identified most at risk from various flood sources, reducing the risk of flooding to its residents and buildings. This review is required to provide an update to existing borough specific SFRAs, which were predominantly completed in 2008.

The Greater London Authority's (GLA) Drain London Project grouped the six boroughs together, as Groups 1 and 2. From this grouping, the Boroughs have since formed the North West London Flood Risk Management Strategic Partnership group. The group aims to provide the Boroughs with the platform to deliver their Lead Local Flood Authority (LLFA) requirements of the Flood & Water Management Act (FMWA) 2010 and the Flood Risk Regulations (FRR) 2009. The group has representation on the Thames Regional Flood and Coastal Committee (RFCC), a committee established by the EA to promote joined up thinking and actions to manage flood risk throughout the Thames catchment area and administer relevant funding streams.

The combined area features several cross-boundary Environment Agency-designated Main Rivers, including the Dollis Brook, Duke of Northumberland's River, River Brent, River Crane, River Colne, River Lee, River Pinn, River Thames and Yeading Brook. These rivers cross boroughs that make up six of the seven local authorities that form the West London Alliance (WLA). Due to these established associations, groupings, and shared borough boundaries, a joint SFRA is beneficial for all Boroughs. This document and mapping will provide consistency and clarity, and will enable sign-posting to common policies and requirements. A joint SFRA also enables the identification of potential improvements which the Boroughs are recommended to adopt and enforce through their future Local Plans to improve local flood risk whilst promoting sustainable development.

1.2. Objectives

The purpose of this Level 1 SFRA is to provide a strategic overview of all forms of flood risk throughout the study area, now and in the future. This document and associated mapping delivered as part of the SFRA, will be used as an evidence base by the Boroughs to inform the

preparation of Local Plans, including the application of the sequential test to future site allocations. In addition to providing an evidence base, the SFRA will provide each Borough with robust information which should be used to:

- Determine the variations in risk from all sources of flooding across their areas.
- Inform the Sustainability Appraisal so that flood risk is fully taken into account in assessment of Local Plans.
- Provide the evidence needed to inform the undertaking of the Sequential Test in determining the land use allocations in accordance with the NPPF, and how to apply the Sequential Test for windfall sites within the boroughs.
- Develop policies to manage the effects of climate change and flood risk from all sources.

It is intended that this Level 1 SFRA will provide a starting point for improved strategic and partnership working by considering the scope for future common approaches for managing flood risk across the study area. This reflects the challenges posed to the Boroughs through the need for increased development.

1.3. Document Structure

This SFRA is published in a website format. The website is broken down into six sections, as described below:

- **Section 1 (Introduction)** provides an overview of the purpose and objectives of the SFRA. This section provides context for having a joint SFRA, with a summary of the current status of each Boroughs Local Plans.
- **Section 2 (Planning and Policy Framework)** provides an overview of the relevant national, regional, and sub-regional policies relating to flood risk and associated requirements. An overview of each Boroughs key local policies is included.
- **Section 3 (Sources and Assessment of Flood Risk)** provides an overview of the flood risk from all sources across the study area, including climate change implications where this information is available. This section introduces the West London SFRA interactive map which depicts the various flood risks across the study area.
- **Section 4 (Flood Risk Assessment Guidance)** provides guidance for developers undertaking Flood Risk Assessments (FRA) for proposed development sites within any of the six boroughs. Borough-specific guidance is included where any key differences exist. This section explains the Sequential Test and Exception Test and how to apply the boroughs' method for the split of Flood Zone 3, including the Functional Floodplain.
- **Section 5 (Policy Recommendations)** provides a set of recommended site-specific and strategic policies. These recommendations are based on the findings of this SFRA, which the Boroughs are advised to incorporate into future versions of their Local Plans and/or associated guidance documents. An overview of the potential impact that future growth could have on flood risk across the study area is provided. Any opportunities for improved strategic flood risk management methods, including possible funding mechanisms, to assist with Boroughs growth delivery requirements are also highlighted.

- **Section 6 (Review and Next Step)** provides a summary of the proposed update schedule for the SFRA (the technical content and the mapping). Recommendations for the need to conduct a Level 2 SFRA are also included based upon the findings of flood risk screening assessments of borough site allocations (included in Appendix A).

This SFRA has appendices and additional content as described below:

- **Appendix A (SFRA Level 2 – Screening Assessment)** contains a spreadsheet that summarises the screening assessments of site allocations within each of the boroughs.
- The **Web Map** index also summarises the list of all data sources used in the web map, including data origin information and any key limitations.
- **Checklists** contains templates which developments must refer to when submitting Flood Risk Assessments and/or Drainage Strategies.

1.4. Local Plans

Table 1-1 below provides a status summary of the Borough-specific Local Plans at the time of writing (March 2018).

Table 1-1. Local Plan Status Summary

Local Plan Document Suite	Local Plan Core Strategy Adoption / Publication Date
Barnet Local Plan	September 2012
Brent Local Plan	July 2010
Ealing Local Plan	April 2012
Harrow Local Plan	February 2012
Hillingdon Local Plan	November 2012
Hounslow Local Plan	September 2015

This SFRA provides recommended policy improvements based on the findings presented throughout this document. These policy recommendations are for future updates of Boroughs Local Plans and are designed to aid the mitigation of flood risks and deliver sustainable future development. Further details are provided in *Section 5.2*.

1.5. Planning Application Considerations

The guidance provided in this Level 1 SFRA is used, in part, in the assessment of planning applications. However, flooding is only one of many considerations in assessing a planning application. Measures that are identified as potentially acceptable in addressing flood issues may not be acceptable for other planning reasons under certain circumstances. For example, raising floor levels to mitigate against flood risk may result in design requirement issues, necessitating alternative solutions to address the flood risk. For further information, contact the relevant LPA.

2. Planning and Policy Framework

2.1. Overview

This section provides an overview of the flood risk policies and requirements on national, regional and sub-regional levels. A local level policies and requirements overview is provided for each of the six Boroughs. The source material is hyperlinked wherever possible, with only the key information stated within this SFRA. The policies referenced in this section may be superseded in time. To ensure that development proposals are in line with the most up to date policy, it is advised that developers, planning consultants and Local Planning Authority officers keep abreast of any changes.

Table 2-1. Policy and Strategy Overview

Level	Policy / Strategy and Hyperlink
National	National Planning Policy Framework (2012)
	Flood Risk and Coastal Change Planning Practice Guidance (2014)
	Flood and Water Management Act 2010
	Flood Risk Regulations (2009)
Regional	The London Plan 2016
	London Regional Flood Risk Appraisal 2014
	Thames Catchment Flood Management Plan (2009)
	Thames Estuary 2100 Plan 2016
	Thames River Basin Management Plan 2015
	Thames River Basin Flood Risk Management Plan 2016
	The Thames Strategy – Kew to Chelsea (2002)
	The Thames Landscape Strategy – Hampton to Kew (2012)
London Sustainable Drainage Action Plan 2016	
Sub-Regional	West London Waste Plan
	North London Waste Plan
	Old Oak and Park Royal Development Corporation Draft Local Plan
	Heathrow Airport
Local	Local Plans (and supporting guidance)
	Local Flood Risk Management Strategies
	Preliminary Flood Risk Assessments
	Surface Water Management Plans
	TE2100 Local Council Briefing Document (for Hounslow)

2.2. Key Policies and Requirements

2.2.1. National

National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 by the Department for Communities and Local Government. The document sets out the government’s planning policies for England and how these are expected to be applied. The NPPF provides guidance for Local Authorities to implement localised plans to meet the challenges presented by, amongst others, climate change, flooding and coastal change whilst achieving sustainable development. Paragraphs 94, 99-104 specifically relate to development and flood risk, with Paragraph 100 outlining the importance of a SFRA:

“Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and internal drainage boards. 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.”

The NPPF introduces the Sequential and Exception Tests as the means to direct new development proposals to areas with the lowest probability of flooding wherever possible. This SFRA provides the basis for applying these tests. Guidance for the application of these tests within the six Boroughs can be found in [Section 4.2](#).

A [Draft Revised NPPF](#) was published in March 2018. The document incorporates a number of proposals brought forward in the [Housing White Paper](#). Part of the revised text in the draft provides a new paragraph on SuDS in major developments. The document states that SuDS should be incorporated as part of major developments unless there is clear evidence that they would be inappropriate. The Draft Revised NPPF is currently under consultation. The consultation draft states that SuDS used should:

- a) Take account of advice from the lead local flood authority.*
- b) Have appropriate proposed minimum operational standards.*
- c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.*
- d) Where possible, provide multifunctional benefits.*

Flood Risk and Coastal Change Planning Practice Guidance

The ‘Flood Risk and Coastal Change’ section of the Planning Practice Guidance (PPG) was initially published in March 2014 and operates in conjunction with the NPPF. As it is intended to serve as a living document, it is subject to periodic updates. This section of the PPG advises users on how to take account of and address the risks associated with flooding and coastal change in the planning process. The section, made up of 86 paragraphs, defines flood risk and how to address all sources of risk. It provides information on how flood risk should be taken into account in the preparation of local plans and what SFRA should include. Where relevant, specific PPG paragraphs are referenced throughout this SFRA in the relevant sections. The current version of the PPG includes new and updated paragraphs from 2015 and 2016.

Flood and Water Management Act 2010

The Flood and Water Management Act (FWMA) 2010 provides a better, more sustainable and consistent management of flood risk in England and Wales. The FWMA was enacted following the Pitt Review of the 2007 flooding experienced across the country.

The FWMA defines the necessity of co-operation between relevant authorities at national, regional and local levels. It defines the roles of Risk Management Authorities (RMA), the

bodies with flood risk-related responsibilities in England and Wales. RMAs includes the Environment Agency (EA), Internal Drainage Boards, Water and Sewerage Companies and Lead Local Flood Authorities (LLFAs). As LLFAs, the Boroughs have several responsibilities under the FWMA:

- Developing and implementing a Local Flood Risk Management Strategy (LFRMS) – see [Section 2.2.4](#) for information about the six borough’s LFRMSs.
- Investigating and recording key local flood incidents
- Maintaining a flood risk asset register
- Coordinate the management of flooding from local sources (surface water, groundwater and ordinary watercourses)
- Regulation of works on Ordinary Watercourses
- Sharing of information about flood risk

Flood Risk Regulations (2009)

The Flood Risk Regulations (FRR) 2009 set out duties for LLFAs and the EA to produce Preliminary Flood Risk Assessments (PFRAs), flood risk maps which show flooding extents and hazards, and flood risk management plans. These FRR requirements are completed on a six-year cycle and achieve the country’s legal obligations of the European Union (EU) Floods Directive 2007. The Floods Directive’s objective is to provide a consistent approach to flood risk management across Europe. Further information about the Thames Flood Risk Management Plan is found within [Section 2.2.2](#), links to the six borough’s PFRAs and flood risk maps are found within [Section 2.2.4](#).

2.2.2. Regional

The London Plan

The London Plan, last updated in March 2016 (at the time of writing, March 2018), is the Greater London Authority’s (GLA) spatial development strategy plan for London. It sets the framework for development in London over the next 20-25 years, linking key economic, environmental, transport and social priorities. The London Plan was first published in 2004 and has undergone various alterations since.

The London Plan sets out several objectives put forward by the Mayor of London. One of the objectives is to ensure London is a city that becomes a world leader in improving the environment. This includes responding to climate change, which is covered in [Chapter Five](#) of the London Plan. Within this chapter are several policies that cover flood risk and water resource matters relevant to this SFRA:

- [Policy 5.3: Sustainable Design and Construction](#)
- [Policy 5.11: Green Roofs and Development Site Environs](#)
- [Policy 5.12 Flood Risk Management](#)
- [Policy 5.13 Sustainable Drainage](#)

[Chapter Seven](#) provides further policies that cover flood risk and water resources. The Blue Ribbon Network (BRN) sub-chapter covers London’s strategic network of natural and semi-natural water spaces, providing policies on the usage, protection and restoration of the BRN.

The GLA's associated [Sustainable Design & Construction Supplementary Planning Guidance \(SPG\)](#) provides guidance that supports the London Plan policies. Chapter 3.4 of the SPG focuses on flooding and provides links to guidance about sustainable drainage systems (SuDS).

A [new London Plan](#) is currently being drafted and expected to be finalised in 2019. Chapter 9 of the draft document covers sustainable infrastructure and includes several policies relating to flood risk and water management, including 'Policy SI12 Flood risk management', 'Policy SI13 Sustainable drainage' and 'Policy SI17 Protecting London's waterways'. Once the new London Plan has been finalised and adopted this SFRA may need to be updated to reflect any changes in key policies. [Table 2-2](#) highlights the key flood risk policies in the both the current and draft London Plan documents. The table summarises the current differences between the two that may trigger future updates for the SFRA.

Table 2-2. Current and Draft London Plan Flood Risk Policy Comparison

Current Policy	Draft New Policy	Key Policy Differences
Policy 5.3: Sustainable Design and Construction	No equivalent policy proposed	N/A
Policy 5.11: Green Roofs and Development Site Environs	Policy G5 Urban greening	The new policy does not specify objectives for green roof and green wall implementation but does highlight high-quality landscaping and nature-based sustainable drainage as greening measures for major development proposals. The new policy also states that boroughs should develop an Urban Greening Factor to identify the amount of greening required in new urban developments.
Policy 5.12 Flood Risk Management	Policy SI12 Flood risk management	The new policy highlights development proposals for utility services, stating that they should be designed to remain operational under flood conditions. The buildings should also be designed to facilitate quick recovery following a flood event.
Policy 5.13 Sustainable Drainage	Policy SI13 Sustainable drainage	The new policy introduces a new level in the drainage hierarchy, bringing the number of levels to 8. New hierarchical level placed at number 5 is 'rainwater attenuation above ground (including blue roofs)'. The rest of the hierarchy remains the same. The new policy also emphasises the need for permeable surfaces in new developments, stating that proposals for impermeable paving should be refused where appropriate. This includes proposals for impermeable paving on small surfaces such as front gardens and driveways.
No equivalent policy	Policy D10 Safety, security and resilience to emergency	The policy states that proposals should maximise building resilience and minimise potential physical risks that arise from flood related hazards.
No equivalent policy	Policy G1 Green Infrastructure	The policy specifies that Boroughs should prepare green infrastructure strategies that integrate objectives relating to flood management.

No equivalent policy	Policy GG6 Increasing efficiency and resilience	The policy states that buildings and infrastructure should be designed to adapt to climate change, utilise water efficiently and reduce flooding impacts.
No equivalent policy	Policy SD2 Collaboration in the Wider South East	Policy stated that collaboration with the wider South East region of the country will occur to tackle issues related to climate change, including water management and flood risk.

London Regional Flood Risk Appraisal

The London Regional Flood Risk Appraisal (RFRA), last updated in August 2014, is an accompaniment to the London Plan. It provides a strategic overview of all sources of flooding in London and addresses its probability and consequences. The findings of the London SFRA supports information presented in the London Plan, and provides details which shape the Plan’s policies. The London RFRA was first published in October 2009.

The 2014 London RFRA provides several revised recommendations, which are meant to be used as a monitoring tool on a borough-wide or London-wide level. Progress against these fourteen recommendations is reported annually in the London Plan Annual Monitoring Report. All monitoring recommendations are categorised under one of the following:

- Fluvial Flood Risk (Recommendations 1 to 5)
- Surface Water Flood Risk (Recommendation 6)
- Foul Sewer Flood Risk (Recommendation 7)
- Groundwater Flood Risk (Recommendation 8)
- Reservoir Flood Risk (Recommendation 9)
- Specific Development Areas (Recommendation 10)
- Main Road Network and Airports (Recommendation 11)
- Emergency Services (Recommendation 12)
- Schools (Recommendations 13)
- Utilities (Recommendations 14)

The contents of the London RFRA are also designed for spatial planners, developers, emergency planners, and infrastructure and utility operators. One of the aims of the London RFRA is to provide spatial planners and emergency planners with a shared understanding and common baseline of information.

A [new London RFRA](#) is currently being drafted and is expected to be finalised in 2019. It provides important evidence that underpins the new draft London Plan. Further revised monitoring recommendations are provided, intended to improve local risk policies and Drain London activities. It is suggested that these recommendations are incorporated into future Local Plan policies and documents once finalised.

Thames Catchment Flood Management Plan

The [Thames Catchment Flood Management Plan \(CFMP\)](#) was published in December 2009 by the EA. Its purpose is to provide an overview of current and future flooding within the River

Thames' catchment area. The Thames CFMP also sets out strategic policies to manage those flood risks over the next 50 to 100 years with climate change in mind.

All six boroughs fall under Sub-area 9, London catchments, in the Thames CFMP (See [Figure 2-1](#)). The boroughs fall into either the River Brent sub-area (Barnet, Brent, Ealing and Harrow) or the River Crane sub-area (Ealing, Harrow, Hillingdon and Hounslow). The Thames CFMP preferred policy for the London catchments is Policy Option 4, summarised as effectively managed flood risk areas where further actions are needed to keep pace with predicted climate change.

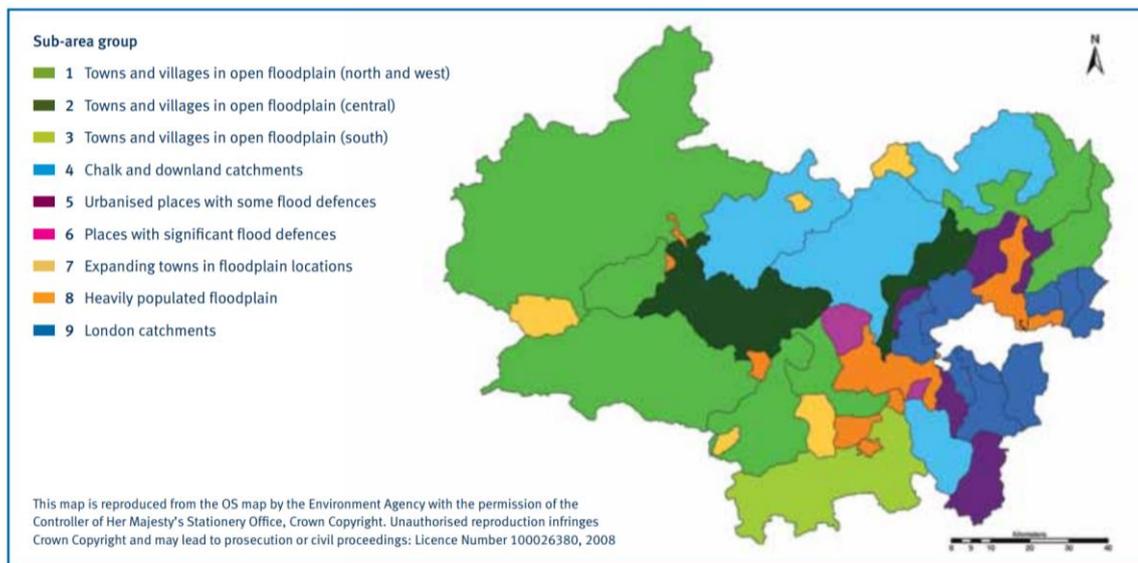


Figure 2-1. Thames CMFP Sub-Area Grouping ([Thames CMFP Map](#))

Three of the boroughs also fall under Sub-area 5: River Pinn sub-area (Hounslow and Hillingdon) and Lower Lee tributaries sub-area (Barnet). The Thames CFMP preferred policy for Sub-area 5 is Policy Option 6 where partnership actions are needed to store and manage runoff in locations with environmental or overall flood risk reduction benefits. The Policy Option states that the approach to flood risk management in these places uses the natural protection already provided by the river channel and the open spaces in the floodplain.

