URS

Epping Forest District Council

Level 2 Strategic Flood Risk Assessment

Final Report

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ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
AAP	Area Action Plan
AEP	Annual Exceedance Probability
ASTGWF	Areas Susceptible to Groundwater Flooding
ASTSWF	Areas Susceptible to Surface Water Flooding
AWS	Anglian Water Services
BGS	British Geological Survey
C&RT	The Canal and River Trust
CFMP	Catchment Flood Management Plan
CLG	(Department for) Communities and Local Government
Defra	Department for Environment, Flood and Rural Affairs
DPD	Development Plan Document
DTM	Digital Terrain Model
EA	Environment Agency
ECC	Essex County Council
EFD	Epping Forest District
EFDC	Epping Forest District Council
FMfSW	Flood Map for Surface Water
FRA	Flood Risk Assessment
FRAZ	Flood Risk Assessment Zones
FWMA	Flood and Water Management Act
GIS	Geographical Information System
HC	Harlow Council
LDD	Local Development Documents
LDF	Local Development Framework
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority

ACRONYM	DEFINITION
LRF	Local Resilience Forum
NPPF	National Planning Policy Framework
PAB	Project Advisory Board
PPS25	Planning and Policy Statement 25: Development and Flood Risk
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SAB	SuDS Approval Body
SFRA	Strategic Flood Risk Assessment
SLAA	Strategic Land Availability Assessment
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
SSSI	Site of Special Scientific Interest
SWMP	Surface Water Management Plan
TWUL	Thames Water Utilities Limited
uFMfSW	Updated Flood Map for Surface Water

GLOSSARY

GLOSSARY	DEFINITION
Aquifer	A source of groundwater comprising water bearing rock, sand or gravel capable of yielding significant quantities of water.
Attenuation	In the context of this report - the storing of water to reduce peak discharge of water.
Catchment Flood Management Plan	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Culvert	A channel or pipe that carries water below the level of the ground.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
Exception Test	The exception test should be applied following the application of the sequential test. Conditions need to be met before the exception test can be applied.
Flood Defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Resilience	Measures that minimise water ingress and promotes fast drying and easy cleaning, to prevent any permanent damage.
Flood Resistant	Measures to prevent flood water entering a building or damaging its fabric. This has the same meaning as flood proof.
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption).
Flood Zone	Flood Zones show the probability of flooding, ignoring the presence of existing defences
Freeboard	Height of flood defence crest level (or building level) above designed water level
Functional Floodplain	Land where water has to flow or be stored in times of flood.
Local Development Framework (LDF)	The core of the updated planning system (introduced by the Planning and Compulsory Purchase Act 2004). The LDF comprises the Local Development Documents, including the development plan documents that expand on policies and provide greater detail. The development plan includes a core strategy, site allocations and a proposals map.
Local Planning Authority (LPA)	Body that is responsible for controlling planning and development through the planning system.
Main River	Watercourse defined on a 'Main River Map' designated by DEFRA. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.

GLOSSARY	DEFINITION
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account.
Return Period	The average time period between rainfall or flood events with the same intensity and effect.
Sequential Test	Aims to steer vulnerable development to areas of lowest flood risk.
Source Protection Zone	Defined areas in which certain types of development are restricted to ensure that groundwater sources remain free from contaminants.
Sustainable drainage systems (SuDS)	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Topographic survey	A survey of ground levels.
Watercourse	All rivers, streams, drainage ditches (i.e. ditches with outfalls and capacity to convey flow), drains, cuts, culverts and dykes that carry water.

1 INTRODUCTION

1.1 Background to the Study

1.1.1 The National Planning Policy Framework (NPPF)[1] (March 2012) emphasises the active role Local Planning Authorities (LPAs) should have in ensuring flood risk is managed effectively and sustainably as an integral part of the planning process. The NPPF outlines that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and use their findings to inform strategic land use planning.

1.1.2 The NPPF sets out the Government's planning policies for England and how these are expected to be applied. The NPPF revoked most of the previous Planning Policy Statements (PPS) and Planning Policy Guidance, including PPS25: Development and Flood Risk Practice Guide. However, the NPPF did not revoke the PPS25 Practice Guide. This was revoked on the 6th March 2014 along with the NPPF Technical Guidance, when it was replaced by the Planning Practice Guidance Flood Risk and Coastal Change. The NPPF document and accompanying Planning Practice Guidance retains key elements of Planning Policy Statement 25 (PPS25)[2] (March 2010) and its planning guidance note[3].

1.1.3 In April 2011 Epping Forest District Council (EFDC) jointly produced a Level 1 SFRA[4] in association with Harlow Council in accordance with PPS25. EFDC now require a Level 2 SFRA as part of its evidence base to inform the development of spatial plans and policies for the district.

1.1.4 The EFDC Level 2 SFRA will build upon information contained within the Level 1 SFRA report and will provide more detailed information regarding the nature of flood risk across the district to facilitate the application of the Exception Test where required.

1.2 Aims and Objectives

1.2.1 The SFRA is a planning tool that enables the LPA to select and develop sustainable site allocations with respect to flood risk throughout the on-going process of developing their spatial plans and policies for the district.