Thames Estuary 2100 Plan

The Thames Estuary 2100 (TE2100) project was established in 2002 by the EA to manage and reduce tidal flood risk through the 21st Century. The inclusion of other sources of flooding, including high river flows and surface water flooding implications on the estuary, resulted in the publishing of the TE2100 Plan in August 2011. A TE2100 5 Year Monitoring Review document was published in October 2016 which provides a five-year review of the TE2100 Plan. The TE2100 Plan, and associated documents, provide recommendations and actions for flood risk management for London and the Thames estuary through to the end of the century and beyond.

Of the six boroughs, only Hounslow lies within the TE2100 policy area, falling under Action Zone 1 ('West London'). The Plan introduces two policies that are applicable to Hounslow to strategically manage flood risk from tidal and high river flow sources in the TE2100 Plan area:

- P3: Continue with existing or alternative actions to manage flood risk. We will continue to maintain flood defences at their current level accepting that the likelihood and/or consequences of a flood will increase because of climate change.
- P5: Take further action to reduce the risk of flooding (now or in the future).

There are also six recommendations for implementation by the Borough. Further details can be found under the Hounslow section in [Section 2.2.4](#) of this document.

Thames River Basin Management Plan

The [Thames River Basin Management Plan \(RBMP\)](#) is part of a series of river basin district (RBD) documents that aim to provide a framework for the protection and enhancement of the benefits provided by the water environment. Prepared by the EA, RBMPs fulfil the requirements of the EU's Water Framework Directive (WFD) and are updated on a six-yearly cyclical basis.

The current Thames RBMP was produced in 2015 and is the second of a series of six-yearly cyclical planning documents. It covers the entire Thames river system, and includes contributory and interconnected rivers, lakes, groundwater and coastal waters. The document provides a set of measures as part of the main programmes, and local measures for catchments within the Thames RBD. As highlighted under the Thames CFMP, the six boroughs fall under either the London Brent catchment or the London Crane catchment. Hillingdon also falls within the Colne catchment and Barnet has a small overlap with the River Lee catchment (via the Pymme's Brook tributary of the River Lee). As part of the local measures sections, priority WFD issues, contributions to environmental outcomes for 2021, and future aims are all highlighted. Further information about local priorities can be obtained from the [Brent Catchment Partnership](#), the [Crane Valley Partnership](#) and the [Colne Catchment Action Network](#).

Thames River Basin Flood Risk Management Plan

The Thames River Basin Flood Risk Management Plan (FRMP) are a set of documents published by the EA in March 2016. They are produced in line with Flood Risk Regulations (2009) and the EU Floods Directive (2007). These documents are updated on a six-yearly basis, with the current cycle running from 2015 to 2021. They set out how RMAs will work with communities to manage flood and coastal risk over the next 6 years within the RBD.

The objectives of the Thames River Basin FRMP are grouped into environmental, social, and economic. They build on the aims and objectives of [The National Flood and Coastal Erosion Risk Management Strategy for England](#), published in 2011 by the EA, and align to the Councils' LFRMSs (see [Section 2.2.4](#) for further information). A set of measures have been produced to work towards achieving specific objectives. These measures fall under one of four different categories:

- Preventing risk
- Preparing for risk
- Protecting from risk
- Recovery and review

Full details regarding these objectives and measure categories can be viewed in Sections 4 and 8 of Part A of the Thames River Basin FRMP.

The Thames Strategy

The Thames Strategy, Kew to Chelsea, was commissioned in 1999 to help provide the basis for a more holistic approach to planning, management and use in Thames riverside areas between Kew and Chelsea. The document provides policy recommendations that fall under several categories, including 'The River Channel', 'Shaping Development', and 'Biodiversity'. These policy recommendations have been devised with the requirements and objectives set out in line with the 1997 Strategic Planning Guidance for the River Thames (RPG3B/9B) and is intended to provide the basis for managing long term change.

The Thames Landscape Strategy, Hampton to Kew, was established in June 1994 and further updated in 2012. The document provides objectives to work towards the overarching aim of understanding the river landscape and to respecting its character - both natural and man-made aspects. A 2017-2020 [Action Plan](#) has recently been published.

Of the six boroughs, only Hounslow falls within the catchment area of both Thames Strategies. Any Thames-side developments should ensure they align with both Strategies' strategic aims and projects.

London Sustainable Drainage Action Plan

The London Sustainable Drainage Action Plan (LSDAP) was published in 2016. Its overarching objective is to address how the capital's increasing population, land use changes and climate change projections, will impact upon flood risk. The existing drainage systems across London is typically over utilised through increased surface water runoff and greater foul water discharges. To reduce the increasing risk of flooding, the GLA produced the LSDAP to better use the existing and planned drainage infrastructure. The LSDAP promotes the benefits of retrofitting traditional piped drainage features with SuDS and demonstrates how rainwater can be used as resource instead of a waste product.

Focusing over a 20 year period, 40 actions have been included within the LSDAP for the GLA to work in partnership with RMAs including the EA, Thames Water, Transport for London and London Boroughs. The actions range from wider policy improvements and delivery of SuDS projects to the identification of opportunities to better implement SuDS in schools, housing and transport schemes. The Boroughs strongly support the LSDAP and this SFRA's push for greater inclusion of SuDS within developments directly align to many of the actions.

2.2.3.Sub-Regional

West London Waste Plan

Waste and Mineral Planning Authorities must take flood risk into account when allocating land for development. In line with PPG paragraph 008, this SFRA should be used to achieve this requirement.

With the objective of providing consistency with national government policy and the London Plan, the London Boroughs of Brent, Ealing, Harrow, Hillingdon, Hounslow and Richmond

upon Thames have jointly prepared the West London Waste Plan (WLWP) as planning authorities. The document was adopted in July 2015 and provides guidance, information and policies that work in conjunction with the Councils' Local Plans. Within the WLWP, 'Policy WLWP 4 – Ensuring High Quality Development' states that for all waste development proposals:

“There will be no increased flood risk, either to the immediate area or indirectly elsewhere. Where necessary, this is to be demonstrated by a Flood Risk Assessment.”

North London Waste Plan

Barnet is taking part in the **North London Waste Plan** (NLWP). The London Boroughs of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest are jointly drawing up the NLWP. A draft version of the Plan was published in July 2015 and consulted upon the same year. Work on the proposed submission version is likely to resume shortly. Within the draft NLWP, one of the requirements of 'Policy 6: Assessment Criteria for waste management facilities and related development' states that applications for waste management facilities should demonstrate that:

“The development does not increase flood risk, and aims to reduce risk.”

Old Oak and Park Royal Development Corporation

The Old Oak and Park Royal Development Corporation (OPDC) is a Mayor of London Development Corporation set up to create a new community hub and centre through the delivery of new homes and jobs. The Old Oak and Park Royal area falls within the boroughs of Brent, Ealing and Hammersmith & Fulham.

In 2016, the OPDC produced a set of draft Local Plan documents for the regeneration project which have undergone consultation. Central to these is the [Draft Local Plan](#), which serves as the key planning policy document for the area. The Plan highlights sub-areas within the Old Oak and Park Royal area and provides preferred policy options to manage new developments within those places. Of the ten sub-areas, Policies P1, P2, P4, P5, P6, P8, P9 and P10 highlight managing flood risk. Policy EU3 (Water) is the main overarching policy linked to management for the overall area. Amongst the listed requirements, the policy states that development proposals will be required to:

“Implement the flood risk management measures identified in the relevant borough's Surface Water Management Plans and protect existing flood management assets.”

To support the Draft Local Plan, the OPDC have also produced a set of supporting evidence base documents. Amongst these documents is the [Integrated Water Management Strategy](#) which reviews flood risk sources and water infrastructure coverage. The document provides a framework and a set of strategic recommendations regarding water demand, drainage and flood risk. These recommendations have been used to produce the water management and policy elements in the Draft Local Plan.

Heathrow Airport

Heathrow Airport have undertaken an SFRA and Surface Water Management Plan (SWMP). These documents focus on addressing flood risk within the entire Airport area. This objective has been addressed through identifying the sources of flood risk and implementing measures to achieve the outcomes that Heathrow agreed with the EA. Cross-boundary cooperation with Hillingdon and Hounslow is important in ensuring that flood risk objectives are met. For further information, it is recommended that the relevant LPA is contacted as these documents are not publicly available.

2.2.4.Local

This section provides an overview of Borough-specific policies and requirements. Borough-specific Flood Risk Assessment guidance can be found in [Section 4.5](#) of this SFRA. The following four are the key documents relating to flood risk which must be referenced when development is being proposed:

- **Local Plan** – As highlighted in [Section 2.2.1](#), the NPPF states that Local Plans are vital components for delivering sustainable development within their area. In addition to remaining consistent with the principles and policies set out in the NPPF, Local Plans for London Boroughs also need to work in conjunction with the London Plan. [Table 2-3](#) summarises any key Borough-specific policies within the Local Plans relating to flood risk which supplements national, regional or sub-regional requirements. This SFRA provides an evidence base for proposing appropriate policies to be implemented within Local Plan documents.
- **Local Flood Risk Management Strategy** – As highlighted in [Section 2.2.1](#), the FWMA requires LLFAs to develop a LFRMS in alignment with National Strategy. These local strategies assess the local flood risk, set out objectives for managing local flooding, summarise responsibilities of RMAs and demonstrate how wider environmental objectives will be achieved. [Table 2-3](#) summarises any Borough-specific policies within the Borough's LFRMSs relating to potential development which improves upon national, regional or sub-regional requirements. This SFRA delivers several of the LFRMS objectives set out by Boroughs to manage flood risk in the local area.
- **Preliminary Flood Risk Assessment** – Preliminary Flood Risk Assessments (PFRAs) are designed to help inform the strategic management of local flood risks. They identify key flood risk areas within each borough and summarise past flooding incidents where significant. Potential impacts of climate change and the identification of possible long-term developments enabled Flood Risk Areas to be defined. PFRAs fulfil statutory requirements in the FRR, which implement the requirements of the EU Floods Directive as highlighted in [Section 2.2.1](#). All of the [original 2011 PFRAs](#) for London boroughs were written as part of the Drain London project to ensure consistency, and one 'London Flood Risk Area' was created. Each Boroughs PFRAs were reviewed in 2017 and updates made where required as part of the six-year FRR cycle. This SFRA provides an evidence base for the next cycle of PFRAs.
- **Surface Water Management Plan** – Surface Water Management Plans (SWMPs) were created in 2011 as part of the Drain London project to outline the preferred

management strategy for surface water runoff for each Borough. Each Council's SWMP describes predicted and historic flooding from sewers, drains, groundwater, and runoff from land, small water courses and ditches sources following heavy rainfall. Each SWMP is broken down into a four-phase approach: Phase 1 – Preparation; Phase 2 – Risk Assessment; Phase 3 – Options; and Phase 4 – Implementation and Review. The SWMPs defined Critical Drainage Areas for each Borough and recommended potential mitigation options that could be incorporated into future flood alleviation schemes. Each borough's SWMP includes an action plan and most are available via their respective websites. In all cases the actions plans were used to create updated proposed objectives and measures for LLFAs to manage and mitigate local flood risks in their LFRMSs. For this reason, specific SWMP actions relating to future development have not been listed in this SFRA, but should be referenced in site-specific Flood Risk Assessments and drainage strategies as necessary. The SWMP provides an evidence base that informs the Local Strategy and the SFRA with flood risk information and location specific surface water management recommendations.

Table 2-3. Borough Specific Document Overview

Borough	Policy / Strategy	Details and Requirements
Barnet	Barnet Local Plan	<p>Barnet’s Local Plan features a suite of Development Plan Documents and Supplementary Planning Documents. Central to this is the ‘Core Strategy’, published in September 2012. The document includes the ‘vision’ for the Local Plan and fundamental objectives and policies. Information in sections ‘18.12 – Flooding and Water Management’ and ‘18.13 – Water Quality and Supply’ provide details on flood risk. These sections feed into ‘Policy CS13: Ensuring the efficient use of natural resources’. This policy ultimately seeks to minimise Barnet’s contribution to climate change, respect environmental limits and improve quality of life. The sixth aim of the policy is key to managing flood risk in the borough, it states:</p> <p><i>“We will make Barnet a water efficient borough and minimise the potential for fluvial and surface flooding by ensuring development does not cause harm to the water environment, water quality and drainage systems. Development should utilise Sustainable Urban Drainage Systems (SUDS) in order to reduce surface water run-off and ensure such run-off is managed as close to its source as possible subject to local geology and ground water levels.”</i></p> <p>The Development Management Policies document is part of the set of documents which makes up the Local Plan. The ‘Environmental considerations for development’ section provides guidance which feeds into ‘Policy DM04: Environmental Considerations’. Part ‘g’ of the policy is linked to flood risk, and states:</p> <p><i>“Development should demonstrate compliance with the London Plan water hierarchy for run off especially in areas identified as prone to flooding from surface water runoff. All new development in areas at risk from fluvial flooding must demonstrate application of the sequential approach set out in the NPPF (paras 100 to 104) and provide information on the known flood risk potential of the application site.”</i></p>
	Local Flood Risk Management Strategy	<p>A draft version of Barnet’s LFRMS (May 2017) is currently undergoing public consultation. The key aim of the LFRMS is to <i>“establish a series of objectives which can be taken forward to deliver effective local flood risk management through measures and actions.”</i> To achieve this, the document lists ten local objectives in Section 4.2. The first objective is to “prevent risks of flooding in new developments“. The following associated measures are proposed:</p> <ul style="list-style-type: none"> - Prevention of flood risk in new developments should be tackled at the planning process stage. Enhance flood resilience measures and encourage the use of SuDS wherever possible. - Ensure that local planning policy sets out the minimum requirements for flood risk mitigation measures within development, including areas at risk of local sources of flooding, particularly within CDAs. - Develop protocols for implementing the statutory consultee role with regard to management of surface water and implementation of SuDS within new development as part of the planning process.

Borough	Policy / Strategy	Details and Requirements
Brent	Brent Local Plan	<p>Brent's Local Plan is a suite of planning documents that sets out the strategy for future development in the borough. Central to this is the 'Core Strategy' which was adopted in July 2010. The section 'Tackling Climate Change and Achieving Sustainable Development' highlights flood risk and Brent's 2008 SFRA. This section is linked to Policy 'CP19: Brent Strategic Climate Change Mitigation and Adaptation Measures'. Policy 'CP15: Infrastructure to Support Development' also feeds into flood risk mitigation.</p> <p>The Local Plan also features a Development Management Policies document which was adopted in November 2016. The document features an 'Environmental Protection' section which includes information and policies to protect certain features of the environment, such as those relating to water. Policies 'DMP 9A: Managing Flood Risk' and 'DMP 9B: On Site Water Management and Surface Water Attenuation' to address flood risk, providing requirements key to FRAs and planning applications.</p>
	Local Flood Risk Management Strategy	<p>Brent's LFRMS was published in 2015. The document is designed to improve the understanding of the risks of flooding in the borough. It provides a source of information that can be utilised to identify effective ways of managing flood risk. The second objective of the LFRMS is "reducing the risk of flooding for people and businesses in Brent". To achieve this objective, the following key actions have been put forward:</p> <ul style="list-style-type: none"> - Continue to closely monitor gully cleansing programme. Consider a more targeted approach to gully clearing, based on silt levels. - Drawing up of an asset register of the most significant flood assets in the borough. - Designation of significant assets to ensure they are maintained in current form where necessary. - In order that Brent's flood risk planning is co-ordinated with the rest of London, Brent will continue to attend Regional meetings, Drain London and LoDEG (London Drainage Engineering Group) has been established by all 33 London Boroughs and meetings are held quarterly <p>Further objectives and associated actions can be found in Appendix G of the document.</p>
Ealing	Ealing Local Plan	<p>Ealing's Local Plan is a collection of documents that sets out how the borough will develop up to 2026. Central to this is the 'Development Strategy 2026', adopted by the Council in April 2012. The document sets out a vision for the future development of the borough and covers a 15-year plan period. Within the Local Plan, 'Policy 1.2: Delivery of the Vision for Ealing 2026', 'Policy 5.2: Protect and Enhance Metropolitan Open Land (MOL)' and 'Policy 5.3: Protect & Enhance Green Corridors' are directly linked to flood risk management in the borough.</p> <p>The Local Plan features a Development Management: Development Plan Document which was adopted in December 2013. The document features a 'Climate Change' section which aims to guide certain environmental based decisions for planning applications. This section contains 'Policy 5.12: Ealing Local Variation – Flood Risk Management' which provides requirements and guidance to address flood risk as part of developments proposals.</p>

Borough	Policy / Strategy	Details and Requirements
	Local Flood Risk Management Strategy	<p>Ealing's LFRMS was published in 2016. The document aims to provide clarity and direction around how flood risk is managed in Ealing. It provides five objectives for flood risk management and a set of linked actions to achieve those objectives. The third objective of the set is to <i>“Prevent the increase of flood risk through inappropriate development”</i>. The following actions are proposed:</p> <ul style="list-style-type: none"> - Continue to ensure that all developments in flood risk areas are appropriate. - Identify sustainable drainage retrofitting opportunities. - Develop Local Sustainable Drainage Guidance. - Begin to review flood plain conditions
Harrow	Harrow Local Plan	<p>Harrow's Local Plan – Core Strategy was adopted in February 2012. An objective of the Core Strategy is to <i>“manage the Borough's contribution to climate change and increase resilience to flooding”</i>. The document sets out some actions as to how this can be achieved, including:</p> <ul style="list-style-type: none"> - Directing development away from areas of high flood risk and increase natural and sustainable drainage. - Achieving sustainable design and construction in all new development. <p>The Core Strategy has a set of Core Policies of actions to be taken by the Harrow and its partners. These Core Policies are either suites of spatial policies relating to 'sub areas' within Harrow (Core Policies 2 to 10) or are a set of unified objectives which form an overarching core policy for the entire borough of Harrow (Core Policy 1). In addition to the overarching Core Principle CS1, each Core Principle addresses flood risk as an objective with the exception of the Core Policy suite for Harrow-on-the-Hill and Sudbury Hill (Core Policy 3).</p> <p>The Development Management Policies document is part of the Local Plan. It ensures that there is a clear policy framework in place to work alongside the Core Strategy and its objectives. Requirements and guidance are provided to resist developments that do not align with the Core Strategy's direction. The 'Environmental Sustainability' section provides four policies linked to flood risk:</p> <ul style="list-style-type: none"> - Policy DM 9: Managing Flood Risk - Policy DM 10: On Site Water Management and Surface Water Attenuation - Policy DM 11: Protection and Enhancement of River Corridors and Watercourses - Policy DM 12: Sustainable Design and Layout <p>Each policy features guidance, associated information and key policy/guidance that drives each policy within the document.</p> <p>The Harrow and Wealdstone Area Action Plan was adopted in July 2013 and is part of the Local Plan. It is there to help guide development change in the Harrow and Wealdstone area by providing detailed standards and policies to be used in the planning application review process. Policy AAP9 of the document provides guidance on flood risk and sustainable drainage, setting out requirements for:</p> <ul style="list-style-type: none"> - Major development proposals on Non-Allocated Sites in identified flood risk areas - Proposals on Allocated and Non-Allocated Sites requiring a site-specific FRA - Major developments and proposals promoting a comprehensive Change of Use

Borough	Policy / Strategy	Details and Requirements
	Local Flood Risk Management Strategy	<p>Harrow's LFRMS was published in 2016. It outlines the priorities for local flood risk management and provides a delivery plan to manage the risk over the next five years. The document provides a set of objectives and highlights how collaboration is vital to deliver the LFRMS. Objective three of the local objectives set for managing flood risk in the borough is <i>"to improve the way in which we provide long term sustainability and flood risk reduction and mitigation through development to ensure the economic prosperity and protection of residents, business and infrastructure."</i> To achieve this objective, the following action plan is proposed:</p> <ul style="list-style-type: none"> - Working with planners and Local Development Framework (LDF) team to keep pace with Planning Legislation and how it affects flood risk management including updating the information that is provided to developers and single applicants. - Develop an online standing local advice for flood risk assessment, SuDS matrix for developers and single applicants. - Continue to support the concept of flood risk reduction through sustainable development by undertaking a more holistic and inclusive approach to river, surface water and sewer modelling.
Hillingdon	Hillingdon Local Plan	<p>Hillingdon's Local Plan is a collection of documents that provide the foundation for how planning will be controlled in the borough. The two primary documents are 'Local Plan Part 1 - Strategic policies' and 'Local Plan Part 2'.</p> <p>Local Plan Part 1 was adopted in November 2012 and outlines the Council's vision for 2026. Section 8 provides Core Policies around environmental improvement, in which 'Policy EM6: Flood Risk Management' is included.</p> <p>Local Plan Part 2 is comprised of a set of documents, including 'Development Management Policies', 'Site Allocations and Designations', and 'Policies Map'. The documents were published for consultation in autumn 2015 and will be submitted for examination in summer 2017 with consultation comments and proposed modifications. The 'Development Management Policies' document provides detailed policies that will form the basis of the Borough's decisions on individual planning applications. Section 6 provides development management guidance and policies linked to environmental protection and enhancement. Of these policies, 'Policy DMEI 9: Management of Flood Risk' provides policy and guidance on flood risk matters.</p>
	Local Flood Risk Management Strategy	<p>Hillingdon's LFRMS was published in 2016. It provides an overview of previously undertaken flood risk studies. It is supported by other documents such as the PFRA, SWMP and SFRA. Appendix 3 of the LFRMS provides a set of objectives, measures and actions. Objective three of the six objectives states <i>"Development in Hillingdon understands and takes account of flood risk issues and plans to reduce flood risk."</i> The measures associated with this objective are:</p> <ul style="list-style-type: none"> - Influence the local plan and creation of suitable policies on flood risk. - Secure contribution to flood risk reduction from new developments. - Major landowners to develop site wide long-term plans for managing water. - Continue influencing developments through the planning process to ensure they meet the requirements of National Standards for Sustainable Drainage and London Plan requirements.