1.2.2 Where decision-makers are unable to allocate all proposed development and infrastructure in accordance with the Sequential Test (i.e. steer development to areas of lowest risk of flooding), it is necessary to increase the scope of the Level 1 SFRA to provide information necessary for application of the Exception Test through the process of a Level 2 SFRA.

1.2.3 The Level 2 SFRA will provide more detail on the nature of flood risk for development allocations located in Flood Zone 2 or Flood Zone 3. This additional flood risk information will enable EFDC to apply the Sequential Test and Exception Test within Flood Zones where there is development pressure in areas at medium or high flood risk.

1.2.4 To this end, the key objectives of this Level 2 SFRA are:

- To provide a review of sources of flooding in Epping Forest District (EFD), building upon the results of the Level 1 SFRA;
- To refine and map the flood zones based upon current available data and existing flood defences;
- To sequentially test the EFDC's growth options individually;
- To carry out the Exception Test where EFDC's growth options cannot meet the Sequential Test;

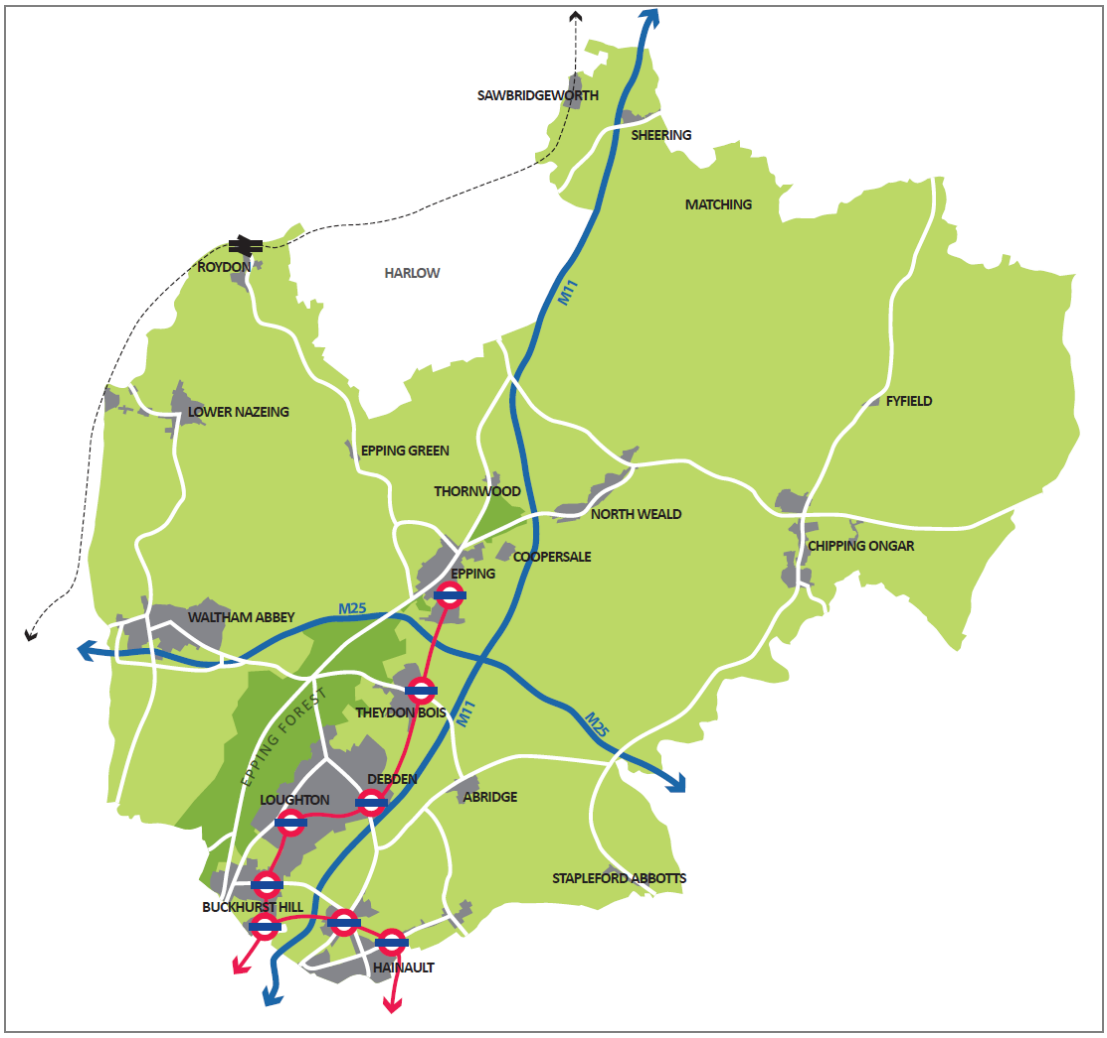
- To suggest procedures for assessing future windfall sites;
- To suggest procedures for site-specific Flood Risk Assessments (FRA) and to refine the definition of safe access;
- To provide policy recommendations for site allocations to meet EFDC's growth in the new plan period (up to 2033). These recommendations will consider (i) the individual flood and drainage implications of site allocations and (ii) cumulative impacts both locally and along the relevant watercourses;
- To provide recommendations for future development management policies relating to flooding and drainage;
- To provide recommendations for areas that may need additional flood protection and how these could best be provided; and
- To make these recommendations at an EFD wide level as well as on a site by site basis for those areas recommended for growth.

2 STUDY AREA

2.1.1 Epping Forest is located on the north eastern edge of London, in the south western corner of the county of Essex. It is a mainly rural area with 92.4% being located within the Metropolitan Green Belt. The south west of EFD is more densely populated including Loughton, Buckhurst Hill and Chigwell. Much of the remaining population is located in the smaller towns of Epping, Waltham Abbey and Chipping Ongar. There are several villages and smaller rural settlements predominantly located towards the north of EFD.

2.1.2 EFD is crossed by the M11 travelling in a north - south direction and the M25 travelling in an east - west direction with an interchange located just to the south of the centre of EFD. In addition, the Central Line of the London Underground network has stations at Buckhurst Hill, Loughton, Debden, Theydon Bois, Epping, Roding Valley, Chigwell and Grange Hill. The National Rail network crosses EFD with a station at Roydon, located on the Cambridge to Liverpool Street main line.

Figure 2.1: Study Area



Source: Epping Forest District Council

3 LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT REVIEW

3.1.1 EFDC in collaboration with Harlow Council (HC) carried out a Level 1 SFRA, completed in April 2011. In order that the findings of the Level 1 SFRA can be fully incorporated into the Level 2 SFRA, a review of the Level 1 SFRA has been completed. This chapter outlines the key findings of the Level 1 SFRA review.

3.2 Planning Policy

3.2.1 The Level 1 SFRA was completed in accordance with Planning Policy Guidance 25 (PPS25), which was superseded by the NPPF in March 2012.

3.2.2 The reform to planning policy brought about by the NPPF places more power in the hands of local communities to shape the places in which they live and has reduced the larger PPS25 document into a shorter more concise set of policies. The NPPF must be taken into account in the preparation of local plans and therefore the Level 2 SFRA must refer to these updated policies. While the NPPF and Planning Practice Guidance: Flood Risk and Coastal Change supersede PPS25, much of the guidance remains largely the same, therefore it is not suggested that a revision to the Level 1 SFRA is required at this time. A material change that will affect the Level 2 SFRA process is the Exception Test, which under PPS25 had three parts, and under the NPPF now only has two as the requirement for development to be on previously developed land has been removed.

3.3 Baseline Data

3.3.1 The Level 1 SFRA provides a good strategic overview of flood risk across Epping Forest including clear descriptions of existing flood risk from fluvial, surface water, groundwater and sewer / artificial sources. Where data was available historic flood records were referred to and climate change scenarios were mapped for fluvial watercourses, as provided by the Environment Agency.

Fluvial Flood Risk

3.3.2 Fluvial flood risk data included in the Level 1 SFRA was primarily based upon data provided by the Environment Agency. Since completion of the Level 1 SFRA, the Environment Agency flood model for the River Lee has been updated in the Lee Model Maintenance Study. Both 1D and 2D revisions were made to the existing models developed in the River Lee Mapping and Hydrology Study. However, flood outlines are only available for the 'defended' flood outlines. This revised data will be used to delineate Flood Zone 3b in the Level 2 SFRA.

3.3.3 The Environment Agency has also provided updated flood outlines for Flood Zone 2 and Flood Zone 3a (May 2013). However, at the time of writing this report the specific sources of each section of flood outline have not been confirmed by the Environment Agency. The Level 2 SFRA will use the latest flood zone outlines provided by the Environment Agency, however if clarification of the source of the outlines is not available, data origins cannot be provided.

3.3.4 On the basis of revised Environment Agency modelling, mapping of fluvial flood risk in the Level 1 SFRA can be considered to be 'out of date'. The Level 2 SFRA will include a review of revised Environment Agency mapping to ensure that where new modelling studies have been completed, the most up to date information is used to illustrate risk. Updated EFD wide fluvial flood risk maps will be provided. The Environment Agency has a good level of modelling data for fluvial flood risk, therefore no additional fluvial modelling is considered necessary as part of the Level 2 SFRA.

Surface Water Flood Risk

3.3.5 The Level 1 SFRA provided an assessment of surface water flood risk with reference to the Environment Agency Flood Map for Surface Water (FMfSW) data as well as EFDC held surface water flood incident records.

3.3.6 Since publication of the Level 1 SFRA, EFDC has maintained a good understanding of the surface water drainage network and flood records, providing a good snapshot of risk posed to EFD. In addition, due to limitations associated with the FMfSW, the Level 2 SFRA will include the Environment Agency's updated Flood Map for Surface Water (uFMfSW) data, which includes a number of improvements on the previous mapping, as discussed in Section 4.2.4.