Borough	Policy / Strategy	Details and Requirements
	Local Development Framework Background Technical Report	<p>Hillingdon’s Local Development Framework Background Technical Report was published in April 2008. The document references the current national policy documents Mineral Planning Statements (MPS), with ‘MPS1: Planning and Minerals’ the most significant of these. MPS1 paragraph 17 highlights flooding and the water environment with regards to mineral planning. As of March 2014, the MPSs were superseded and replaced by the overarching NPPF.</p>
Hounslow	Hounslow Local Plan	<p>The Hounslow Local Plan was adopted in September 2015. The Local Plan is designed to form part of the planning framework of the Borough until 2030.</p> <p>Volume 1 lists a set of objectives and corresponding Local Plan policies. Objective Seven is based on ‘Ensuring Environmental Quality’ and as part of that, ‘Policy EQ3 - Flood risk and surface water management’ is designed to mitigate flood risk. The policy states the Borough’s approach, how the policy will be achieved, and what is expected of development proposals. This policy is further supported by additional information which helps to guide its delivery.</p> <p>Volume provides a set of site allocations. The document features information regarding Flood Zones, for sites located in Flood Zones 3b, 3a or 2.</p>
	Local Flood Risk Management Strategy	<p>The Hounslow LFRMS was agreed and implemented in 2014. Hounslow’s LFRMS provides details on how the Borough will manage flood risk alongside its partners. The overall aim of managing flood risk is driven by a set of objectives and guiding principles. The document provides six local flood risk objectives. The document’s third objective seeks to “prevent the increase of flood risk through inappropriate development”, and the fifth seeks to “Identify and implement flood mitigation measures in areas at risk from surface water flooding where additional funding can be secured.”</p> <p>The strategy provides actions that the Borough and other key stakeholders will take to manage potential flood risk in within the borough. Key future actions to improve flood risk management include:</p> <ul style="list-style-type: none"> - Flood investigations reports for any major new flood incidents. - Publication of significant flood assets in the borough. - Designation and maintenance of structures and features that provide flood alleviation.
	TE2100 Local Council Briefing Document	<p>Hounslow’s TE2100 Local Council Briefing Document was published in 2015. As highlighted in Section 2.2.2 of this document, the TE2100 Plan has six recommendations specifically for Hounslow: Recommendations 1, 2, 3, 6, 7 and 8. To help explain the requirements and recommendations of the TE2100, the TE2100 Local Council Briefing Document provides ideas and suggestions of key policy messages. These policy messages could be incorporated into Hounslow’s strategic planning documents to ensure that the recommendations of TE2100 are implemented in new developments.</p>

3. Sources and Assessment of Flood Risk

3.1. Overview

This section introduces the different sources of flooding which affect all boroughs. The supporting flood maps are provided as a set of five Web Maps. Details on data sources and confidence levels are provided along with the Web Maps.

This section also introduces flood risk from each of these sources. Flood risk is defined as the probability and potential consequences of flooding from various sources. Each sub-section presents information on the flood risk from these sources across the study area and accompanies the Web Map to provide useful flood risk source information.

Developing measures to mitigate against flood risk is essential. However, flood risk can never be fully mitigated against as risks will always remain after actions are taken. In addition, flood risks may have been initially unaccounted for at early design phase, and uncertainties may arise over time. These risks are defined as residual risks and are included within the fluvial and tidal flood risk source sections below.

3.2. Responsibilities

Risk Management Authorities (RMAs) are responsible for flood and coastal erosion risk management (FCERM). As part of those responsibilities, they must contribute towards the achievement of sustainable development and collaborate on matters relating to flood risk management. All RMAs have a duty to co-operate and share information and act in a way that is consistent with National Strategy. This may be through preparing relevant flood risk documents, assisting with development planning, or providing consent for flood risk related activities. *Table 3-1* provides a list of RMAs and their responsibilities within the context of this SFRA. Defra and EA guidance on [RMAs](#) provides further information.

Table 3-1. Risk Management Authorities and Responsibilities

Risk Management Authority	Responsibility (within the context of this SFRA)
DEFRA	Overall national responsibility for policy on FCERM in England. DEFRA also provides funding for flood risk management.
Environment Agency (EA)	Supervises and works with others to manage flood risk and coastal erosion. They manage flood risk from <u>main rivers</u> , the <u>sea</u> and <u>reservoirs</u> . They have a range of responsibilities: <ul style="list-style-type: none"> • Providing flood risk advice to LPAs regarding development proposals in Flood Zones 2 and 3 • Managing fluvial and coastal flood risk by carrying out works • Issuing and operating flood warning systems • Facilitating works on or near main rivers, and works affecting watercourses, flood and sea defences and other structures protected by its byelaw by issuing consent. • Providing advice on development proposals (see Section 4 for further details).
Lead Local Flood Authorities (LLFAs)	All boroughs within London are Unitary Authorities and deliver the LLFA role for their respective administrative areas. LLFAs have the lead operational role in managing flood risk from <u>surface water</u> , <u>ordinary watercourses</u> and <u>groundwater</u> sources. Their responsibilities include: <ul style="list-style-type: none"> • Developing, applying, maintaining and monitoring strategies for local flood risk management, including being involved in the preparation of SFRA's. • Preparing and maintaining a preliminary flood risk assessment, flood hazard maps, flood risk maps and flood risk management plans. • Designating structures and features of the environment that may have an effect on local flood or coastal erosion risk. • Managing flood risk from surface water, ordinary watercourses and groundwater. • Creating policies and guidelines to ensure that flood risk management work is effective. • Providing advice on development proposals (see Section 4 for further details). • Regulation and enforcement of works on ordinary watercourses.
Highway Authorities	Within London, this includes Highways England, all Boroughs and Transport for London who are responsible for providing and managing highway drainage. When necessary, they must work with the EA and LLFAs when: <ul style="list-style-type: none"> • Working on highway drainage • Working in roadside ditches • Carrying out works on part of a watercourse • Managing highway flooding
Water and Sewerage Companies	Primary responsibility for floods from water & sewerage systems (sewer flooding, burst pipes or water mains, floods caused by system failures). Thames Water Utilities Ltd. and Affinity Water are the relevant water and sewerage companies in the sub-region and have powers under the Water Industry Act 1991 regarding connection of proposed developments to their networks.

3.3. Fluvial Flooding

Fluvial flooding, also known as main river flooding, occurs when heavy or prolonged periods of rain causes a river to exceed its capacity. This can also be caused by excessive snow melt or exacerbated by high tides and storm surges for rivers with tidal influences. Floodplains and adjacent open spaces in the natural environment help manage and convey overbank flooding. However, urbanisation can exacerbate the effects of fluvial flooding due to increased impermeable surfaces and development within the potential flood plain. The increase in runoff rates results in greater volumes of water entering rivers and an increase in water flows. The impact of fluvial flooding on urban environments can be severe, causing significant social, economic and environmental impacts.

The risk of flooding from fluvial sources is shown in the [Fluvial & Tidal Flood Risk Web Map](#). The Web Map breaks down the probability of fluvial flooding across the sub-region based on the EA's Flood Zone categories. These Flood Zones are split into categories 1 – 3, with Flood Zone 1 having the lowest risk of fluvial flooding and Flood Zone 3 having the highest risk of fluvial flooding. Flood Zone 3 is further broken down into Flood Zone 3a (high probability) and Flood Zone 3b (functional floodplain). The EA's Flood Zones are based on the undefended flood scenario and does not account for the actual flood risk in an area that benefits from flood defence assets. [Section 3.11](#) of this document provides further information on functional floodplains. The definition of each Flood Zone can be found in the PPG [Flood Zone](#) table.

Certain boroughs within the sub-region share several EA designated main rivers. These rivers pose a fluvial flood risk to the boroughs in their catchment areas, leaving significant numbers of properties at risk. [Table 3-2](#) highlights the main rivers in the sub-region and the boroughs that they flow through.

Table 3-2. Main River Catchments and Borough Breakdown

Main River Catchments	Boroughs
River Brent (incl. Dean's Brook, Dollis Brook, Edgware Brook, Folly Brook, Grand Union Canal, Mitchell Brook, Mutton Brook, Silk Stream, Wealdstone Brook and Wembley Brook main river tributaries)	Barnet, Brent, Ealing, Harrow, Hounslow
River Crane (incl. Duke of Northumberland's River, Frog's Ditch, Roxbourne/Yeading Brook East and Yeading Brook West main river tributaries)	Harrow, Hillingdon, Hounslow
River Colne (incl. Bigley Ditch, Fray's River, River Pinn and Wraysbury River main river tributaries)	Harrow, Hillingdon
River Lee (incl. Bounds Green Brook and Pymme's Brook main river tributaries)	Barnet
River Thames (incl. Felthamhill Brook, Lower Feltham Brook and Portlane Brook main river tributaries)	Hounslow

In addition to the main rivers and tributaries highlighted in [Table 3-2](#), there are also a number of lost rivers that may contribute to fluvial and surface water flooding. Thames Water is currently conducting a project to rediscover and map these former watercourses. Using historical maps and data, and combining the historical information with modern satellite images, the project aims to locate former rivers and map them.

Counters Creek is an example of a known lost river. The catchment area of the river largely falls outside of the West London sub-region but extends into Brent. As many of these rivers

were buried, they can cause flooding when pipes and tunnels become blocked or overloaded. As information regarding lost rivers is still being developed, they are not captured in the [Fluvial & Tidal Flood Risk Web Map](#) or the [Surface Water Flood Risk Map](#). For further information, contact Thames Water.

The [Fluvial & Tidal Flood Risk Web Map](#) highlights areas at risk of fluvial flooding that currently benefit from flood defence schemes. Structural failure of fluvial flood defences presents a residual risk due to breaching or overtopping of these defended areas. The map also highlights the areas benefitting from flood defences through the 'EA Flood Map for Planning (River and Sea) – Areas Benefitting from Flood Defence' operational layer. This information can also be viewed through the [Policy Web Map](#) and the [Flood Management Infrastructure Web Map](#). FRAs for development proposals should consider both actual and residual flood risks if a proposed site is protected by flood defences. [Section 4.4](#) defines development proposal requirements.

3.4. Tidal Flooding

Tidal flooding occurs during extreme high tide and / or storm surge events. The River Thames is at risk of tidal flooding and provides the greatest risk when storm surges coincide with extremely high tide levels. Within the sub-region, only the boroughs of Hounslow and Ealing are at risk from this flood source. The risk of flooding from tidal sources is shown in the [Fluvial & Tidal Flood Risk Web Map](#).

The Thames Tidal Defences (TTD) are a collection of walls, embankments, flood gates, pumping stations and barriers designed to protect at-risk properties against flooding from the River Thames. Of these assets, the Thames Barrier is the most significant structure that offers protection against tidal flooding. The barrier provides protection against extremely high tides and storm surges moving from the North Sea down towards the Thames Estuary. These flood defences currently protect properties within the floodplain up to a 1 in 1000 year event. The Fluvial & Tidal Map highlights the areas benefitting from flood defences through the 'EA Flood Map for Planning (River and Sea) – Areas Benefitting from Flood Defence' operational layer. This information is also present on the [Policy Web Map](#) and the [Flood Management Infrastructure Web Map](#).

The [TE2100](#) plan highlights that with some modifications, the Thames Barrier will continue to provide flood protection up until 2070. The document provides information and recommendations to ensure that the same level of protection currently offered will be provided up until the year 2100. Further information is provided in [Section 2.2.2](#).

3.4.1. Actual Risk

The [Fluvial & Tidal Flood Risk Web Map](#) highlights areas at risk of tidal flooding modelled to the year 2100. The mapped layer is a combination of maximum extent, hazard, elevation and depth of flooding if an individual breach were to occur at any point on the TDD. Areas that currently benefit from the TTD are included in the layer Areas Benefitting from Flood Defences. The 'actual' flood risk for properties in Thames tidal floodplain is reduced as a result. FRAs for development proposals should consider actual and residual flood risks if the proposed site is protected by the TTD scheme. For further guidance, see [Section 2.2.2](#) for recommendations provided by the TE2100 plan and [Section 4.4](#) for development proposal requirements.

3.4.2. Residual Risk

The TTD offers significant protection against flooding from tidal sources, however, risk still remains. Over topping or failure of the Thames Barrier and other flood defence assets could occur. Defences can also be overtopped due to wind and wave actions. In addition, structural failure of TTD assets can lead to these features being breached. The [Web Map](#) shows the potential extent of inundation, including maximum likely water level, that could occur due to tidal flood defence breach and thus accounting for the residual risk (London Thames Breach Assessment, EA 2017).

For proposed developments within the breach range of the River Thames, an assessment analysing the residual risk should be considered as part of an FRA. The probability of both residual risks are both small, however the potential damage extent is significant. [Section 4.4](#) of this document contains further information on development requirements.

3.5. Surface Water and Ordinary Watercourse Flooding

Surface water flooding occurs as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or a watercourse. Ordinary Watercourse flooding occurs under similar circumstances but is associated with non-main river watercourses or ditches. Surface water flooding is often exacerbated by the intensity or duration of the rainfall event overwhelming drainage points, leaving soil, drainage channels and other drainage systems incapable of draining water away at a sufficient rate. Extreme weather conditions can also lead to ordinary watercourses exceeding their capacity, overwhelming systems and causing water to flow onto land.

For the purposes of this SFRA, the risk of flooding from ordinary watercourses is covered within the 'surface water' terminology. This aligns with the inclusion of ordinary watercourse flood risks within the EA's *Risk of Flooding from Surface Water* mapping.

The majority of the ground coverage in the sub-area is impermeable as it is heavily urbanised. This can compound surface water flooding as the runoff rate is greater on impermeable grounds compared to permeable areas. In addition, less water is able to drain away through infiltration, which increases the surface water flood risk in these areas.

The [Surface Water Flood Risk Web Map](#) highlights areas identified at risk of surface water flooding from all sources. The map also highlights Critical Drainage Areas (CDAs). These areas are defined locally by a Borough's SWMP and do not include areas with critical drainage problems as designated by the EA. Heavy rainfall and severe weather leave CDAs at risk from multiple flood risk sources, mainly surface water flooding but typically heavily interrelated with sewers and/or watercourses. For further information on how surface water flood risks have been incorporated into Flood Zones 3a refer to [Section 3.11](#).

3.6. Groundwater Flooding

Groundwater flooding occurs because of the underground water table rising, which can result in water emerging through the ground and causing flooding in extreme circumstances. This source of flooding tends to occur after extensive periods of heavy rainfall. During these periods, a greater volume of water infiltrates through the ground, causing underlying aquifers to rise above its regular depth below the ground's surface. Springs and low-lying areas, where the water table is likely to be closer to the surface, pose greater risks of groundwater flooding.

Groundwater flooding can occur in areas where the underlying soil and bedrock can become saturated with water. Therefore, ground composition and aquifer vulnerability are significant influences on the potential rate of groundwater flooding.

A majority of the sub-region is underlain by Thames Group (also referred to as London Clay) bedrock, a composition of silty clay/mudstone, sandy silts and sandy clayey silts of marine origin. This geological unit generally has a low hydraulic conductivity which means water does not easily move through it. However, because of this characteristic and poor drainage, ponding can occur if London Clay is downhill of aquifer outcrops. Other predominant bedrock geology types are Lambeth Group compositions and White Chalk, both of which are predominantly found in the northwest of the sub-region. White Chalk in particular can be prone to groundwater flooding due to its high hydraulic conductivity and low effective porosity, meaning it can become saturated quite quickly due to intense rainfall and recharge the water table. In areas with a high water table, water can move through chalk and out onto the surface. Superficial deposits in the region are predominantly River Terrace Deposits which are comprised of sand and gravel, with lenses of silt, clay or peat. Area-specific information on groundwater flood risk are shown in [Sewer, Groundwater & Artificial Flood Risk Web Map](#).

3.7. Sewer Flooding

Sewer flooding can occur due to sewer infrastructure failure or due to an increased flow and volume of water entering a sewer system which exceeds its hydraulic capacity, causing the system to surcharge. If sewer outfall points are either blocked or submerged due to high water levels, water can back up in a sewer system and cause flooding. These issues can result in water overflowing from gullies and manholes, causing flooding in the local area. Blockages caused by sediment or debris can further exacerbate the probability of sewer flooding.

Drainage in the sub-region is serviced by Thames Water Utilities Ltd (Thames Water), who provide surface water, foul and combined sewer systems. Modern sewer systems are designed to be separate surface water and foul water systems, typically accommodating up to 1 in 30 year rainfall events. However, sewer system segments across London vary in capacity due to age. Older segments have a smaller capacity and may not be designed to accommodate rainfall events as significant as 1 in 30 year events. Combined sewer systems are also prevalent within older areas of London, including eastern parts of Ealing and Hounslow, leading to increased environmental risks were flooding to occur.

The Thames Water historical sewer flooding dataset provides details on the number of reported sewer flood incidents within a four-digit postcode area. Further information on historical sewer flooding is shown in the [Sewer, Groundwater & Artificial Flood Risk Web Map](#).

3.8. Artificial Sources Flooding

Artificial Flooding occurs when the failure of infrastructure or human intervention results in flooding. Artificial flood sources include reservoirs, canals, water retention ponds, docks and other artificial structures. Though the probability of a structural breach is low, the potential extent of damage is significant. Flooding from an artificial source could leave many properties at risk.