3.3.7 As a consequence of these developments in the data used in the Level 1 SFRA, the assessment of surface water flood risk will be reviewed. The Level 2 SFRA will re-map data from pluvial modelling and more recent surface water flood incident data (post 2007). This will enable identification of the flood extent for different storm return periods, which will all be used to inform the Sequential Test and Exception Test processes.

Groundwater Flooding

3.3.8 The Level 1 SFRA includes a comprehensive description of local geology supported by mapping. Data on the geology of EFD has not been significantly altered since publication of the Level 1 SFRA.

3.3.9 The Level 2 SFRA will use this data to provide guidance on the likelihood of groundwater flooding based on geology overlaid with the most recent (2013) Environment Agency and Epping Forest groundwater flood records. The Level 2 SFRA will also provide guidance on the suitability of the use of infiltration drainage techniques across the district.

Flooding from Sewers

3.3.10 Sewer flooding data provided by Thames Water Utilities Limited (TWUL) is limited and not provided at street level resolution. The Level 1 SFRA has included a description of the sewerage infrastructure serving Epping Forest as well as mapped outputs of historical sewer flooding incidents held by Epping Forest.

3.3.11 TWUL hold records of flooding due to sewers. This data is provided on a 'post code' basis.

3.3.12 Due to the availability of additional data from TWUL and more recent records of flooding held by EFDC, the assessment of flood risk from sewers presented in the Level 1 SFRA can be considered to be out of date and will be updated in this Level 2 SFRA, with flood records presented in Figure 2 and Figure 7 of Appendix A.

Artificial Sources of flooding (flood defence structures and raised water bodies)

3.3.13 The Level 1 SFRA includes a good description of flood defence information (provided by the Environment Agency National Flood and Coastal Defence Database) as well as details of local flood defence schemes and the location of storm grilles maintained by EFDC and the Environment Agency.

3.3.14 The same sources of information will be used to inform the Level 2 SFRA. This will include updated Environment Agency mapping and any additional flood defence information provided by Epping Forest post the 2008 dataset used in the Level 1 SFRA. In addition the Canal and Rivers Trust (C&RT) has provided their flood incident records and details of assets which will be mapped in the Level 2 SFRA. Mapping will highlight potential development areas which benefit from the presence of flood defence infrastructure.

Development Guidance

3.3.15 Specific information referring to development guidance including requirements of site-specific FRAs, development in Epping Forest Flood Risk Assessment Zones (FRAZs) which are identified in Figure 9, Appendix A and EFDC policies on the use of Sustainable Drainage Systems are provided in the Level 1 SFRA.

3.3.16 Due to a change in national planning policy and developments in baseline datasets the guidance in the Level 1 SFRA will be reviewed and developed in the Level 2 SFRA. This will be carried out at the site level (based on site information provided by Epping Forest) and will therefore provide targeted guidance with regard to flood risk for use by developers and planning teams in relation to specific development areas.

3.3.17 Each piece of guidance included in the Level 1 SFRA is discussed in more detail below to highlight where there may be requirements for update in the Level 2 SFRA.

- **Requirement for a site-specific FRA** - The Level 1 SFRA refers to PPS25 guidelines to specify the need for site specific FRAs. While PPS25 has been superseded by the NPPF, the guidance in relation to the need for site specific FRAs has not changed. The Level 1 SFRA report also refers to Epping Forest Local Plan (2006) guidance which includes the definition of 'FRAZs' where FRAs may be required for smaller developments than described in PPS25 [and now the NPPF]. Environment Agency pluvial modelling to define surface water flood risk will also form the basis to definition of revised FRAZs. In addition, Epping Forest is currently working to produce a new Local Plan which will replace the current Local Plan (2006). It is not anticipated that the new Local Plan will be available prior to completion of the Level 2 SFRA. However, revised FRAZs should be available which may result in a revision to this guidance.
- **Sustainable Drainage Systems** - The Level 1 SFRA provides an overview of Sustainable Drainage Systems (SuDS) and outlines that the Council encourage the use of SuDS on all forms of development. However, the Level 1 SFRA does not provide any further detail with regard to policy requirements and the use of SuDS other than:
    - Space should be specifically set aside for SuDS which will be a requirement for all appropriate new development and used to inform the overall site layout. The drainage systems must be appropriate for local soil and geology conditions;
    - Opportunities should be pursued to retrofit SuDS in known problem areas, with developer contributions where appropriate.

3.3.18 It is not suggested that the Level 1 SFRA be updated with regard to SuDS, however the Level 2 SFRA will provide additional guidance on the suitability of SuDS based on local geology and clearer requirements for SuDS for development sites and types.

3.4 Conclusions

3.4.1 EFDC in collaboration with HC carried out a Level 1 SFRA, completed by an in house team in April 2011. A review of this Level 1 SFRA has identified that policies contained within the Level 1 SFRA remain valid for any new development within EFD. However, upon completion of the Level 2 SFRA the Level 1 SFRA will be superseded and should not be referred to. Instead, information on flood risk in the District should be established through reference to the Level 2 SFRA. Further findings are outlined below:

- PPS25 has been replaced by the NPPF. However, there are no changes in the policy which directly influence / change the requirements of the Level 1 SFRA;
- Flood Risk Data – There have been revisions to Environment Agency fluvial modelling data used in the Level 1 SFRA mapping. Latest model data will be used in the Level 2 SFRA. Due to the resolution of the data included at the Level 1 SFRA and the comprehensive description of flood risk, it is not suggested that the Level 1 SFRA be revised at this time, rather readers be directed to the Level 2 SFRA for latest modelled data upon its completion;
- Development Guidance – The Epping Forest Local Plan (2006) is currently undergoing revision. However, it is not anticipated that this will be available within the timescales of the Level 2 SFRA. No revision to the Level 1 SFRA is suggested based upon planning policy due to the level of detail provided in the report. The Level 2 SFRA will provide greater clarity with regard to the requirements placed upon developers building in areas of flood risk.

4 FLOOD RISK IN EPPING FOREST

4.1 Fluvial Flooding

Sources

4.1.1 The main source of flood risk to Epping Forest is fluvial flooding associated with the River Roding and River Lee, as well as other smaller main rivers.

4.1.2 The Roding flows from the north to the south along parts of the eastern boundary of EFD. Its catchment dominates the eastern two thirds of EFD and has a rapid response to rainfall due to the predominance of a clay underlying geology. A major tributary to the River Roding is the Cripsey Brook.

4.1.3 The River Lee flows along the western boundary of EFD and its catchment occupies the western one third of EFD. The upstream catchment is largely rural, while the Lower Lee catchment is heavily urbanised with the combination of man-made, impermeable surfaces and low permeability clayey soils. The two main tributaries of the Lower Lee are the Nazeing Brook and Cobbins Brook.

4.1.4 A small proportion of the north of EFD falls into the catchment of the River Stort, and finally, the River Ingrebourne catchment is located on the south eastern boundary of EFD.

4.1.5 Both the River Lee and Roding have proportions of their catchment defined by low permeability surfaces reducing the potential for infiltration to sub-soils. Therefore, a large proportion of the rainfall is conveyed directly to the river resulting in a 'flashy' hydrograph profile. This means that there is limited time for flood warning and evacuation processes unless they are well informed through weather forecasting techniques.

4.1.6 Figure 1 located in Appendix A illustrates Main River Locations.

4.1.7 The Thames Catchment Flood Management Plan (CFMP) (2009) states that there are between 2,500 and 5,000 properties within Epping Forest District at risk of flooding during a 1 in 100 year (1% Annual Exceedance Probability (AEP)) fluvial event.

Historic Flooding

4.1.8 Figure 2 in Appendix A presents extents of historic fluvial flood events supplied by the Environment Agency. Major fluvial flooding events are shown to have occurred in 1947, 1968, 1974, 1978, 1987, 1993, 2000 and 2001. The majority of flooding has occurred along sections of Main River which do not have raised defences, or did not at the time of the flood event.

4.1.9 The C&RT provided details of overtopping events along the sections of watercourse which they maintain. Recorded incidents of overtopping are limited, and have occurred along the River Lee Navigation and River Stort Navigation channel, which are classed as main rivers by the Environment Agency.

NPPF Flood Zones

4.1.10 The NPPF defines four Flood Zones based on the probability of flooding as shown in Table 4.1 below. During the writing of this Level 2 SFRA, the Environment Agency provided details of the modelling carried out to inform the Flood Map. The Flood Map was first developed in 2004 using national generalised modelling and has subsequently been updated and improved on a number of occasions. The Environment Agency carries out a programme of catchment studies, entailing topographic surveys and hydrological and/or hydraulic modelling, aimed at providing improvements to the Flood Map.

4.1.11 The River Roding and Lee have been extensively modelled, as has the River Stort and therefore large sections of the mapped Flood Zones are derived from more detailed modelling. Where detailed modelling studies have not been carried out, existing JFLOW modelling has been utilised to inform the Environment Agency's delineation of Flood Zone 2 and Flood Zone 3a. However it has not been possible to identify which sections of the undefended flood outlines have been derived from the detailed modelling studies and therefore the confidence in any specific section of flood zone cannot be defined. Figure 3 in Appendix A illustrates fluvial Flood Zones across the study area.

4.1.12 However, modelling study outputs for the 1 in 20 year (5% AEP) event, used to define Flood Zone 3b, are available as GIS layers. Further detail in provided in Table 5.1.

Table 4.1: Fluvial Flood Zone Definitions

FLOOD ZONE	DEFINITION	PROBABILITY OF FLOODING
Flood Zone 1 - Low Probability	Land assessed as having a less than 1 in 1000 annual probability of river flooding (<0.1% AEP events).	Low Probability
Flood Zone 2 - Medium Probability	Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% AEP and 0.1% AEP events).	Medium Probability
Flood Zone 3a - High Probability	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1% AEP event).	High Probability
Flood Zone 3b - High Probability	Land where water has to flow or be stored at times of flood. The identification of the functional floodplain takes into account local circumstances but for the purposes of this SFRA, land which would flood during a 5% AEP event or greater in any year has been mapped.	Functional Floodplain

Hydraulic Modelling

4.1.13 Details of hydraulic modelling studies that have been carried out within EFD are provided in Table 5.1. Studies have been carried out on the River Lee (2010), Upper Roding (2003), Middle Roding (2003) and Upper and Middle Stort (2010).