The [Sewer, Groundwater & Artificial Flood Risk Web Map](#) shows potential reservoir breach inundation mapping, which displays the largest area that could potentially flood if a reservoir

were to fail and release the water it holds. The information displayed by the Web Map is a worst-case scenario, providing data that could be used for emergency planning purposes. Further details on emergency planning and other FRA requirements, refer to [Section 4.4](#).

3.9. Historic Flooding

Each Borough has differing levels of historic information. The majority of this comes from the EA’s Recorded Flood Outline dataset which shows all EA records of historic flooding and the EA’s Historic Flood Map which shows the maximum extent of all individual recorded flood outlines. This can be viewed on the [Fluvial & Tidal Flood Risk Web Map](#). Further information can be obtained from the Borough Flood Investigation Reports produced under Section 19 of the FMWA (see [Table 3-3](#)). The Boroughs can investigate any flood event deemed necessary. Where they, as LLFAs, carry out these investigations, they must notify the relevant RMAs and publish the results of the investigations.

Applicants are advised to contact the respective Borough as part of planning application submissions to check against any other records that may exist and review published PFRAs, LFRMSs and SWMPs.

Table 3-3. Flood Investigation Reports

Borough	Flood Investigation Report Status
Barnet	None published to date
Brent	None published to date
Ealing	None published to date
Harrow	S.19 Flood Investigation Reports
Hillingdon	Flood Risk Investigation Reports
Hounslow	None published to date

3.10. Impacts of Climate Change – All Sources of Flood Risk

The NPPF set out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. The Web Map shows the impacts of climate change on the various sources of flood risk as follows:

- Fluvial Flooding** – A proportion of the main rivers within the sub-region have been assessed for impacts of climate change using the allowances defined in the [EA Guidance for Flood Risk Assessment](#) (2016). The [Fluvial & Tidal Flood Risk Web Map](#) includes flood mapping for the following climate change scenarios for main rivers as detailed in [Table 3-4](#).

Table 3-4. Climate Change Scenarios per Main River

Main River	Climate Change Scenarios
Upper Colne	1 in 100 year probability event (as a baseline comparison) 1 in 100 year + 20% increase in peak river flow
Lower Colne	1 in 100 year probability event 1 in 100 year + 10% increase in peak river flow 1 in 100 year + 15% increase in peak river flow 1 in 100 year + 25% increase in peak river flow 1 in 100 year + 35% increase in peak river flow

	1 in 100 year + 70% increase in peak river flow
River Lee (Pymmes Brook & Tributaries)	1 in 100 year probability event 1 in 100 year + 10% increase in peak river flow 1 in 100 year + 15% increase in peak river flow 1 in 100 year + 25% increase in peak river flow 1 in 100 year + 35% increase in peak river flow 1 in 100 year + 70% increase in peak river flow
Silk Stream	1 in 100 year probability event 1 in 100 year + 20% increase in peak river flow
River Brent	1 in 100 year probability event 1 in 100 year + 25% increase in peak river flow 1 in 100 year + 35% increase in peak river flow 1 in 100 year + 70% increase in peak river flow
River Crane	1 in 100 year probability event 1 in 100 year + 25% increase in peak river flow 1 in 100 year + 35% increase in peak river flow 1 in 100 year + 70% increase in peak river flow
River Pinn	1 in 100 year probability event 1 in 100 year + 25% increase in peak river flow 1 in 100 year + 35% increase in peak river flow 1 in 100 year + 70% increase in peak river flow

- **Tidal Flooding** – The [Fluvial & Tidal Flood Risk Web Map](#) shows the potential tidal defence breach inundation area for the year 2100 epoch. This is considered an appropriate representation of climate change impacts on tidal flooding for the purposes of this SFRA.
- **Surface Water and Ordinary Watercourse Flooding** - The [Surface Water Flood Risk Web Map](#) shows a range of surface water flood event annual probabilities (3.33%, 1% and 0.1%) in the Risk of Surface Water Flooding map. The 3.3% annual probability extent is considered to represent the current likely risk and the 1% annual probability extent represents the potential climate change adjusted impact of current risk.
- **Groundwater, Sewer and Artificial Flooding** – No specific climate change impact assessments have been completed for these flood risk sources. Existing flood risk mapping should be used until updated information is made available.

3.11. Functional Floodplain

3.11.1 Definition

The Flood Risk and Coastal Change PPG defines functional floodplain as “*land where water has to flow or be stored in times of flood*” ([PPG Table 1 in Paragraph 065](#)). The PPG states that the extent of the functional floodplain, also known as Flood Zone 3b, should be defined by LPAs within their SFRAs. This allows for the incorporation of local circumstances and must be agreed with the EA and the boroughs’ LLFAs.

[PPG Paragraph 015](#) states that the functional floodplain is usually defined, as a minimum, as land which would naturally flood up to and including a 1 in 20 year return period event or designed to flood in 1 in 1000 year events. Flood storage areas designed to protect

downstream communities from flooding should also be included in the functional floodplain. This ensures that land that is required for current or future flood management features can be safeguarded from development, directly aligning to [Paragraph 100 of the NPPF](#). The area identified as functional floodplain should take into account the effects of defences and other flood risk management infrastructure. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain – further clarification of this is provided below in [Section 3.11.2](#).

This SFRA adopts a definition for Flood Zone 3a that includes fluvial, tidal and surface water flood extents as described in the bold text boxes below. The extents are shown in the Web Map. The mapping extents have been split to aid applicants and the LPA through highlighting the flood risk source(s) which a site may fall within. The policy requirements are identical regardless of the flood source.

The Flood Zone 3b (functional floodplain) definition is adopted to ensure that future development is steered away from the most 'at risk' flooding extents from fluvial and tidal sources. The Flood Zone 3b definition within this SFRA does not include surface water flood risk, but it should be noted that a policy recommendation is made in [Section 5](#) that may be adopted by some boroughs that could impose additional requirements for developments proposed within Flood Zone 3a (surface water) and the 1 in 30yr RoFSW extent.

The surface water mapping used, the Risk of Flooding from Surface Water (RoFSW) map published by the EA, is the most consistent and representative data currently available. Further information about this dataset can be found in its associated November 2013 [guidance note](#) (note that the published name for the Risk of Flood from Surface Water map was previously the 'updated Flood Map for Surface Water' – the underlying dataset is the same).

Flood Zone 3b (Functional floodplain) is defined as:

- Land within EA modelled fluvial and tidal flood risk extents predicted for up to and including 1 in 20 year return period events allowing for the impact of flood defences - **Flood Zone 3b (fluvial / tidal)**
- Land which is included within the EA's Flood Storage Areas dataset – **Flood Zone 3b (fluvial / tidal)**

Flood Zone 3a is defined as:

- Land within EA modelled fluvial flood risk extents predicted for up to and including 1 in 100 year return period events – **Flood Zone 3a (fluvial / tidal)**
- Land within EA modelled tidal flood risk extents predicted for up to and including 1 in 200 year return period events – **Flood Zone 3a (fluvial / tidal)**
- Land within EA modelled surface water flood risk extents predicted for up to and including 1 in 100 year return period events – **Flood Zone 3a (surface water)**

Flood Zone 3a has been split into '(fluvial / tidal)' and '(surface water)' within the Web Map, and the above definition explains which datasets have been used for each. Flood Zone 3a may exceed EA's Flood Map for Planning's Flood Zone 3 in some locations. This is due to differences in the modelling methodologies used to define fluvial and surface water flood risk mapped extents. It is for this reason why Flood Zone 3 does not equal Flood Zones 3a plus 3b.

Where Flood Zone 3a exceeds Flood Zone 3, Flood Zone 3a as defined by this document takes precedence and should be applied accordingly. It should also be noted that, Flood Zone 3a always includes land also defined as Flood Zone 3b. This is no different from how Flood Zone 2 incorporates land within Flood Zone 3. Sites within Flood Zone 3a and / or 3b as defined by this SFRA will be treated as if it were in Flood Zone 3 with regards to the needs of the NPPF, PPG and site-specific FRA submission requirements. Where a location is mapped to be within two or more Flood Zones, the requirements for the highest risk zone must be applied.

In line with nationally defined responsibilities for management of flood risk, applications will be assessed by the organisations defined as follows:

- Flood Zone 3a / 3b (fluvial / tidal): Environment Agency and for minor developments Local Planning Authority applying relevant Standing Advice
- Flood Zone 3a (surface water): Local Planning Authority only

This approach is consistent with existing statutory requirements and means that there is no change to the permitted development rights and policy requirements listed within the [Town and Country Planning \(General Permitted Development\) \(England\) Order 2015](#) as these only relate to the EA's Flood Zones 1, 2 and 3. For this reason, site-specific FRAs are still required for developments requiring prior approval (in relation to change of use permitted development rights) if located within EA Flood Zones 2 or 3.

The definition of Flood Zones 3a and 3b within this SFRA cannot amend the General Permitted Development policies without the adoption of an Article 4 Direction. Article 4 Directions are detailed on each Boroughs respective website and should be reviewed by applicants to ensure all requirements are met.

3.11.2 Interpretation - Approach

As noted in the previous section, areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain (Flood Zone 3b). The impact of flood defences has been accounted for in the definition of the Flood Zones in the previous section. This section provides clarification of interpretation of Flood Zones 3a and 3b where the land being considered for development is already occupied by infrastructure or solid buildings that influence the extent of the functional flood plain.

As required by [NPPF Paragraph 103](#), a site-specific FRA is required for all development proposals in Flood Zone 3 (the combination of Flood Zones 3a and 3b as defined in [Section 3.11.1](#)). The site-specific FRA must provide appropriate evidence to demonstrate which parts of the site are classified within Flood Zones 3a or 3b based on flood mapping and existing use. Any parts of the site that are mapped as being within Flood Zone 3b that are already occupied by infrastructure or solid buildings that provide a physical obstruction to existing flooding can be interpreted as being Flood Zone 3a. Any areas that do not meet this criterion should be interpreted as Flood Zone 3b. The use of this approach as a method for defining land exempt from Flood Zone 3b means that front and rear gardens are included within the functional floodplain when within Flood Zone 3b. Similarly, open spaces (defined in [Section 336 of the Town and Country Planning Act 1990](#)) are included within the functional floodplain where they have a level of risk probability of Flood Zone 3b.

The assessment process that should be used within the site-specific risk assessment to determine Flood Zones 3a / 3b within a development is recommended as follows:

1. **Identify Flood Zones:** Identify the extents of Flood Zone 3a and 3b within the site.
2. **Assess Current Risk:** Assess the interactions of existing infrastructure and / or solid building footprints with the Flood Zones (this can be done through comparison of existing flood mapping or undertaking appropriate flood risk modelling).
3. **Determine Functional Floodplain:** Determine areas acting as functional floodplain (this could include standing water and / or overland flow paths and assessment of flood depth where this information is available).
4. **Assess Development Impact:** Assess the impact of the proposed development on the functional floodplain (including the storage/flow route function of the land surrounding the proposed buildings) and associated potential change in flood risk on and off site.
5. **Assess Potential Mitigation:** Assess and select appropriate flood mitigation and resilience / risk reduction measures (using appropriate flood risk modelling techniques where required and recognising the predicted depth of flooding where this information is available).
Within Flood Zone 3b development should be directed to making use of the existing built footprint. No additional building footprint would be acceptable in within Flood Zone 3b.
6. **Determine Development Approach:** Based on evidence (including site specific flood risk modelling where required) and guidance below, determine if development could be possible on all or part of the site through resilience, mitigation and / or compensation.

Development may be possible within land classified as Flood Zone 3b (fluvial / tidal) when it is directed to the areas occupied by existing infrastructure or solid building footprint (which are not currently floodable). The proposals must provide mitigation and resilience against flood risks, must not increase flood risk elsewhere, and aim to provide an improvement to the current situation by reducing the levels of risk. Proposals will not be acceptable where they introduce additional development footprint outside the existing solid footprint areas. Where beneficial to flood risk and / or other planning requirements it may be possible for development to occur within the functional floodplain through the relocation (but not increase of footprint size) of an existing building's footprint within a site (taking advice from the Environment Agency as appropriate). To enable development, further guidance is provided in [Section 4](#) (including detailed requirements for Major, Minor and Change of Use / change to Prior Approvals development proposals) and [Standing Advice](#) is available online.

Potential development must still align to the PPG's [Flood Risk Vulnerability and Flood Zone Compatibility](#) table through not increasing the development's vulnerability. The applicant must submit evidence to demonstrate the application of the Sequential Test and the passing of the Exception Test as appropriate in those parts of the site classified as Flood Zone 3a.

4. Flood Risk Assessment Guidance

4.1. Overview

As stated within the [NPPF](#) and [PPG](#), developers and local authority planners need to consider flood risk to and from the development as part of planning proposals. To assess and demonstrate that the proposed development will not be at risk of flooding or increase flood risk elsewhere for all flood sources, a site-specific FRA and/or drainage strategy may be required. Development proposals should also aim to reduce local flood risk where possible through the implementation of SuDS and other water management measures. These key principles need to be applied at the strategic level for borough wide planning and at the site level for development proposals and site allocations.

Planning applications are required for development proposals to be considered. The relevant LPA will undertake a period of consultation to review the proposal, referring to internal and external consultees as required. Flood risk to and from the development must be considered as part of the planning proposals. If a site-specific FRA and/or drainage strategy is required, and is either not submitted or is deemed unsatisfactory, the LPA will refuse the application as providing satisfactory documentation is a national policy requirement.

Tables 4-1, 4-2, 4-3 and 4-4 provide requirements and considerations that must be addressed in flood risk and drainage strategy documents to demonstrate that a proposed development is appropriately flood resilient and resistant. *Tables 4-1, 4-2, and 4-3* cover planning application and development requirements for Major, Minor and Change of Use developments (including changes to prior approvals), respectively. *Table 4-4* provides the requirements for the assessment and management of flood risk from other sources where applicable. FRA Submission and Drainage Strategy Submission Checklists have been developed as part of this SFRA and have been designed to accompany the guidance presented in this section. Further guidance is available via the [PPG Site-specific FRA Checklist](#), the EA's [Standing Advice](#), and by contacting the relevant LPA or EA where required.

Further developer ([Section 4.2](#)), developer management ([Section 4.3](#)) and planning policy ([Section 4.4](#)) specific guidance regarding flood risk assessment is available in this section. Information regarding the Sequential Test, Exception Test, SuDS, site-specific FRAs and drainage strategies is covered, accompanying the information presented in the tables below.

Table 4-1. Planning Application and Development Requirements for **Major Developments** (Flood Zones 1, 2, 3a and 3b)

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
Planning Permission and Permitted Developments	Planning permission is required if the work being carried out meets the Section 55 of the Town and Country Planning Act 1990 definition of a 'development'. Section 57 of the Town and Country Planning Act 1990 states that all work falling under this statutory definition of 'development' requires planning permission unless it meets permitted development criteria.			
Documentation Requirements and Considerations	The information supplied in a site-specific FRA and / or drainage strategy for any development should be proportionate to the identified flood risks and appropriate to the scale, nature and location of the development. Major developments are large in scale so all flood risk assessment documentation should reflect their size and impact.			
Sequential and Exception Tests <i>(Refer to Section 4.2 for guidance on application of these at the strategic and site-specific scales)</i>	<p>The undeveloped Functional Floodplain should be protected. Redevelopment may be supported if there is a net flood risk reduction. Proposed redevelopment should not be permitted if the change results in an intensification of use or places the development in a higher PPG vulnerability category, unless allocated through a development plan.</p> <p>No form of new development should be permitted unless it is water-compatible development or essential utility infrastructure, as defined by the PPG. Development may also be permitted if it is within the curtilage of a developed site and would not increase (but ideally reduce) flood risk as part of a wider development. This is applicable for sites where there is no overall increase in the total area of footprint of structures within what would otherwise be functional floodplain. Paragraph 15 of the PPG states: <i>"If an area is intended to flood, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often." Development can only be permitted following application of the Sequential Test, and a successful application of the Exception Test."</i></p>	<p>Developments within Flood Zone 3a can only be considered following applications of the Sequential and Exception Tests.</p> <p>Developments classified as 'Highly Vulnerable' should not be permitted under any circumstances.</p>	<p>Developments within Flood Zone 2 can only be considered following applications of the Sequential and Exception Tests.</p>	<p>The Sequential Test only needs to be applied for development proposals in Flood Zone 1 if the SFRA and accompanying Web Map indicates there may be existing flood issues from other sources (refer Table 4-4) or flood issues in the future. This information may also come from other sources.</p>
Site-specific FRA	<p>The Flood Risk Vulnerability and Flood Zone Compatibility table in the PPG highlights that only 'Essential Infrastructure' and 'Water Compatible' developments may be granted planning permission. Site-specific FRAs in Flood Zone 3b must also demonstrate that:</p> <ul style="list-style-type: none"> - Infrastructure will remain safe and operational for users during flood periods. - The development will not impede flowing water. - There will be no net loss of floodplain storage (see the 'Flood Compensation Storage' section in this table). - Flood mitigation measures will reduce the overall flood risk of the site. 	<p>The Flood Risk Vulnerability and Flood Zone Compatibility table in the PPG highlights that 'Highly Vulnerable' land uses should not be permitted in this Flood Zone.</p> <p>Site-specific FRAs in Flood Zone 3a must also demonstrate that there will be no net loss of floodplain</p>	<p>Assessment needs to demonstrate the reduction of flood risk at the site through various mitigation techniques. Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime.</p>	<p>Flood risk from all sources should be assessed, including the potential impacts of climate change over the development's lifetime. The EA's 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak</p>

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
	<p>Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>storage (see the 'Flood Compensation Storage' section in this table). Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>rainfall intensities.</p>
<p>Where a site-specific FRA is required, predicted flood depths should be analysed and appropriately mitigated. Mitigation may include (but not be limited to) flood resistance measures (where predicted flood depths are less than 0.3m) or flood resilience measures (where predicted flood depths are greater than 0.6m). Predicted flood depths between 0.3m and 0.6m should be analysed on a case-by-case basis to determine if resistance measures are sufficient. Design plans should show floor levels (relative to Ordnance Datum) and predicted flood depths.</p>				
<p>Drainage Strategy & SuDS</p>	<p>The drainage strategy requires information on the proposed SuDS and surface water runoff discharge destination in line with Policy 5.13 of the London Plan. It also requires supporting calculations on the greenfield and proposed development's peak discharge rates and water storage volumes for different rainfall events. These calculations need to ensure that proposed developments are designed to the Non-statutory technical standards for sustainable drainage systems.</p> <p>Where the SuDS Suitability Mapping indicates that infiltration based SuDS are potentially suitable or uncertain, the drainage strategy must investigate the use of infiltration techniques through site-specific infiltration testing or bore hole records. This level of evidence must be provided to justify use of any non-infiltration based surface water management techniques. A Drainage Strategy Submission Checklist and SuDS / Drainage Assessment Form where appropriate (as described in Section 4.2.4) should be provided with the application. SuDS need to be designed with the landscape features of the development site in mind, maximising additional benefits including, but not limited to, environmental, water quality and amenity enhancement.</p> <p>Permission to connect to the local sewer network and pipes should be sought from the relevant Water and Sewerage Company. Evidence demonstrating that an agreement in principle for any proposed new sewer connections has been reached must be provided as part of the drainage strategy. Failure to do so could impact the detailed design and overall drainage strategy for the site.</p>			

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
Basements	Basements should not be permitted in Flood Zone 3b.	Basement dwellings are categorised as "Highly vulnerable" infrastructure by the PPG and therefore should not be permitted in Flood Zone 3a. Other new basement developments are restricted to Less Vulnerable / Water Compatible uses only. All basement rooms must have internal access and egress to a higher floor above the design flood level which can be utilised as part of emergency evacuation procedures. As part of any assessment, evidence needs to be submitted to confirm the local water table level.	If both criteria of the Exception Test are satisfied, "Highly vulnerable" new basement dwellings may be permitted for development in Flood Zone 2. The same rule applies to basement dwelling redevelopment works such as extensions and conversions. All basement rooms must have internal access and egress to a higher floor above the design flood level which can be utilised as part of emergency evacuation procedures. As part of any assessment, evidence needs to be submitted to confirm the local water table level.	Where there is evidence of flood risk from surface water, groundwater and / or sewer flooding in the area, a site-specific FRA is required for new and existing basement dwelling proposals (refer <i>Table 4-4</i>). Flood mitigation measures for these sites are required to demonstrate that the development will not be impacted by flooding, or have any adverse impacts on flooding locally during a 1 in 100 year event. As part of any assessment, evidence needs to be submitted to confirm the local water table level.
Flood Compensation Storage	If permissible development decreases the volume of a fluvial floodplain or surface water flood area, flood storage compensation needs to be provided. The compensatory storage provided must equal or exceed the storage lost to ensure there will be no net loss of flood storage. Where developments are proposed within Flood Zone 3a (surface water), floodplain compensation must account for predicted flood depths for the 1 in 30yr and 1 in 100yr RoFSW mapping or depths predicted by site specific modelling.		N/A	N/A
Emergency Planning	Flood Warning and Emergency Plans need to feature measures to manage flood risk before, during, and after a flood, reducing the potential human impact of any flood event and making developments as resilient to flooding as possible. These plans need to be detailed and up-to-date, addressing the risks local to the site. The PPG highlights several important considerations, helping to define some key requirements including: <ul style="list-style-type: none"> - Details of all the flood risk sources present at the site development site. - Adequate flood warning procedures for people accessing the development. - Potential mitigation measures following an assessment of the risks, including appropriate flood resistance or resilience measures to address predicted flood depths. 			

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
	<p>- Information regarding safe access and egress points across the site, ensuring that they remain so during flooding. These points need to be maintained over the development's lifetime.</p> <p>- Suitable evacuation plans that consider the impact of climate change. These evacuation plans need to feature adequate routes and refuge areas for people to be taken to, accounting for the potential length of time of the evacuation.</p> <p>Where the site is encircled (on a 'dry island' surrounded by flooding) but not necessarily at high risk itself, an emergency plan must still address this risk and provide appropriate management measures. If the planning application is permitted, the onus to train, test and implement the stated measures become the responsibility of the applicant and ultimately the building owner or management company.</p>			
	PPG defined 'Essential Infrastructure' needs to remain operational and safe in times of flood. Emergency Plans need to reflect this as these structures may assist in flooding evacuations.	-	-	-
Residual Risk	As part of the second criteria of the Exception Test, there is a requirement to show that proposed developments are safe and that any residual risks can be satisfactorily overcome. Residual risk should be mitigated through flood resilient / resistant designs and emergency planning to make sure the proper measures are in place to offer protection.			
Main River Buffer Zone	Developments sites within specified distances of main rivers may require a flood risk activity permit in addition to planning permissions. For non-tidal main rivers, flood risk activity permits may be required if development sites are within 8 metres of a river, flood defence structure or culvert. For tidal main rivers, flood risk activity permits may be required if development sites are within 16 metres of a river, flood defence structure or culvert. Further details on flood risk activity permits are available from the Environment Agency .			
Ordinary Watercourse Buffer Zone	Development sites within specified distances of ordinary watercourses may require an approved ordinary watercourse consent in addition to planning permissions. The consent, a variation of Section 23 of the Land Drainage Act 1991 , is regulated and work enforced by LLFAs and distances tend to vary by Borough. Further details on ordinary watercourse consents are available from LLFAs.			

Table 4-2. Planning Application and Development Requirements for **Minor Developments** (Flood Zones 1, 2, 3a and 3b)

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
Planning Permission and Permitted Developments	Planning permission is required if the work being carried out meets the Section 55 of the Town and Country Planning Act 1990 definition of a 'development'. Section 57 of the Town and Country Planning Act 1990 states that all work falling under this statutory definition of 'development' requires planning permission unless it meets permitted development criteria.			
Documentation Requirements and Considerations	<p>The information supplied in a site-specific FRA and / or drainage strategy for any development should be proportionate to the identified flood risks and appropriate to the scale, nature and location of the development. For the purposes of the planning applications and development requirements listed in this table, Minor developments within the flood risk management context are developments which are not classified as Major and:</p> <ul style="list-style-type: none"> ○ impact the flood plain and / or ○ impact the footprint of the building(s) and / or ○ development within the curtilage of an existing dwelling <p>The size of a Minor development is always smaller than that of a Major development, often significantly so. All flood risk assessment documentation should reflect this difference, whilst ensuring their all applicable key requirements detailed in this table are met.</p>			
Sequential and Exception Tests <i>(Refer to Section 4.2 for guidance on application of these at the strategic and site-specific scales)</i>	<p>Minor developments need to follow the Sequential and Exception Test guidance below if they do any of the following:</p> <ul style="list-style-type: none"> - Introduce a new householder building structure to the site (e.g. sheds and garages) - Impact the footprint of the existing building(s) - Introduce non-residential extensions greater than 250 square meters 			
	<p>The undeveloped Functional Floodplain should be protected.</p> <p>Redevelopment may be supported if there is a net flood risk reduction. Proposed redevelopment should not be permitted if the change results in an intensification of use or places the development in a higher vulnerability category, unless allocated through a development plan.</p> <p>No form of new development should be permitted unless it is water-compatible development or essential utility infrastructure, as defined by the PPG. Development may also be permitted if it is within the curtilage of a developed site and would not increase (but ideally reduce) flood risk as part of a wider development. This is applicable for sites where there is no overall increase in the total area of footprint of structures within what would otherwise be functional floodplain.</p> <p>Paragraph 15 of the PPG states: <i>"If an area is intended to flood, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often."</i> Development can only be permitted</p>	<p>Developments within Flood Zone 3a can only be considered following applications of the Sequential and Exception Tests.</p> <p>Developments classified as 'Highly Vulnerable' should not be permitted under any circumstances.</p>	<p>Developments within Flood Zone 2 can only be considered following applications of the Sequential and Exception Tests.</p>	<p>The Sequential Test only needs to be applied for development proposals in Flood Zone 1 if the SFRA and accompanying Web Map indicates there may be flood issues from other sources (refer Table 4-4) or flood issues in the future. This information may also come from other sources.</p>

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
	<i>following application of the Sequential Test, and a successful application of the Exception Test.”</i>			
Site-specific FRA	<p>The Flood Risk Vulnerability and Flood Zone Compatibility table in the PPG highlights that only 'Essential Infrastructure' and 'Water Compatible' developments may be granted planning permission. Site-specific FRAs in Flood Zone 3b must also demonstrate that:</p> <ul style="list-style-type: none"> - Infrastructure will remain safe and operational for users during flood periods. - The development will not impede flowing water. - There will be no net loss of floodplain storage (see the 'Flood Compensation Storage' section in this table). - Flood mitigation measures will reduce the overall flood risk of the site. <p>Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA's 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>The Flood Risk Vulnerability and Flood Zone Compatibility table in the PPG highlights that 'Highly Vulnerable' land uses should not be permitted in this Flood Zone.</p> <p>Site-specific FRAs in Flood Zone 3a must also demonstrate that there will be no net loss of floodplain storage (see the 'Flood Compensation Storage' section in this table).</p> <p>Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA's 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>Assessment needs to demonstrate the reduction of flood risk at the site through various mitigation techniques.</p> <p>Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA's 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>A site-specific FRA are required for new Minor developments in if other sources of flooding, other than fluvial and tidal flooding, may impact the development. All Minor developments within EA identified critical drainage problem areas will require a site-specific FRA (<i>note that there are currently no areas that fall within EA critical drainage problem areas in the study area</i>).</p> <p>The EA's 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>
	Where a site-specific FRA is required, predicted flood depths should be analysed and appropriately mitigated. Mitigation may include (but not be limited to) flood resistance measures (where predicted flood depths are less than 0.3m) or flood resilience measures (where predicted flood depths are greater than 0.6m). Predicted flood depths between 0.3m and 0.6m should be analysed on a case-by-case basis to determine if resistance measures are sufficient. Design plans should show floor levels (relative to Ordnance Datum) and predicted flood depths.			
Drainage Strategy & SuDS	<p>A drainage strategy is required for all Minor developments which modify existing surface water drainage. Strategies must be proportional to the scale of the development.</p> <p>The drainage strategy requires information on the proposed SuDS and surface water runoff discharge destination in line with Policy 5.13 of the London Plan. It also requires supporting calculations on the greenfield and proposed development's peak discharge rates and water storage volumes for different rainfall events. These calculations need to ensure that proposed developments are designed to the Non-statutory technical standards for sustainable</p>			

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
	<p>drainage systems.</p> <p>Reference should be made to the SuDS Suitability Mapping available in each borough’s SWMP to determine the potential of implementing infiltration-based SuDS. Where applicable, the drainage strategy must investigate the use of infiltration techniques through site-specific infiltration testing or bore hole records. This level of evidence must be provided to justify use of any non-infiltration based surface water management techniques. A Drainage Strategy Submission Checklist and SuDS / Drainage Assessment Form where appropriate (as described in Section 4.2.4) should be provided with the application. SuDS need to be designed with the landscape features of the development site in mind, maximising additional benefits including, but not limited to, environmental, water quality and amenity enhancement.</p> <p>Permission to connect to the local sewer network and pipes should be sought from the relevant Water and Sewerage Company. Evidence demonstrating that an agreement in principle for any proposed new sewer connections has been reached must be provided as part of the drainage strategy. Failure to do so could impact the detailed design and overall drainage strategy for the site.</p>			
Basements	<p>Basements should not be permitted in Flood Zone 3b.</p>	<p>Basement dwellings are categorised as "Highly vulnerable" infrastructure by the PPG and therefore should not be permitted in Flood Zone 3a. Other new basement developments are restricted to Less Vulnerable / Water Compatible uses only. All basement rooms must have internal access and egress to a higher floor above the design flood level which can be utilised as part of emergency evacuation procedures. As part of any assessment, evidence needs to be submitted to confirm the local water table level.</p>	<p>If both criteria of the Exception Test are satisfied, "Highly vulnerable" new basement dwellings may be permitted for development in Flood Zone 2. The same rule applies to basement dwelling redevelopment works such as extensions and conversions. All basement rooms must have internal access and egress to a higher floor above the design flood level which can be utilised as part of emergency evacuation procedures. As part of any assessment, evidence needs to be submitted to confirm the local water table level.</p>	<p>Where there is evidence of flood risk from surface water, groundwater and / or sewer flooding in the area, a site-specific FRA is required for new and existing basement dwelling proposals (refer Table 4-4). Flood mitigation measures for these sites are required to demonstrate that the development will not be impacted by flooding, or have any adverse impacts on flooding locally during a 1 in 100 year event. As part of any assessment, evidence needs to be submitted to confirm the local water table level.</p>

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
Flood Compensation Storage	If permissible development decreases the volume of a fluvial floodplain or surface water flood area, flood storage compensation must be provided. The compensatory storage provided must equal or exceed the storage lost to ensure there will be no net loss of flood storage. Where developments are proposed within Flood Zone 3a (surface water), floodplain compensation must account for predicted flood depths for the 1 in 30yr and 1 in 100yr RoFSW mapping or depths predicted by site specific modelling.		N/A	N/A
Emergency Planning	<p>Required as part of a site-specific FRA, drainage strategy, or as part of the second requirement of the Exception Test. If it can be demonstrated that none of these requirements is necessary for the Minor development, then Emergency Planning is not required. Other Minor developments are required to follow the Emergency Planning guidance below.</p> <p>Flood Warning and Emergency Plans need to feature measures to manage flood risk before, during, and after a flood, reducing the potential human impact of any flood event and making developments as resilient to flooding as possible. These plans need to be detailed and up-to-date, addressing the risks local to the site. The PPG highlights several important considerations, helping to define some key requirements including:</p> <ul style="list-style-type: none"> - Details of all the flood risk sources present at the site development site. - Adequate flood warning procedures for people accessing the development. - Potential mitigation measures following an assessment of the risks, including appropriate flood resistance or resilience measures to address predicted flood depths. - Information regarding safe access and egress points across the site, ensuring that they remain so during flooding. These points need to be maintained over the development's lifetime. - Suitable evacuation plans that consider the impact of climate change. These evacuation plans need to feature adequate routes and refuge areas for people to be taken to, accounting for the potential length of time of the evacuation. <p>Where the site is encircled (on a 'dry island' surrounded by flooding) but not necessarily at high risk itself, an emergency plan must still address this risk and provide appropriate management measures. If the planning application is permitted, the onus to train, test and implement the stated measures become the responsibility of the applicant and ultimately the building owner or management company.</p>			
	PPG defined 'Essential Infrastructure' needs to remain operational and safe in times of flood. Emergency Plans need to reflect this as these structures may assist in flooding evacuations.	-	-	
Residual Risk	As part of the second criteria of the Exception Test, there is a requirement to show that proposed developments are safe and that any residual risks can be satisfactorily overcome. Residual risk should be mitigated through flood resilient / resistant designs and emergency planning to make sure the proper measures are in place to offer protection.			
Main River Buffer Zone	Developments sites within specified distances of main rivers may require a flood risk activity permit in addition to planning permissions. For non-tidal main rivers, flood risk activity permits may be required if development sites are within 8 metres of a river, flood defence structure or culvert. For tidal main rivers, flood risk activity permits may be required if development sites are within 16 metres of a river, flood defence structure or culvert. Further details on flood risk activity permits are available from the Environment Agency .			
Ordinary Watercourse Buffer Zone	Development sites within specified distances of ordinary watercourses may require an approved ordinary watercourse consent in addition to planning permissions. The consent, a variation of Section 23 of the Land Drainage Act 1991 , is regulated and work enforced by LLFAs and distances tend to vary by Borough. Further details on ordinary watercourse consents are available from LLFAs.			

Table 4-3. Planning Application and Development Requirements for **Change of Use** Developments and **Changes to Prior Approvals** (Major and Minor - Flood Zones 1, 2, 3a and 3b)

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
Planning Permission and Permitted Developments	Planning permission is required if the work being carried out meets the Section 55 of the Town and Country Planning Act 1990 definition of a 'development'. Section 57 of the Town and Country Planning Act 1990 states that all work falling under this statutory definition of 'development' requires planning permission unless it meets permitted development criteria.			
Documentation Requirements and Considerations	The information supplied in a site-specific FRA and / or drainage strategy for any development should be proportionate to the identified flood risks and appropriate to the scale, nature and location of the development. Change of use (or change to a prior approval) can be operational transformations of existing buildings and developments, or redevelopments which could change the Flood risk vulnerability classification of the development. Change of use are often contained within existing developments and do not impact the footprint of the building(s), though they may impact the landscape of the development. Where required, all flood risk assessment documentation for change of use developments should be proportional to the scale of the works. The key requirements detailed in this table should be met where applicable. Change in use restrictions may be in place in certain areas. This may be influenced by the increase in flood risk that the development's vulnerability classification change may bring. For further information, seek advice from the LPA.			
Sequential and Exception Tests <i>(Refer to Section 4.2 for guidance on application of these at the strategic and site-specific scales)</i>	Changes of use developments that are not classified as ' material change of use ', except for a change of use to a caravan, a mobile home or park home site, or to a camping or chalet site, do not need to apply the Sequential and Exception Tests for the proposed site. The undeveloped Functional Floodplain should be protected. Redevelopment may be supported if there is a net flood risk reduction. Proposed redevelopment should not be permitted if the change results in an intensification of use or places the development in a higher PPG vulnerability category, unless allocated through a development plan. No form of new development should be permitted unless it is water-compatible development or essential utility infrastructure, as defined by the PPG. Development may also be permitted if it is within the curtilage of a developed site and would not increase (but ideally reduce) flood risk as part of a wider development. This is applicable for sites where there is no overall increase in the total area of footprint of structures within what would otherwise be functional floodplain. Paragraph 15 of the PPG states: " <i>If an area is intended to flood, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often.</i> " Development can only be permitted following application of the Sequential Test,	Developments within Flood Zone 3a can only be considered following applications of the Sequential and Exception Tests. Developments classified as 'Highly Vulnerable' should not be permitted under any circumstances.	Developments within Flood Zone 2 can only be considered following applications of the Sequential and Exception Tests.	The Sequential Test only needs to be applied for development proposals in Flood Zone 1 if the SFRA and accompanying Web Map indicates there may be existing flood issues from other sources (refer Table 4-4) or flood issues in the future. This information may also come from other sources.