4.1.14 The Lee Model Maintenance Study (2010)[5] updated both the 1D and 2D elements of the original River Lee model in order to incorporate additional modelling carried out during separate studies, such as those developed for the purposes of a site-specific flood risk assessment. The updated model covers the entire length of the River Lee through EFD.

4.1.15 The Upper Roding model covers the Upper Roding catchment to Passingford Bridge and the whole of the Cripsey Brook tributary. An out-of-bank hydraulic model was constructed along the watercourses, with a hydrological model producing the inflow hydrographs into the model. Flood levels were derived and subsequently mapped.

4.1.16 The Middle Roding model extends from Passingford Bridge Mill just downstream of the eastern boundary of EFD where the B175 meets the A113 close to the M25, to its downstream extent at Redbridge south of EFD. An out-of-bank model was developed, with model outputs consisting of flood levels, which were mapped in order to present flooding extents.

4.1.17 The modelling study for the Stort entailed the development of a linked 1D-2D. The Stort passes along the boundary of EFD at its north-western point near Sawbridgeworth.

4.1.18 The Harlow Northern Extension SFRA – Hydrology and Hydraulic Modelling Report (2006)[6] was developed at the request of the Environment Agency to support a SFRA for the proposed development of a large area of land to the north of Harlow. An existing hydraulic model developed in the Lower Stort Modelling Report (PBA 2000)[7] was adapted for the purposes of the study. The model extends from Bishop's Stortford, north of EFD, to the confluence with the River Lee.

4.2 Surface Water Flooding

Sources

4.2.1 Overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems. It can run quickly off land and result in localised flooding.

4.2.2 In the more rural northern parts of EFD, surface water drainage tends to be isolated systems, linked to the Essex County Council (ECC) highway drainage network discharging to open ditches alongside roads. When these rural drainage networks become silted or blocked, surface water flooding can occur.

4.2.3 In more urban areas, surface water drainage is provided via a combination of gullies, carrier pipes, adopted surface water sewers (often owned by water utilities, in the case of EFD, TWUL and Anglian Water Services (AWS) and ECC highway drainage. An increase in the impermeability of urban areas over time (e.g. concreting of driveways) has led to many surface water drainage systems being unable to cope adequately leading to an increased frequency of surface water flooding.

National Level Pluvial Modelling

4.2.4 The Environment Agency has undertaken pluvial modelling at a national scale and produced mapping identifying those areas at risk of surface water flooding during 1 in 30 year (3.33% AEP), 1% AEP and 0.1% AEP rainfall events. The uFMfSW extents have been made available to EFDC as GIS layers. The extents relevant to the ninety-seven Proposed Development Sites are shown in Figure 4 in Appendix A. The uFMfSW provides all relevant stakeholders, such as the Environment Agency, ECC as the Lead Local Flood Authority (LLFA) and the public access to information on surface water flood risk which is consistent across England and Wales[8]. The modelling will help the Environment Agency take a strategic overview of flooding, and assist ECC (as the LLFA) in their duties relating to management of surface water flood risk. For the purposes of this Level 2 SFRA, the mapping also allows an improved understanding of areas within the district which may have a surface water flood risk.

4.2.5 The modelling represents a significant improvement on previous mapping, namely the FMfSW (2010) and the Areas Susceptible to Surface Water Flooding (AStSWF) (2009), for example:

- Increased model resolution to 2m grid;
- Representation of buildings and flow routes along roads and manual editing of the model for structural features such as flyovers;
- Use of a range of storm scenarios; and
- Incorporation of appropriate local mapping, knowledge and flood incident records.

4.2.6 However, it should be noted that this national mapping has the following limitations:

- Use of a single drainage rate for all urban areas;
- It does not show the susceptibility of individual properties to surface water flooding;
- The mapping has significant limitations for use in flat catchments;

- No explicit modelling of the interaction between the surface water network, the sewer systems and watercourses;
- In a number of areas, modelling has not been validated due to a lack of surface water flood records;
- As with all models, the uFMfSW is affected by a lack of, or inaccuracies in, available data.

4.2.7 The suitability of the mapping varies spatially depending on the confidence in the local modelling. The mapping available for EFD is suitable for identifying areas that are at risk and approximate flood extents, and is not suitable for assessing risk at the individual property scale. The data has therefore been used in this Level 2 SFRA to highlight potential surface water risk to the Proposed Development Sites which may justify further investigation through a site-specific FRA. This is discussed further in Section 5.6 and Section 9.4.

Historic Records

4.2.8 Recorded surface water flooding incidents were provided by EFDC and are presented in Figure 3 in Appendix A. The records only reflect events which were reported to EFDC's drainage team. It is possible that surface water flooding has previously occurred but was not reported to EFDC and therefore could not be included in their flood database.