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
<p>Site-specific FRA</p>	<p><i>and a successful application of the Exception Test.”</i></p> <p>The Flood Risk Vulnerability and Flood Zone Compatibility table in the PPG highlights that only 'Essential Infrastructure' and 'Water Compatible' developments may be granted planning permission. Site-specific FRAs in Flood Zone 3b must also demonstrate that:</p> <ul style="list-style-type: none"> - Infrastructure will remain safe and operational for users during flood periods. - The development will not impede flowing water. - There will be no net loss of floodplain storage (see the 'Flood Compensation Storage' section in this table). - Flood mitigation measures will reduce the overall flood risk of the site. <p>Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>The Flood Risk Vulnerability and Flood Zone Compatibility table in the PPG highlights that 'Highly Vulnerable' land uses should not be permitted in this Flood Zone. Site-specific FRAs in Flood Zone 3a must also demonstrate that there will be no net loss of floodplain storage (see the 'Flood Compensation Storage' section in this table). Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>Assessment needs to demonstrate the reduction of flood risk at the site through various mitigation techniques. Flood risk from all sources should be assessed, including the potential impacts of climate change over the developments lifetime. The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>	<p>A site-specific FRA is not required for change of use developments in Flood Zone 1 unless the development is being changed to a more vulnerable class. It is also required if it is identified that other sources of flooding, other than fluvial and tidal flooding, may impact the development. All minor developments within EA identified critical drainage problem areas (<i>there are currently no areas that fall within this bracket in the study area</i>) will require a site-specific FRA. The EA’s 2016 climate change allowances must be used when assessing peak river flows, sea level rises and peak rainfall intensities.</p>
	<p>Where a site-specific FRA is required, predicted flood depths should be analysed and appropriately mitigated. Mitigation may include (but not be limited to) flood resistance measures (where predicted flood depths are less than 0.3m) or flood resilience measures (where predicted flood depths are greater than 0.6m). Predicted flood depths between 0.3m and 0.6m should be analysed on a case-by-case basis to determine if resistance measures are sufficient. Design plans should show floor levels (relative to Ordnance Datum) and predicted flood depths.</p>			
<p>Drainage Strategy & SuDS</p>	<p>Change of use developments that do not have a bearing on a site’s existing drainage regime do not need to provide a drainage strategy as part of the development proposal. All other change of use proposals are required to follow the ‘Drainage Strategy & SuDS’ requirements listed below.</p> <p>The drainage strategy requires information on the proposed SuDS and surface water runoff discharge destination in line with Policy 5.13 of the London Plan. It also requires supporting calculations on the greenfield and proposed development's peak discharge rates and water storage volumes for different rainfall events. These calculations need to ensure that proposed developments are designed to the Non-statutory technical standards for sustainable drainage systems.</p>			

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
	<p>Reference should be made to the SuDS Suitability Mapping available in each borough’s SWMP to determine the potential of implementing infiltration-based SuDS. Where applicable, the drainage strategy must investigate the use of infiltration techniques through site-specific infiltration testing or bore hole records. This level of evidence must be provided to justify use of any non-infiltration based surface water management techniques. A Drainage Strategy Submission Checklist and SuDS / Drainage Assessment Form where appropriate (as described in Section 4.2.4) should be provided with the application. SuDS need to be designed with the landscape features of the development site in mind, maximising additional benefits including, but not limited to, environmental, water quality and amenity enhancement.</p> <p>Permission to connect to the local sewer network and pipes should be sought from the relevant Water and Sewerage Company. Evidence demonstrating that an agreement in principle for any proposed new sewer connections has been reached must be provided as part of the drainage strategy. Failure to do so could impact the detailed design and overall drainage strategy for the site.</p>			
Basements	<p>Basements should not be permitted in Flood Zone 3b.</p>	<p>Basement dwellings are categorised as "Highly vulnerable" infrastructure by the PPG and therefore should not be permitted in Flood Zone 3a. Other new basement developments are restricted to Less Vulnerable / Water Compatible uses only. All basement rooms must have internal access and egress to a higher floor above the design flood level which can be utilised as part of emergency evacuation procedures. As part of any assessment, evidence needs to be submitted to confirm the local water table level.</p>	<p>If both criteria of the Exception Test are satisfied, "Highly vulnerable" new basement dwellings may be permitted for development in Flood Zone 2. The same rule applies to basement dwelling redevelopment works such as extensions and conversions. All basement rooms must have internal access and egress to a higher floor above the design flood level which can be utilised as part of emergency evacuation procedures. As part of any assessment, evidence needs to be submitted to confirm the local water table level.</p>	<p>Where there is evidence of flood risk from surface water, groundwater and / or sewer flooding in the area, a site-specific FRA is required for new and existing basement dwelling proposals (refer Table 4-4). Flood mitigation measures for these sites are required to demonstrate that the development will not be impacted by flooding, or have any adverse impacts on flooding locally during a 1 in 100 year event. As part of any assessment, evidence needs to be submitted to confirm the local water table level.</p>
Flood Compensation Storage	<p>If permissible development decreases the volume of a fluvial floodplain or surface water flood area, flood storage compensation needs to be provided. The compensatory storage provided must equal or exceed the storage lost to ensure there will be no net loss of flood storage. Where developments are proposed within Flood Zone 3a (surface water),</p>		N/A	N/A

Requirement Area	Flood Zone 3b	Flood Zone 3a	Flood Zone 2	Flood Zone 1
	floodplain compensation must account for predicted flood depths for the 1 in 30yr and 1 in 100yr RoFSW mapping or depths predicted by site specific modelling.			
Emergency Planning	Required as part of a site-specific FRA, drainage strategy, or as part of the second requirement of the Exception Test. If it is demonstrated that none of these requirements is necessary for the change of use development planning application, then Emergency Planning is not required. Other change of use development proposals are required to follow the Emergency Planning guidance below.			
	Flood Warning and Emergency Plans need to feature measures to manage flood risk before, during, and after a flood, reducing the potential human impact of any flood event and making developments as resilient to flooding as possible. These plans need to be detailed and up-to-date, addressing the risks local to the site. The PPG highlights several important considerations, helping to define some key requirements including:			
	<ul style="list-style-type: none"> - Details of all the flood risk sources present at the site development site. - Adequate flood warning procedures for people accessing the development. - Potential mitigation measures following an assessment of the risks, including appropriate flood resistance or resilience measures to address predicted flood depths. - Information regarding safe access and egress points across the site, ensuring that they remain so during flooding. These points need to be maintained over the development's lifetime. - Suitable evacuation plans that consider the impact of climate change. These evacuation plans need to feature adequate routes and refuge areas for people to be taken to, accounting for the potential length of time of the evacuation. Where the site is encircled (on a 'dry island' surrounded by flooding) but not necessarily at high risk itself, an emergency plan must still address this risk and provide appropriate management measures. If the planning application is permitted, the onus to train, test and implement the stated measures become the responsibility of the applicant and ultimately the building owner or management company. 			
	PPG defined 'Essential Infrastructure' needs to remain operational and safe in times of flood. Emergency Plans need to reflect this as these structures may assist in flooding evacuations.		-	-
Residual Risk	Required as part of the second requirement of the Exception Test. The proposed development needs to demonstrate that it is safe and that any residual risks can be satisfactorily overcome. Residual risk should be mitigated through flood resilient / resistant designs and emergency planning to make sure the proper measures are in place to offer protection.			
Main River Buffer Zone	Developments sites within specified distances of main rivers may require a flood risk activity permit in addition to planning permissions. For non-tidal main rivers, flood risk activity permits may be required if development sites are within 8 metres of a river, flood defence structure or culvert. For tidal main rivers, flood risk activity permits may be required if development sites are within 16 metres of a river, flood defence structure or culvert. Further details on flood risk activity permits are available from the Environment Agency .			
Ordinary Watercourse Buffer Zone	Development sites within specified distances of ordinary watercourses may require an approved ordinary watercourse consent in addition to planning permissions. The consent, a variation of Section 23 of the Land Drainage Act 1991 , is regulated and work enforced by LLFAs and distances tend to vary by Borough. Further details on ordinary watercourse consents are available from LLFAs.			

Table 4-4. Planning Application and Development Requirements for Individual Sites (Other Flood Risk Sources)

Flood Risk Source	Planning Application and Development Requirements
Groundwater Flooding	<p>Required for all Minor and Major development proposals where there is a risk of groundwater flooding. Where the development site intersects with an area with $\geq 25\%$ susceptibility to groundwater flooding, the applicant should address this issue by providing a Screening Assessment (as a minimum) that either confirms low risk of impacts (and therefore no further work is needed) or advises the level of impact and the associated mitigation actions proposed.</p> <p>The assessment must be prepared by an individual who is a Hydrogeologist and holds one or more of the following qualifications:</p> <ul style="list-style-type: none"> Chartered Member of the Geological Society Registered Ground Engineering Professional (with the Institute of Civil Engineers) <p>Where the development includes a basement the Screening Assessment must include the following as a minimum requirement:</p> <ul style="list-style-type: none"> Description of the proposed basement development. Construction methods proposed. Characteristics of potential impacts (including the impact on soils, land use, water quality and hydrology with descriptions of the nature & scale of impacts and the extent of the impacted area). Details of mitigation measures (where appropriate).
Sewer Flooding	<p>Where the development site intersects with an area defined as having one or more sewer flooding records, the applicant must consult with the relevant Water and Sewerage Company to confirm if the development site has historically flooded. Where historic flooding has occurred, the applicant must show how they will effectively manage this risk for the lifetime of the development. This is required for all Minor and Major development proposals. Where the site is not at risk, the applicant must demonstrate that Water and Sewerage Company has agreed in principle to any proposed new sewer connections.</p>
Artificial Sources Flooding – Canals	<p>Required for all Minor and Major development proposals. If the application site is within 100m of an existing canal, the applicant must assess if any failure of the canal structure could result in flooding of the development site. This only requires a comparison of relative levels of the canal structure and the site – however, if the site is potentially at risk, then the applicant will consult with the Canal & River Trust to determine the condition of the local structure and propose proportionate management measures within their site (similar to residual risk management measures outlined in Tables 4-1, 4-2 and 4-3).</p>
Artificial Sources Flooding – Reservoirs	<p>Required for all Minor and Major development proposals at risk of flooding from reservoirs. Where the application site intersects the area defined to be at risk of flooding from reservoirs, the applicant shall:</p> <ul style="list-style-type: none"> Identify which reservoirs are the sources of risk (available from the adjacent link). Where the site is encircled by flood water, but not necessarily at risk itself, the implications of this must be addressed in the risk management measures proposed. Propose appropriate and proportionate risk management measures.
Artificial Sources Flooding – Other	<p>Other sources of artificial flood risk may include small lakes or ponds. Where these exist within or immediately adjacent to the development site, the applicant shall identify them and propose risk management measures as appropriate. This is required for all Minor and Major development proposals.</p>

The information presented in [Tables 4-1, 4-2, 4-3 and 4-4](#) are a mixture of legislative and best-practice requirements from various sources, including the [NPPF](#), [PPG](#), and [London Plan](#). The requirements presented in this table may change over time. Please consult the relevant LPA if you are unsure on matters relating to any of the requirement areas outlined in this table.

4.2. Developer Guidance

This sub-section provides developer specific guidance on a range of key requirements to ensure that development proposals are compliant. The guidance accompanies the information presented in the tables in Section 4.1.

4.2.1. Application of the Sequential and Exception Tests

Implementation of a sequential, risk-based approach is vital in determining the suitability of a site for development with regards to flood risk. For proposed development sites that require the application of the Sequential Test, and in some instances, the Exception Test, this document, and the [Web Maps](#), provide the basis for applying these tests at a site-specific level.

Proposed development sites within multiple flood risk zones are classed under the highest Flood Zone present on site. For example, a site that partly falls under Flood Zone 1 and Flood Zone 2 is formally classified as a site in Flood Zone 2. The Flood Zone that each proposed site falls under helps inform the approach needed for the site and the information required for the planning application. The Sequential Test will need to be applied to steer the entire proposed site to the areas with the lowest risk of flooding. If the Exception Test is required, application is based on the highest flood risk zone the site is in and will need to be passed for the planning application.

Sequential Test

The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. For sites that require it, but have not undergone Sequential Testing as part of the site allocations identified in the Borough's Local Plan, a site-specific Sequential Test is required. The search area and definition of reasonable available alternative sites must be determined in line with the guidance below in consultation with the relevant LPA. The Scope is not limited to, but should include the following, and any scope should be shared with the LPA for review and agreement prior to the Test being undertaken.

- **Search Area:** The default area should be the whole of the LPA area in question. This can be reduced where justified by the functional requirements of the development or relevant objectives of the Local Plan. Examples of these include:
 - Functional requirements – Industrial or infrastructure developments that may service an area wider than the LPA.
 - Local plan objectives – Regeneration of a specific area may be targeted and the proposed development type may meet the needs of the specified regeneration area.
- **Reasonable available sites:** These generally include sites that are suitable (can accommodate the requirements of the proposed development), developable and deliverable. Sources of where these could be selected from include the following:
 - List of sites prepared as part of the evidence base or background documents produced to inform the Local Plan.

- Sites listed under a Local Authority's brownfield land register, which contains information on previously developed sites that are considered to be appropriate for residential development. This includes sites with and without planning permission.

Exception Test

Following the application of the Sequential Test, if it is determined that the proposed development cannot be located in an area with a lower probability of flooding, the Exception Test should be applied. The Exception Test is designed to help ensure that flood risk to both people and property will be managed across the lifetime of the proposed development. To pass the Exception Test, the PPG sets out two considerations that need to be achieved. Both considerations will need to be satisfactorily demonstrated to the LPA for development to be allocated or permitted. These considerations are:

- The development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A site-specific FRA 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.

To satisfy the Exception Test, a sustainability appraisal or evidence demonstrating the development proposal's sustainability benefits should be provided. A sustainability appraisal should demonstrate the evidence of the wider sustainability benefits that the development would bring at that specific site. This may include evidence demonstrating how the proposed development meets the objectives set out in the sustainability appraisal of the Local Plan, or evidence demonstrating policy compliance regarding affordable housing or defined housing needs for the area. In addition, the planning and design of the development needs to demonstrate that the site will remain safe and operational during a flood event. This may involve:

- Designing buildings to avoid flooding by, for example, raising floor levels.
- Implementing resilient and / or resistant features to reduce the impact of a flood. For example, resilient features, such as installing electrical equipment above flood level, are designed to ensure the internal elements of a property to be recovered as quickly and as cost effectively as possible. Flood resistant features, such as installing flood doors and barriers, are designed to ensure water stays out of a property up to a given height.
- Utilising SuDS as a priority.
- Mitigating the potential impacts of flooding through design (for example ensuring more vulnerable development lies in less at-risk parts of a site) and flood resilient and resistant construction.
- Developing emergency evacuation procedures. Flood warnings and / or flood alerts (these are included in the [*Web Map*](#)) need to be considered along with the emergency evacuation procedures in the design and layout of the proposed development.
- Leaving space in developments for flood risk management infrastructure to be maintained and enhanced.
- Providing adequate flood risk management infrastructure which will be maintained for the lifetime of the development.

The PPG [Flood Risk Vulnerability and Flood Zone Compatibility](#) table sets out some circumstances where the Exception Test will need to be applied following the Sequential Test.

4.2.2. Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) incorporate a range of measures and management techniques designed to manage surface water runoff. All new developments should incorporate SuDS in line with the [Non-statutory technical standards for sustainable drainage systems](#), unless there are practical and justifiable reasons for why they are not appropriate. The [PPG](#) highlights that the final decision on whether SuDS are truly inappropriate for a particular development proposal is a matter of judgement for the LPA.

The SuDS measures should aim to achieve greenfield runoff rates, providing management and attenuation features that ensure that surface water runoff is managed as close to the source as possible. Greenfield runoff conditions must be achieved for any greenfield sites. Development on current brownfield sites should also aim to achieve greenfield runoff rates where practical. To assist, several policy and guidance documents provide information to assist with the implementation of sustainable drainage. In addition to the London Plan, the [London Sustainable Drainage Action Plan](#), and CIRIA guidance documents [The SuDS Manual](#) and [Guidance on the Construction of SuDS](#) provide important information.

The investigation needs to demonstrate the SuDS measures that the development will include and demonstrate how they connect with any piped drainage system required if infiltration is not possible. The submitted evidence needs to demonstrate that the [London Plan drainage hierarchy](#) has been followed, with surface water management features higher up the drainage hierarchy preferably incorporated:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer

To assist the application of the above hierarchy, reference should be made to the SuDS Suitability Mapping available in each borough's SWMP to determine the potential of implementing infiltration-based SuDS. Where information is available, the SWMP indicates where infiltration based SuDS may be potentially suitable for use, where uncertainties exist and where they are unlikely to be suitable. Where infiltration SuDS are potentially suitable or uncertain, the applicant must provide site-specific infiltration testing or bore hole data to justify use of non-infiltration based surface water management techniques within their drainage strategy.

Not all developments that require a planning application have a bearing on a site's existing drainage regime, or the potential impact of surface water flooding locally. This may include certain Minor developments that do not increase the built footprint of a site or do not introduce new building structures. Some of these cases may not present an opportunity to improve on-site water management. However, efforts should be made to improve the site's drainage systems as the current regime may have wider flood risk implications for the area. For further information, contact the relevant LPA.

Further details on SuDS is provided in the tables in [Section 4.1](#) and a West London-specific checklist for drainage strategies is accessible through the [Checklist](#) section.

4.2.3. Site-Specific Flood Risk Assessment (FRA)

Site-specific FRAs should be proportionate to the degree of flood risk, making the best use of available information. They should also be appropriate to the scale, nature and location of the development. For example, developments such as single house extensions would generally require a less detailed assessment as they tend not to significantly increase the number of people present in an area at risk of flooding. Conversely, new developments comprising of multiple houses in a similar location would generally require FRAs with greater detail. For further information, see the 'Site-specific FRA' key requirement section in [Tables 4-1](#) (Major Developments), [4-2](#) (Minor Developments), and [4-3](#) (Change of Use), and the EA produced guidance on [FRAs for Planning Applications](#).

The site-specific FRA requires potential flood depths to be addressed as part of flood risk management and emergency planning where there is a probability of flooding from any flood risk source. Depending on the circumstances, certain mitigation measures will need to be employed to demonstrate that the potential impacts of flood depth will be adequately addressed. The most appropriate measure depends on a range of different factors including flood risk source, the potential impact of the flood risk, and the [vulnerability classification of the development](#) amongst others. Where developments are proposed within Flood Zone 3a (surface water), flood plain compensation must account for predicted flood depths for the 1 in 30yr and 1 in 100yr RoFSW mapping or depths predicted by site specific modelling. Further details on the requirements of emergency planning can be found in [Tables 4-1, 4-2, and 4-3](#).

For further guidance on the preparation and development of a site-specific FRA, the PPG has a [checklist](#) to provide guidance through the process. A West London-specific FRA checklist has also been developed as part of this SFRA and is accessible through the [Checklist](#) section.

4.2.4. Drainage Strategy

As part of, or separate to, site-specific FRAs, information demonstrating how surface water runoff generated by the development site may need to be presented. As FRAs are not required for all developments, producing a separate drainage strategy may be advisable. A drainage strategy is a report that demonstrates how surface water could affect a site of interest and the surrounding areas. A strategy is required for all Major developments not categorised as 'Change of Use'. This includes sites identified as being at risk of surface water flooding, and those that have a history of surface water flooding. All Minor developments and developments categorised as 'Change of Use' which modify existing surface water drainage will also require a Drainage Strategy. The report needs to demonstrate how water is

expected to behave on a site, determine the site's infiltration potential, runoff rates, and flow pathways, both before and after the proposed development is in place.

A Drainage Strategy Submission Checklist has been created alongside this SFRA (accessible through the [Checklist](#) section) and aligns with the standards and key policy requirements highlighted throughout Section 4. This template should be completed and included with any drainage strategy submissions to the relevant LPA. Four of the six boroughs already have similar forms that should also be completed and included with drainage strategy submissions:

- Barnet: [SuDS Assessment Form](#)
- Ealing: [Drainage Assessment Form](#)
- Hillingdon: [SuDS Flows and Volumes Proforma](#)
- Hounslow: [Drainage Assessment Form](#)

Further details on the SuDS requirements and SuDS implementation to address the impact of future growth are contained in [Section 4.1](#) (Tables [4-1](#), [4-2](#), and [4-3](#)) and [Section 5.1](#) respectively.

4.2.5. Flood Risk Management Structures and Features

As described in [Section 3.3 and 3.4](#), a complex system of flood defences exists along the River Thames and its tributaries within the study area. The impact of these defences is shown on the [Flood Management Infrastructure Web Map](#) in the 'Areas Benefitting from Defence' layer and the location of the defences is shown in the 'EA Flood Defences' layer. To be classified as an Area Benefitting from Defence, the defence must provide a minimum standard of protection of 1 in 100yrs. This is why there can be areas with defences shown, but no associated Area Benefitting from Defence, as the defence in question likely provides a standard of protection less than 1 in 100yrs.

These defences are owned and maintained by a range of entities depending on their location and history. Most defences are owned and maintained by the EA, but others may be owned and maintained by riparian owners, Local Authorities or other entities. As defined in Table 4-1, any development within the stated buffer zones will need to contact the EA to determine the ownership and condition of any adjacent flood defences. Depending on the nature of the development, a [Flood Risk Activity Permit](#) may be required. An assessment of the condition of the defence and the associated impact on the Flood Evacuation Plan should also be considered.

Under section 21 of the FWMA, LLFAs are required to maintain a register of features and structures that are likely to have a significant impact on local flood risk. LLFAs have the power to 'designate' these structures and features on this register, which means that an application needs to be submitted to the relevant Borough to alter or remove one. For further information on asset registers and designated structures, contact the Borough directly. As defined in Tables [4-1](#), [4-2](#) and [4-3](#), any development within the stated buffer zones of an Ordinary Watercourse will need to contact the relevant LLFA to determine if any Ordinary Watercourse consents are required. The local of all mapped Ordinary Watercourses is shown on [Flood Management Infrastructure Web Map](#).

4.2.6. Borough-Specific Requirements

In addition to the national, regional and local guidance available for flood risk management, LPAs provide supplementary guidance in the forms of Supplementary Planning Documents (SPD) and/or

Supplementary Planning Guidance (SPG). These documents often supplement and operate in conjunction with Local Plans, providing guidance which goes over and above existing policies. Table 4-5 below highlights relevant SPD/SPG documents for each Borough which contains specific requirements on the information presented in Section 4.1. A complete list of SPG/SPD documents for each Borough can be found on their respective websites. It should also be noted that Boroughs may choose to adopt some or all of the Policy Recommendations made in Section 5 and developers should ensure they are applying the most recently published policies.

Table 4-5. Borough Specific Guidance for Planning Applications and Developments

Borough	Supplementary Planning Guidance/ Documents	Other Sources
Barnet	<p>The Local Plan Supplementary Planning Document (SPD): Sustainable Design and Construction document contains sections on Flood Risk, SuDS and Water Quality Design/Construction Principles which sets out requirements and considerations in certain flood risk related areas. This includes guidance on basements, which provides the following:</p> <ul style="list-style-type: none"> - The council may require a Hydrology report to be submitted which determines the surface flow of water, the subterranean flow of water and land stability where this requires further consideration. - Areas with geology more prone to increased groundwater flows such as a non-clay based geology combined with a basement development in a previously vegetated area [a garden] or basement development proximate to surface water flows or basement development on a sloping site over 8 degrees may all require further technical verification. - Developers may be required to provide independent verification of further technical evidence and all technical reports should be prepared by a suitably qualified chartered engineer or chartered geologist who is a member of the relevant professional body. 	<p>The Local Requirements Validation Guidance Notes 2017 contains a list of planning application requirements. For each requirement, the document provides a description, guidance and the legislation or policy that drives the planning application requirement. Requirements addressed include FRAs and drainage statements/ strategies.</p>
Brent	<p>The Basement Supplementary Planning Document provides information and guidance on planning matters related to basement development. Each section also features relevant national and local policies which helps guide matters relating to basements. The document features a flood risk specific section. Amongst the information included in this section is a requirement adopted from Brent's SFRA and SWMP, which states that "<i>all basement developments should be fitted with resilience measures.</i>" Certain building regulations require resilience measures for basements, which include waterproofing of walls and floors. They also require the inclusion of a positive pumped device to protect from risk of sewer flooding in line with Thames Water recommendations.</p>	None
Ealing	None currently available.	None
Harrow	<p>The Supplementary Planning Document: Planning Obligations and Affordable Housing guidance contains a section on flood risk which sets out obligations for proposed developments. As part of these obligations, the SPD states "<i>the Council where applicable will require a commuted sum which would go towards the long-term maintenance of the SUDS.</i>" In addition, the document highlights the requirement of a Section 106 agreements to secure offsite attenuation and storage.</p>	<p>The Information Requirements for Validation of Planning Applications document contains a list of planning application requirements. Amongst the addressed requirements, the document provides information on when FRAs are required and an overview of what should be included in them.</p>

Borough	Supplementary Planning Guidance/ Documents	Other Sources
Hillingdon	None currently available.	<p>The Development Management Policies document is one of several documents that make up the Local Plan Part 2. It provides detailed policies that helps guide the Boroughs decisions on individual planning applications. Policies DMEI 9 and 10 specifically refers to the management of flood risk and water, whilst Policies DMEI 8 and 11 address flood risk and water management as part of the overall policy. Key local level guidance and requirements include:</p> <ul style="list-style-type: none"> - Developers to engage with relevant water and wastewater infrastructure providers prior to submitting a planning application (Policy DMEI 10). - Strict control is to be exercised to manage surface water in CDAs (Policy DMEI 9). <p>The Hillingdon SuDs Design and Evaluation Guide provides information on the SuDS design and evaluation process, ensuring they are properly implemented into developments. It provides as set of required standards that need to be met when submitting development proposals. The guide features some local SuDs specific requirements, including:</p> <ul style="list-style-type: none"> - Designing the worst-case scenario is not acceptable. - Offsite contributions will be considered if a suitable scheme cannot be fully implemented onsite.
Hounslow	The Residential Extension Guidelines: Supplementary Planning Document contains a flood risk section with information aimed to guide developers on building alterations and extensions with regards to flood risk. This includes the following guidance on basements, <i>"all basements, extensions and conversions likely to flood must have internal access to a higher floor and must include flood resistance and resilience in their design techniques. Basements must not include sleeping accommodation."</i>	The TE2100 Plan provides guidance and recommendations for developers to ensure the objectives of the Plan are met. Sub-regions within the TE2100 policy area are broken up into 'Action Zones' which highlights different sub-regional characteristics, flood sources and how those could be addressed. Hounslow lies within Action Zone 1 ('West London') of the TE2100 policy area: Recommendations 6, 9, 10 and 12. In addition, Action Zone 0 Recommendations 7 and 11 are applicable for all developers in the TE2100 plan. Further information on the TE2100 Plan can be found in Section 2.2 .

4.3. Developer Management Guidance

This sub-section provides development management specific guidance to ensure that the key requirements for individual planning applications can be effectively evaluated and assessed. Development should be considered at a strategic level, so it is important to identify how individual development proposals fit within a wider flood risk management strategy for a given area. The guidance accompanies the information presented in the tables in [Section 4.1](#).

4.3.1. Application of the Sequential and Exception Tests

Implementation of a sequential, risk-based approach is vital in determining the suitability of a site for development with regards to flood risk. Developers need to apply the Sequential Test, and in some instances, the Exception Test, for any proposed development site that requires them. This document, and the [Web Maps](#), provide the basis for applying these tests at a site-specific level.

Guidance on development in London, and the types of sites and locations to be considered, has seen a push towards certain considerations. The [current London Plan](#) identifies small site developments making an important contribution towards meeting housing objectives. In addition, the need to adopt a sequential approach to guide retail, commercial and leisure developments towards town centres is also of importance. These development objectives are consistent with the guidance and policies laid out in the draft of the [new London Plan](#), making them important considerations for Boroughs when considering new development proposals.

The PPG contains information on [development compatibility within different Flood Zones](#). This table works in conjunction with the PPG [Flood Risk Vulnerability Classifications](#) table to provide guidance on the types of development that may be considered as suitable within Flood Zones.

Sequential Test

The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. This means that certain development proposals should not be permitted in high and medium flood risk areas, where there are reasonably available sites appropriate for the proposed development in areas of lower flood risk. Within each Flood Zone, all sources of flooding need to be considered when applying this risk-based approach to the proposed development site.

For sites that have not undergone Sequential Testing but require it, developers will need to complete a site-specific Sequential Test and provide evidence that the Test has been undertaken as part of the planning application. For information on the Sequential Test search area and definition of reasonable available sites, see [Section 4.2.1](#).

Exception Test

Developers may need to provide evidence that the Exception Test has been applied if the Sequential Test demonstrates that the proposed development cannot be located in a lower flood risk area. Through the Exception Test, the developer needs to demonstrate that flood risk to both people and property will be managed across the lifetime of the proposed development. The PPG sets out two considerations that need to be achieved in order to pass the Exception Test. Both considerations need to be satisfactorily demonstrated by the developer before development can be allocated or permitted. These considerations are:

- The development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A site-specific FRA 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 PPG [Flood Risk Vulnerability and Flood Zone Compatibility](#) table sets out some circumstances for Exception Test application following Sequential Testing. Evidence of Exception Testing may need to be applied for particular developments within areas subject to redevelopment or regeneration. For developments that are part of regeneration strategies, it is likely that they will provide the wider sustainability benefits required to pass that aspect of the Exception Test. All submitted planning applications still need to demonstrate that the development will be safe for its lifetime, will not increase flood risk elsewhere and, where possible, will reduce flood risk overall. For information on how the second consideration of the Exception Test could be achieved by the developer, see [Section 4.2.1](#).

4.3.2. Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) incorporate a range of measures and management techniques designed to manage surface water runoff. They are designed to mimic natural drainage as closely as possible, providing an alternative to 'hard engineered' traditional drainage. They provide opportunities to:

- Reduce the causes and impacts of flooding, providing opportunities to reduce the overall local flood risk.
- Minimise pollution from urban runoff at source.
- Enable groundwater recharge where infiltration is possible.
- Combine water management with green space, providing environmental, amenity and recreational benefits.

As highlighted in [Section 2.2.2](#) of this document, [Policy 5.13](#) of the London Plan is a key policy with regards to flood risk and water resource management. The policy provides the *drainage hierarchy* to ensure that reasonable measures are taken to sustainably manage and reduce the overall amount of rainfall being discharged from a development site. Developers should take measures to ensure that surface water management features higher up the drainage hierarchy are incorporated. The current London Plan drainage hierarchy is as follows:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer

Developers should aim to achieve greenfield runoff rates via their proposed SuDS measures and ensure that surface water runoff is managed as close to the source as possible. The proposed measures should be incorporated in line with the [Non-statutory technical standards for sustainable drainage systems](#).

In December 2014, LLFAs became statutory consultees on major planning applications with surface water drainage implications. The associated [Written Ministerial Statement](#), alongside the London Plan, demonstrate the importance of developers incorporating SuDS into their development proposals. This means that LPAs are required to consult LLFAs for expertise and technical advice on the management of surface water before reaching a decision on Major planning applications under the [Town and Country Planning \(Development Management Procedure\) \(England\) Order 2015](#).

The issues that are analysed by LLFAs and LPAs for planning applications are referred to as 'material planning considerations', issues that are relevant to the decision making process. SuDS are a material planning consideration for major applications, and decisions on all planning applications require evidence that SuDS are implemented to ensure surface water is managed safely on site. Further information on material planning considerations, planning applications and the decision making process can be found on the [Determining a Planning Application](#) guidance page.

4.3.3. Site-Specific FRAs

Submitted site-specific FRAs should demonstrate how flood risk will be managed now and in the future over the proposed development's lifetime. The FRA needs to take climate change into account, and the vulnerability of land use classification of the development (Refer to [Table 2 – Flood Risk Vulnerability](#) of the PPG). An FRA should be provided with a planning application for developments in the following circumstances:

- New proposals in Flood Zone 2 or 3, including Minor Development and Change of Use. *Minor developments include property sub-division (as this is 'development' defined by [Section 55 of the Town and Country Planning Act 1990](#)) and extensions that exceed the parameters of Permitted Development defined by [Planning Portal Guidance](#).*
- Proposals for development areas that are 1 hectare or greater in Flood Zone 1.
- New proposals, or a Change of Use in development type to a more vulnerable class, where the proposed development could be affected by sources of flooding other than rivers and the sea.
- Proposals within areas with critical drainage problems as designated by the EA (*note that this does not include Critical Drainage Areas as defined by the Borough SWMPs – there are currently no such areas defined by the EA within the West London sub-region at the time of publication of this SFRA in March 2018*).

As early as possible, development management should refer this SFRA and the [Web Maps](#) to developers, highlighting the key areas that developers should take note of as it could impact their proposals. For development proposals in areas at risk of fluvial or tidal flooding, there is a statutory requirement for LPAs to consult with the EA before planning permission is granted under the [Town and Country Planning \(Development Management Procedure\) \(England\) Order 2015](#). For advice on when the EA should be consulted, and guidance for where fluvial / tidal flood risk is an issue, the EA has developed [Standing Advice](#). In addition, the PPG has a [checklist](#) which can aid in the process of reviewing a site-specific FRA.

4.3.4. Drainage Strategy

Developers may need to demonstrate how surface water runoff generated by the development site will be managed. This may be demonstrated through a drainage strategy, a report that should demonstrate how surface water could affect a site of interest and the surrounding areas. A strategy is required for all Major developments not categorised as 'Change of Use'. All Minor developments and developments categorised as 'Change of Use' which modify existing surface water drainage will also require a Drainage Strategy.

DEFRA published the [Non-statutory technical standards for sustainable drainage systems](#) in March 2015. The document sets out non-statutory technical standards for SuDS relating to:

- Flood risk outside the development
- Peak flow control
- Volume control
- Flood risk within the development
- Structural integrity
- Designing for maintenance considerations
- Construction

These standards should be used for the assessment of surface water drainage strategies submitted with planning applications.

4.3.5. Flood Risk Management Structures and Features

The impact of flood defences along the River Thames and its tributaries can be seen on the [Flood Management Infrastructure Web Map](#) in the 'Areas Benefitting from Defence' layer. In addition, the location of the flood defences can also be seen on the map in the 'EA Flood Defences' layer. Places classified as Areas Benefitting from Defence provide a minimum standard of protection of 1 in 100yrs.

Most defences are owned and maintained by the EA, but others may be owned and maintained by riparian owners, Local Authorities or other entities. As highlighted in Tables [4-1](#), [4-2](#) and [4-3](#) developments within the stated buffer zones will need to contact the EA to determine the ownership and condition of any adjacent flood defences. Developers may also need to submit a [Flood Risk Activity Permit](#) depending on the nature of the development. Developers should also consider providing an assessment of the condition of the defence and the associated impact on the Flood Evacuation Plan.

If a development is within the buffer zone of an Ordinary Watercourse (as defined in Tables [4-1](#), [4-2](#) and [4-3](#)) developers are required to contact the relevant LLFA to determine if any Ordinary Watercourse consents are required. The local of all mapped Ordinary Watercourses is shown on [Flood Management Infrastructure Web Map](#).

4.3.6. Borough-Specific Requirements

Developers are required to follow any borough-specific requirements when addressing flood risk as part of their planning application submission. LPAs may provide guidance through Supplementary Planning Documents (SPD) and/or Supplementary Planning Guidance (SPG) that accompany the Local Plan. These are listed in [Table 4-5](#). Development management should refer to these when reviewing planning applications as they support the borough-wide objectives for flood risk management.

4.4. Planning Policy Guidance

This sub-section provides guidance on managing flood risk at a strategic level. The NPPF and PPG highlight that developments should be directed away from the highest areas of risk and that developments should be made safe without increasing flood risk elsewhere. Due to development needs and demands, the NPPF identifies that it may not always be possible to completely avoid flood risk areas. The guidance provided in this sub-section supports borough level strategic planning and supplements information presented in the tables in Section 4.1.

4.4.1. Application of the Sequential and Exception Tests

The NPPF highlights the need for a sequential, risk-based approach to be considered for development. This approach aims to keep development out of Flood Zones 2 and 3, and areas at risk from other sources of flooding, where possible. Implementation of the sequential, risk-based approach requires proposed development sites to be reviewed through the application of the Sequential Test, and in some instances, the Exception Test. This document, and the [Web Maps](#), provide the basis for applying these tests, at the site-specific level.

Strategic application of the Tests for Allocated Sites, if required, are generally completed as part of the Local Plan development process by LPA officers. This process should be informed by the initial screening assessment completed for current Allocated Sites provided in [Appendix A](#). Recommendations for Level 2 SFRA are made in [Section 6](#) where further flood risk information and assessment may be required to inform the Tests. Guidance is provided in the following sections for application of the Test at the Local Plan / strategic scale.

Sequential Test

The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. This document provides the evidence base for the Sequential Test to be applied at a borough-wide level in preparation for a Borough's Local Plan and associated Allocated Sites. If the application of the Sequential Test demonstrates that development can be allocated in Flood Zone 1, then the Sequential Test has been passed. However, some lower flood risk areas may not be suitable for development due to various other reasons. In these instances, the Sequential Test should be applied to guide the development to the lowest risk area appropriate for the development type. This increases the possibility of facilitating development which is at the lowest risk of flooding in line with the relevant vulnerability of land use classification. The PPG flowchart demonstrating the '[Application of the Sequential Test for Local Plan Preparation](#)' provides guidance.

The following process is recommended to complete the Sequential Test for site allocations during Local Plan development based on the [PPG development vulnerability classification](#):

1. Complete a screening assessment of all sites to identify flood risk sources and how they might be impacted by Climate Change. The Web Maps should be used to identify flooding from all sources as detailed in [Section 3](#). Climate change guidance is provided in [Section 3.10](#). *Note this screening assessment has already been completed for sites allocated at the time writing this SFRA – Refer to Appendix A and the [Policy Web Map](#).*
2. Assess how long it is anticipated each development will be present for (the 'design life'). A design life of 100yrs for residential development and 60yrs for non-residential development is recommended if no other information is available.

3. Any 'Highly Vulnerable' developments should be located within Flood Zone 1. If this is not possible due to a lack of suitable sites, then locations in Flood Zone 2 can be considered where the Exception Test can be passed. If no suitable sites exist in Flood Zones 1 or 2, then further opportunities for development locations should be sought (this could be within or outside the Borough)
4. A similar process can then be applied to 'More Vulnerable' developments with priority given to locations within Flood Zones 1 and 2. If there are no suitable sites, then Flood Zone 3a can be considered – noting that the Exception Test will need to be passed.
5. 'Less Vulnerable' developments can then be located within remaining sites in Flood Zones 1, 2 and 3a (in that order of preference). This development classification is not appropriate for Flood Zone 3b.
6. 'Essential infrastructure' should also be preferentially located in the lowest risk Flood Zone available for the type of infrastructure. This development can be located in Flood Zone 3a or 3b after passing the Exception Test.
7. 'Water compatible' development should be allocated last as they generally have the fewest constraints with regard to flood risk.

Where proposed site allocations are at a risk of flooding from one or more sources, Level 2 SFRA recommendations are made in [Section 6](#) for specific Allocated Sites within each Borough. The Level 2 SFRA can provide site-specific flood risk management recommendations and an assessment of whether the site could pass the exception test on this basis.

Exception Test

The Exception Test should be applied after the Sequential Test if it has been determined that a proposed development cannot be located in an area with a lower flood risk. To pass the Exception Test and ensure that flood risk to both people and property is effectively managed across the proposed developments lifetime, the PPG sets out two considerations that need to be achieved. These considerations are:

- The development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A site-specific FRA 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 PPG '[Application of the Exception Test for Local Plan Preparation](#)' flowchart provides guidance on applying the Exception Test for Local Plans. The flowchart highlights that following the borough-wide level Sequential Test, the Exception Test will need to be applied if certain development sites are not in an appropriate location. Guidance for what is deemed an appropriate location is based on NPPF flood risk policy as highlighted in [Section 2.2.1](#). A Level 2 SFRA may also be used to assess Allocated Sites in more detail to determine if the Exception Test can be passed. Recommendations for Level 2 SFRA assessments are made in [Section 6](#).

4.4.2. Flood Risk Management Structures and Features

Under Section 21 of the FWMA, LLFAs are required to maintain a register of features and structures that are likely to have a significant impact on local flood risk. LLFAs have the power to 'designate' these structures and features on this register, which means that owners and developers need to

submit an application to the relevant Borough to alter or remove one. These registers are available to the public and access can be arranged through the relevant LLFA if the information is not already published on the Local Authority website.

4.4.3. Local Policy Recommendations

To ensure that future developments incorporate flood risk management measures in line with the findings of this SFRA, a set of strategic and site-specific policy recommendations are provided in Section 5.3. These recommendations could be adopted as part of the flood risk planning policies within the developing Local Plans. Recommendations supporting the implementation of SuDS, the requirement of site-specific FRAs and drainage strategies, and strategic implementation of the Sequential Test are provided amongst other policies designed to guide flood risk management.

5. Policy Recommendations

5.1. Overview

Future developments and climate change are some of the key factors that are increasing the risk of flooding events across the UK and globally. Several key drivers, including urban development expansion, could see an increase in flood risk from various sources. For example, increased foul drainage from an increased local population places a greater pressure on the local sewer system. This has the potential to increase the risk of sewer flooding, especially in areas with combined sewers which drain foul and surface water. A decrease in permeable ground cover due to urban development may increase the risk of surface water and ordinary watercourse flooding.