4.2.9 Comparison of historic flood records with the uFMfSW mapping shows a good correlation in terms of flood incidents being located in areas of potential flood risk. Large areas identified by the uFMfSW as being at high risk of surface water flooding do not have any associated recorded surface water flood incidents. This may be due to flood incidents not being reported. It is also important to note that due to the nature of the uFMfSW exercise, medium and high risk areas are often associated with the natural drainage network such as main rivers and ordinary watercourse. It may therefore often be difficult to distinguish the source of a flood incident.

4.3 Groundwater Flooding

Sources

4.3.1 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather.

4.3.2 Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.

4.3.3 A number of surface water drainage channels across the borough are spring fed at their head. This is caused by a perched water table at the boundary of impermeable and permeable strata. Groundwater fed watercourses and springs are affected by seasonal variability in rainfall and man-made interventions such as the construction of foundations and basements. Care should be taken in the use of infiltration drainage systems in areas where the permeable strata are of geographically limited extent as their use may contribute to groundwater flooding nearby. Almost the entire district is underlain by London Clay or Claygate Member bedrock (Figure 5 in Appendix A). The south and south-west of EFD is underlain by impermeable soils which are seasonally waterlogged. The majority of the remainder of Epping Forest is underlain by cracking clay soils. The soil types and geology indicate that for the majority of sites, infiltration based SuDS are unlikely to be suitable. Should infiltration SuDS be proposed a site investigation of ground conditions should be carried out.

4.3.4 Figure 6 in Appendix A presents the Environment Agency's dataset: Areas Susceptible to Groundwater Flooding (AStGWF), which indicates where groundwater may emerge due to certain geological and hydrogeological conditions. This information is shown as a proportion of 1km grid squares where there is potential for groundwater emergence. The data does not show where flooding is likely to occur, but instead should be used at a strategic level to indicate areas for further investigation. The data is relatively broad and susceptibility varies greatly throughout EFD.

Historic Records

4.3.5 Groundwater flooding is known to occur around Nazeing associated with outcrops of the highly permeable Lambeth Group sands and the Kesgrave Sands and Gravels. Discontinuation of groundwater abstraction in areas may have the potential to lead to a rise in groundwater levels.

4.3.6 Groundwater flooding incidents are concentrated within urban areas of Epping Forest, specifically Chigwell, Loughton, Theydon Bois and Epping.

4.4 Sewer Flooding

Sources

4.4.1 During heavy rainfall, flooding from the sewer system may occur if:

1. **The rainfall event exceeds the capacity of the sewer system/drainage system:**

4.4.2 Sewer systems are typically designed and constructed to accommodate rainfall events with a 3.3% AEP or less. Therefore, rainfall events with a return period of frequency greater than 3.3% AEP would be expected to result in surcharging of some of the sewer system. While TWUL and AWS are concerned about the frequency of extreme rainfall events, it is not economically viable to build sewers that could cope with every extreme rainfall event.

2. **The system becomes blocked by debris or sediment:**

4.4.3 Over time there is potential that road gullies and drains become blocked from fallen leaves, build-up of sediment and debris (e.g. litter).

3. The system surcharges due to high water levels in receiving watercourses:

4.4.4 Within the study area there is potential for river outlets to become submerged due to high river levels. When this happens, water is unable to discharge. Once storage capacity within the sewer system itself is exceeded, the water will overflow into streets and potentially into houses. Where the local area is served by 'combined' sewers i.e. containing both foul and storm water, if rainfall entering the sewer exceeds the capacity of the combined sewer and storm overflows are blocked by high water levels in receiving watercourses, surcharging and surface flooding may again occur but in this instance floodwaters will contain untreated sewage.

Historic Records

4.4.5 DG5 sewer flooding records were provided by TWUL and are grouped into 4 digit post code areas (see Figure 7 in Appendix A). The records are not available at individual property level. EFDC provided records of sewer flooding, which are presented in Figure 3 and Figure 7 in Appendix A. AWS were consulted during the writing of this SFRA and confirmed that they hold no records of flooding within their service area in EFD.

4.5 Artificial Sources

4.5.1 Figure 8 in Appendix A shows the location of flood defences within EFD. Environment Agency data provides information on maintained channels, raised man-made defences, culverted sections of watercourses and non-flood defence structures such as earth embankments of varying flood defence value. Figure 8 in Appendix A also shows areas identified as critical watercourses by EFDC and storm grills maintained by them.

4.5.2 A section of the River Lee is a maintained channel running from the A110 to the south-west of EFD at Chingford as far north as Highbridge Street in Waltham Abbey. The Rammey Marsh Flood Relief Channel runs to the east of Enfield Island Village in a roughly north-south direction. Sections of the River Lee and connecting channels to the north of this point are maintained and/or benefit from raised man-made flood defences. Other more isolated areas throughout the district benefit from raised defences and these are indicated on Figure 8 in Appendix A.