The pressure of accommodating more developments may mean a larger number of developments being proposed for sites within higher risk Flood Zone areas, placing them at greater risk of flooding. The impact of development and projected future population growth may not only have an impact on the flood risk presented by different flood sources, but present a greater overall flood risk to people and properties due to the accumulative risk from each source. To meet flood risk mitigation requirements whilst facilitating housing development needs, local policy targeting the impact of future growth on flood risk is required.

The NPPF and accompanying PPG state that a sequential, risk-based approach to the location of development should be applied. This would enable possible flood risk to people and property to be avoided whilst taking impacts of climate change into account. This underpins the strategic recommendations for the borough and supports the site-specific recommendations. For further information, see [Section 5.3](#).

5.2. The Impact of Future Growth on Flood Risk

To meet the demands presented by future growth, the London Plan provides a minimum housing development target for each London Borough. These targets are based on the requirements of accommodating a growing population whilst meeting a range of social needs. The [current London Plan](#) approach is shown below. Increasing development is an identified driver of increased flood risk.

“Takes account of London’s locally distinct circumstances of pressing housing need and limited land availability and aims to deliver sustainable development.”

London’s development requirements are rapidly increasing over time. The current London Plan provides a ten-year housing target for each borough, spanning 2015 to 2025. These targets require a minimum of 71,456 housing properties to be constructed by 2025 across the West London sub-region (see [Table 5-1](#)).

Table 5-1. Current London Plan Ten Year Annual Average Housing Supply Monitoring Targets 2015 – 2025

Planning Authority	Minimum Ten-Year Target	Annual Monitoring Target
Barnet	23,489	2,349
Brent	15,253	1,525
Ealing	12,972	1,297
Harrow	5,927	593
Hillingdon	5,593	559
Hounslow	8,222	822
Total	71,456	7,145

The projected housing targets presented in the [2017 Draft London Plan](#) require a minimum of 139,830 housing properties to be supplied between the 2019/20 - 2028/29 ten year period (see [Table 5-2](#)). Each Boroughs annual target is higher compared to the figures presented in the current London Plan, providing an insight into the potential future growth of developments in the West London sub-region. Many of the housing developments created to meet these numbers are expected through small sites. Policy H2 ‘Small Sites’ of the Draft London Plan highlights that small sites should play a greater role in delivering new houses, stating that boroughs should:

“Pro-actively support well-designed new homes on small sites through both planning decisions and plan-making.”

Opportunity Areas are major sources of brownfield land which have a significant capacity for development, and are also seen as a way of meeting London’s housing development targets. The Draft London Plan highlights Opportunity Area Planning Frameworks as the means to develop policies and supporting documentation required to develop a plan-led approach and provide the required infrastructure.

Table 5-2. 2017 Draft London Plan Ten Year Targets for Net Housing Completions (2019/20 - 2028/29)

Planning Authority	Ten-year Housing Target	Annualised Average
Barnet	31,340	3,134
Brent	29,150	2,915
Ealing	28,070	2,807
Harrow	13,920	1,392
Hillingdon	15,530	1,553
Hounslow	21,820	2,182
Total	139,830	13,983

The requirements of the NPPF and PPG state that all developments need to demonstrate that they will remain safe for the entirety of their lifetime in terms of flood risk and coastal change. The [PPG](#) defines the lifetime of residential developments as a minimum of 100 years unless reasons are stated for otherwise. The lifetime of non-residential developments are defined by

their individual characteristics, and require the planners and developers to assess the lifetime of the development. Developments need to ensure that flood risk is not increased elsewhere, and where possible, flood risk is reduced overall. This should be achieved through the inclusion of flood risk and drainage at all developments' master planning stage to reduce local flood risks to and from development sites. Achieving these objectives, and those listed in [Section 2](#) and [Section 4](#), is vital in ensuring that the impact of future growth on flood risk is mitigated as much as possible.

The safeguarding of land used for flood mitigation purposes can help to free-up other land for development that might not otherwise have been suitable under the [PPG's vulnerability table](#). This provides opportunities for strategic flood risk management approaches which the boroughs' LLFAs, in partnerships with other RMAs, are actively taking to safeguard future land. Partnership working such as this further demonstrates the benefit of having a joint SFRA for the sub-region. The following flood alleviation schemes provide examples of partnership projects:

The [Brent Catchment Partnership](#) are undertaking a series of projects to improve and enhance watercourses within the River Brent catchment. Amongst the potential projects are the Silk Stream, Tokyngton Park, and Greenford Flood Alleviation Schemes that will be delivered by Barnet, Brent, and Ealing respectively. These projects will all be delivered alongside EA with the objective to transform *"up to 10 kilometres of heavily modified river to a more natural condition by 2021"*. These projects provide opportunities to safeguard land to achieve this objective.

The [River Pinn and Cannon Brook Flood Alleviation Scheme](#) is a partnership between Harrow, Hillingdon and the EA. As part of the scheme objectives, the partnership aims to obtain a better understanding of flood risk in the River Pinn catchment, and to deliver a viable scheme that could reduce future flood risk. Flood storage areas have been identified as a possible measure, which could provide opportunities to safeguard land for flood mitigation purposes.

For further information on strategic projects in the sub-region, refer to the EA's [FCERM Investment Programme](#), contact the local Environment Agency Partnership and Strategic Overview Officer or the LLFA Officer for details.

Although the above-mentioned flood alleviation schemes are led by the Boroughs or the EA, their potential progression to implementation heavily relies on the need for matched funding. Rules on the use of grant money from DEFRA's *Flood and Coastal Erosion Risk Management Grant in Aid* and TRFCC's *Local Levy* funding streams requires a certain amount of partnership funding to have been secured before schemes may become viable to implement.

Opportunities for the progression of these and similar strategic flood risk infrastructure schemes should be taken through the use of funding contributions. Examples of such

contributions include planning obligations under [Section 106 \(S106\) of the Town and Country Planning Act 1990](#) and the Community Infrastructure Levy (CIL) under [Part 11 of the Planning Act 2008](#). S106 funding allows for developers to enter into agreements with an LPA to make proposed development sites acceptable in planning terms. Similarly, CIL funding agreements allow potential for LPAs to provide contributions towards the costs of implementing infrastructure improvements required for the development of the area.

Natural Flood Management is an example of a strategic flood risk management approach that benefits from the safeguarding of land. These management techniques utilise natural processes to reduce flood risk and coastal erosion. Natural flood management often takes a hydrological catchment based approach by managing water along the length of a watercourse's catchment area. In addition to flood risk mitigation benefits they can provide, they can also benefit people and wildlife through habitat restoration and water quality improvement. Natural Flood Management projects provide opportunities for partnership working and provide boroughs' LLFAs and RMAs with the opportunity to implement an approach as identified by the [EA](#) and the [draft London Plan](#). The following flood alleviation schemes provide examples of Natural Flood Management projects:

The [Park Woods, Ruislip Natural Flood Management Scheme](#) is a partnership between Hillingdon Council, Thames 21, Natural England and the EA. The Natural Flood Management Scheme aims to slow the velocity of the water in the catchment area by replicating the characteristics of natural rivers. Implementing large woody debris along various points of the watercourse to attenuate water has been identified as a means of achieving this. The floodplain will also facilitate water attenuation.

5.3. Recommended Policies

This section builds on the findings presented throughout the SFRA and provides recommendations that each Borough can adopt as part of their flood risk planning policies within their developing Local Plans. The recommended policies set out strategic and site-specific principles to guide flood risk management for prospective development within each borough and the sub-region as a whole. They provide part of the solution to the general growth trends and associate strategic flood risk management issues identified in [Sections 5.1 and 5.2](#). Recommendations have been suggested instead of model policies given the Borough Local Plans are at different stages of being updated. These policies acknowledge that a lot of developments will be based on small and windfall sites and have been developed to support this.

5.3.1. Strategic

1. Boroughs should adopt a sequential approach for planning and development to identify areas that are not susceptible to flood risk impacts posed by climate change. Development should be encouraged in these identified areas to make properties more resilient to increasing flood risk and reduce the reliance on property level protection methods.
2. Boroughs should apply the Sequential Test to Allocated Sites within the LPA area at an early stage in the Local Plan development process to help identify any lower flood risk

areas that may not be suitable for development. This can be used to inform spatial planning and identify key growth locations, increasing the possibility of facilitating development which is not exposed to flood risk whilst meeting development objectives.

3. Boroughs should implement measures through their Local Plans to deal with the Sequential Test acceptability of windfall site development proposals at the strategic level. The measure could set out locations and quantities of windfall sites that would or would not be acceptable in Sequential Test terms (to provide input to the process defined in [Section 4.2.1](#)). This would help create efficiencies in the process.
4. If it is determined by evidence that there are insufficient sites within Flood Zone 1 to meet the borough's housing development targets, then windfall developments in Flood Zone 2 or 3 might be acceptable and should be considered (preferably with support of a Level 2 SFRA). This would inform an approach determining locations where the Sequential Test would be passed. Conversely, if the borough has sufficient land available in Flood Zone 1 to accommodate windfall development sites, then it may not be possible or prudent to consider windfall development in Flood Zone 2 or 3 as acceptable.
5. Existing and planned flood alleviation schemes should be incorporated into Borough Infrastructure Delivery Plans (IDPs). Where these IDPs, or similar corporate work programmes (e.g. planned highway improvement works or Green Infrastructure Plans), identify predicted or actual flood risks, new potential strategic level flood alleviation schemes should be developed.
6. Boroughs should make space for water storage by identifying strategic locations that are required for current and future flood risk management. These identified areas of land should be safeguarded via Local Plans to facilitate links between flood risk management and other environmental priorities.
7. Boroughs should adopt a [Catchment Based Approach](#) to ensure recognition of catchment wide flood issues to justify the collection and use of S106 funding to investigate and develop flood alleviation schemes within the catchment the development falls within. CDAs defined by the Borough SWMPs (for surface water flooding) or policy sub-areas defined by EA CFMPs (for fluvial / tidal flooding) provide an established technical basis for this approach.
8. Boroughs should set up mechanisms to enable the use of CIL charges to be used for flood alleviation schemes across the borough to address the cumulative impact of development on flood risk.
9. Boroughs should use their Local Plans to ensure developments within CDAs (as defined by SWMPs) provide increased surface water drainage requirements. Examples could include increased storage through the use of SuDS to restrict off-site runoff rates to greenfield (or lower) conditions.
10. Boroughs should develop standing advice for the assessment of minor development planning applications with surface water implications. This will aid LPAs in making

informed and consistent decisions where the EA and / or LLFA has no statutory duty to provide comments as part of an application's review exercise.

11. Boroughs should review the benefits of removing Permitted Development rights for sites which fall within Flood Zones 3a and / or 3b, collaborating on Article 4 Directions where justifiable, defensible and beneficial. This could include provisions around subdivisions, extensions and paving of gardens in specific areas.
12. Boroughs should use their Local Plans to ensure developments with a high susceptibility to groundwater flooding (as identified in the Sewer, Groundwater & Artificial Flood Risk Interactive Web Map and other available data) demonstrate that increased groundwater mitigation and management measures have been implemented to protect people from groundwater flooding. Any known groundwater and flow routes should be safeguarded to ensure groundwater flood risk is not increased on site or elsewhere.
13. Boroughs should consider implementation of further surface water flood risk mitigation requirements for proposed developments within Flood Zone 3a (surface water) where the development is also within the 1 in 30yr RoFSW mapped extents. These requirements could be similar to those adopted for Flood Zone 3b (fluvial / tidal) Functional Floodplain with modifications as follows:
 - Development within the 1 in 30yr RoFSW mapped extent will be treated as if it were Flood Zone 3b (Functional Floodplain) as defined in [PPG Table 1 \(Paragraph 065\)](#).
 - Development may be possible within the 1 in 30yr RoFSW mapped extents outside of existing infrastructure or solid building footprints.
 - To enable development, the proposals must provide mitigation and resilience against flood risks (taking advice from the LLFA as appropriate) and provide appropriate compensation on existing flood risk levels (addressing the predicted 1 in 30yr and 1 in 100yr RoFSW mapped depths as a minimum), supported by detailed flood risk modelling if appropriate.
 - The development must not increase flood risk elsewhere and where possible reduce flood risk overall.
 - Where beneficial to flood risk and/or other planning requirements, it may also be possible for development to occur within the functional floodplain through the relocation (but not increase of footprint size) of an existing building's footprint within a site.

5.3.2.Site-specific

1. Ensuring that land within development sites are safeguarded for potential flood mitigation use through the active consideration of predicted flood mapping from all sources at the master planning stage.
2. Developers must submit completed Flood Risk Assessments and Drainage Strategy (with supporting *Checklists*) to demonstrate compliance with requirements detailed in *Sections 2* and *4* for all Major development proposals.

3. Drainage Strategies with the supporting checklist must be provided for all Minor developments and for Change of Use proposals if they impact the proposed development's current drainage regime. Site-specific Flood Risk Assessments with the accompanying checklist must be provided for Minor developments and Change of Use proposals if they:
 - Are outside of Flood Zone 1.
 - Are inside an EA defined area with a critical drainage problem.
 - Change the existing footprint of the building(s).
 - Are at risk from any other sources of flooding.
4. As part of a submitted development proposal, developers must provide evidence to the LPA to demonstrate that the Sequential Test has been undertaken. Developers must also provide evidence that an on-site sequential approach has been taken to direct vulnerable uses to the lowest risk parts of the development site.
5. Where development is proposed for sites within Flood Zones 3a (surface water), evidence must be submitted to demonstrate that:
 - There will be no increase of flood risk to properties outside of the development boundary.
 - Consultation has been undertaken with the relevant LLFA to consider potential wider impacts or benefits the development could have on the local surface water catchment.
 - Relevant strategic documents (such as the Thames CFMP, LFRMS and SWMP) have been reviewed.
 - The LLFA has been consulted to determine if the development should contribute to any catchment wide flood alleviation schemes being considered by the LLFA (such as a S106 contribution to wider catchment flood risk management infrastructure).
6. Development should maximise the use of open spaces to ensure spaces for water to flow during times of flood.
7. Developments that seek to increase impermeable surfaces within a site, including small areas such as front gardens, will be resisted where appropriate.
8. Developers should aim to incorporate permeable paving in hardstanding areas to provide flood mitigation benefits in new and existing developments. In areas where the geology does not facilitate infiltration (e.g. areas underlain with clay), permeable paving should be underlain with gravel or feature an underground storage system.
9. Development proposed in 'dry islands' should be designed for safe access and egress in a flood event. Dry islands are considered as flood risk areas due to the potential loss of important local services during flood events and lack of safe access routes. They require safe access and egress routes to be developed for the lifetime of the property, factoring in the impacts of climate change.

6. Review and Next Steps

6.1. Review & Update - Technical Content

A SFRA is a live document which is to be used to assist in allocating sites for future development and general decision making. It is essential that the data contained within the SFRA is as up to date as possible to ensure that decisions are made on the best information available. Events that may trigger review and update are summarised below:

- Changes to the NPPF and associated Flood Risk and Coastal Change PPG which form the basis of the SFRA.
- Updates to any of the overarching legislation which may alter the responsibilities of the Boroughs – including the new London Plan and RFRA documents, which are both currently undergoing consultation and are expected to be finalised in late 2019.
- Changes to the flood risk information. There is a need to ensure developers and the LPA are provided with the best available information.
- Developments in flood risk knowledge. There is a need to ensure that site-specific FRAs are informed by the most up-to-date information and planning decisions are made on the best available data.
- Significant updates of baseline flood risk information (such as a major update to the Risk of Flooding from Surface Water map or Flood Map for Planning) or following a major flooding event within the sub-region.

6.2. Review & Update - Mapping

The knowledge of flood risk is constantly changing and improving and the SFRA should reflect this. Not only could this enhanced knowledge highlight risk areas which were not previously at risk, it could also free up areas which may have been at risk but are no longer considered to be so. This could free up land for potential future development.

The [Web Maps](#) developed to support this SFRA provides a flexible platform for ensuring the most up-to-date information is available. Several Web Map layers are maintained externally by the EA and will be updated automatically when the EA publishes revised data – these layers include:

- EA Flood Map for Planning (River and Sea) - Flood Zone 2
- EA Flood Map for Planning (River and Sea) - Flood Zone 3
- EA Flood Map for Planning (River and Sea) - Areas Benefiting from Flood Defences
- EA Flood Map for Planning (River and Sea) - Flood Defences
- EA Flood Warning Areas
- EA Recorded Flood Outlines
- EA Historic Flood Map
- Risk of Flooding from Surface Water Extent: 3.3 percent annual chance
- Risk of Flooding from Surface Water Extent: 1 percent annual chance
- Risk of Flooding from Surface Water Extent: 0.1 percent annual chance
- Risk of Flooding from Reservoirs - Maximum Flood Extent

The remaining Web Map layers are current as at the date of publication of the SFRA (March 2018) and may require update in the future. It should be noted that all Flood Zone 3a and 3b layers are static and may require update under the following circumstances:

- Updated main river flood extents are made available by the EA (the EA undertake periodic review and update of main river flood models and associated predicted flood extents)
- Updates to the Risk of Flooding from Surface Water Map – these occur when LLFAs undertake local surface water flood risk studies and provide revised surface water flood extents to the EA to update the national mapping

6.3. Level 2 SFRA Recommendations

As detailed in [Section 4](#), a high level screening assessment of currently Allocated Sites within each Borough was undertaken as part of this SFRA. This assessment includes a spatial analysis of the percent of site area within each of the defined Flood Zones, the potential impact of climate change, potential interactions with other sources of flood risk, an initial appraisal on whether the Sequential Test and Exception Test are required and a recommendation on if assessment through a Level 2 SFRA would be appropriate. Allocated Site specific recommendations are included in [Appendix A](#) in a spreadsheet format that can be filtered on a borough-by-borough basis and other assessment parameters as required.

The assumptions applied for the assessment are summarised below:

- If proposed use of site is unknown, then vulnerability classification is assumed to be 'more vulnerable' (residential)
- Waste management sites with an unspecified use have been given an unknown vulnerability classification as these sites could be either 'More vulnerable' or 'Less Vulnerable' dependent on the use
- If proposed use is 'Other' these have been given an unknown vulnerability classification
- If proposed use is 'Commercial' these have been given an unknown vulnerability classification as these sites could be either 'More vulnerable' or 'Less Vulnerable' dependent on the use
- Gypsy & Traveller sites have been given a 'Highly Vulnerable' classification as these sites could be either 'Highly vulnerable' or 'More Vulnerable' dependent on the property type
- Sites with 0% of areas in Flood Zones 2 and 3a/b do not require the Sequential Test (on the basis that other forms of flood risk are generally manageable on a site by site basis)
- Less vulnerable sites within Flood Zone 2 and 3a/b require the Sequential Test
- More vulnerable sites within Flood Zone 2 and 3a/b require the Sequential Test
- More vulnerable sites in Flood Zone 3a require the Sequential and Exception Tests
- Highly vulnerable sites in Flood Zone 2 require the Sequential and Exception Tests
- Highly vulnerable sites are not suitable in Flood Zones 3a/b
- Water Compatible use in Flood Zones 2 and 3a/b require the Sequential Test
- Level 2 SFRA recommended where Sequential & Exception Tests are needed and Flood Zone 3 extent is greater than 20% of site (and will be a significant constraint on

development) or if the site is currently less than 20% in Flood Zone 3, but will be more than 20% under the selected climate change scenario (1 in 100yr event +35%)

- Allocated Sites in Barnet were not supplied with a spatial extent - only centre point coordinates. The development size is assumed to be a 100m diameter circle around the centre point for the purpose of this analysis
- Flood Zone 3a for surface water is defined using the full 1 in 100 extent from the EA Risk of Flooding from Surface Water Map

Appendix A – SFRA Level 2 – Screening Assessment