4.5.3 Flood defences provide areas with protection from fluvial flooding to a degree. The main areas afforded a level of protection from flood defences are Thornwood, Waltham Abbey and areas along the River Lee along the western edge of EFD. Areas benefitting from the flood defences are afforded protection up to the 1% AEP fluvial event. However, such areas are still at risk from flooding in the event of failure of the defences, or the occurrence of a flood event exceeding the design standard of the flood defences resulting in overtopping.

5 MAPPING OF LOCAL FLOOD ZONES

5.1 Rationale

5.1.1 To inform application of the Sequential Test local level mapping of flood zones, flood risk and available flood incident records has been produced (Appendix A). Flood data should be used to define flood risk to development sites enabling those with the lowest flood risk to be identified for development in preference to those with greater flood risk. This section details the data used to produce the flood maps.

5.2 Data Collected

Data Origin

5.2.1 The majority of the data utilised to develop local level mapping was obtained from local stakeholders and is detailed in the following sections. The data obtained, the organisation that supplied it and the format of the data are detailed in Table 5.1.

Table 5.1: Data Supplied by Stakeholders

DATA	STAKEHOLDER	FORMAT
Flood Zone 2 Outline	Environment Agency	GIS
Flood Zone 3 Outline	Environment Agency	GIS
Flood Zone 3b 5% AEP flood outline, based on a defended scenario, from the River Lee Model Maintenance Report, Halcrow 2010 5% AEP flood outline, based on a defended scenario, from the Upper Roding Section 105 Modelling Report, Jacobs Gibb 2003 5% AEP flood outline, based on a defended scenario, from the Middle Roding Section 105 Modelling Report, Jacobs Gibb 2003 5% AEP flood outline, based on a defended scenario, from the Upper and Middle Stort Flood Mapping Model, Halcrow 2010 5% AEP flood outline, based on a defended scenario, from the Harlow Northern Extension SFRA – Hydrology and Hydraulic Modelling Report, Faber Maunsell 2006	Environment Agency	GIS
Main Rivers, Detailed River Network layers	Environment Agency	GIS
Epping Forest District Council records of flooding from fluvial, surface water, sewer, groundwater and other/unknown sources.	Epping Forest District Council	Spreadsheet
Groundwater Flood Incident Records	Environment Agency	Spreadsheet

DATA	STAKEHOLDER	FORMAT
Canal and River Trust Overtopping Records	Canal and River Trust	GIS
DG5 sewer Incident records	Thames Water	Spreadsheet
Highways Flood Incident records	Highways Agency	Spreadsheet / Plans

5.3 Mapping of Flood Zones

5.3.1 Flood Zone 2, Flood Zone 3a and Flood Zone 3b were mapped using data provided by the Environment Agency. The data consisted of Flood Zone 2 and Flood Zone 3a outlines based on undefended model scenarios, provided in GIS format.

5.3.2 Flood Zone 3a is defined in the Planning Practice Guidance: Flood Risk and Coastal Change as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1% AEP). Flood Zone 2 is defined as land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% AEP - 0.1% AEP).

5.3.3 Flood Zone 2 and Flood Zone 3a were delimited using Environment Agency flood zone outlines. As discussed in Section 4.1.10, the flood zone outlines are a composite of outputs from the modelling studies detailed in Table 5.1 and generalised modelling outputs. As new modelling studies are carried out, generalised modelling outputs are gradually replaced. Correspondence with the Environment Agency has confirmed that a GIS layer detailing the source of the Flood Zone 2 and Flood Zone 3 outlines i.e. generalised modelling or subsequent modelling studies, is not available. As a consequence, the confidence associated with the definition of any specific section of the flood outlines cannot be established.

5.3.4 Flood Zone 3b is defined in the Planning Practice Guidance as land where water has to flow or be stored in times of flood. For the purposes of this Level 2 SFRA Flood Zone 3b is identified as the 5% AEP defended outline for the Rivers Lee, Middle and Upper Roding and Upper Stort. Since completion of the Level 1 SFRA, the Environment Agency flood model for the River Lee has been updated through the Lee Model Maintenance Study. Both 1D and 2D revisions were made to the existing models developed in the River Lee Mapping and Hydrology Study.

5.3.5 Where detailed modelling has not been carried out, Flood Zone 3b has not been mapped.

5.3.6 Flood Zone 1 is defined as having a 1 in 1000 or less annual probability of river flooding (<0.1% AEP) and is considered to be all areas not in Flood Zone 2, Flood Zone 3a or Flood Zone 3b.

Areas lacking defined flood zones

5.3.7 In a limited number of areas, sections of main river do not have a defined flood zone. This is potentially due to a lack of detailed modelling and/or a lack of historical flood data. Where Proposed Development Sites are located nearby, the mapping indicates that there is no fluvial flood risk to the site, where in actuality there may be a risk. The sites where this occurs have been identified in Table 6.1. Particular attention should be given to such sites, as they may be vulnerable to fluvial flooding that is not quantified at present by Environment Agency mapping.

5.3.8 Flood zones are not defined for the majority of ordinary watercourses in EFD, and therefore the flood risk posed by such watercourses to proposed development sites should also be given consideration. Further guidance for site-specific flood risk assessments is detailed in Section 9.

5.4 Flood Incident Mapping

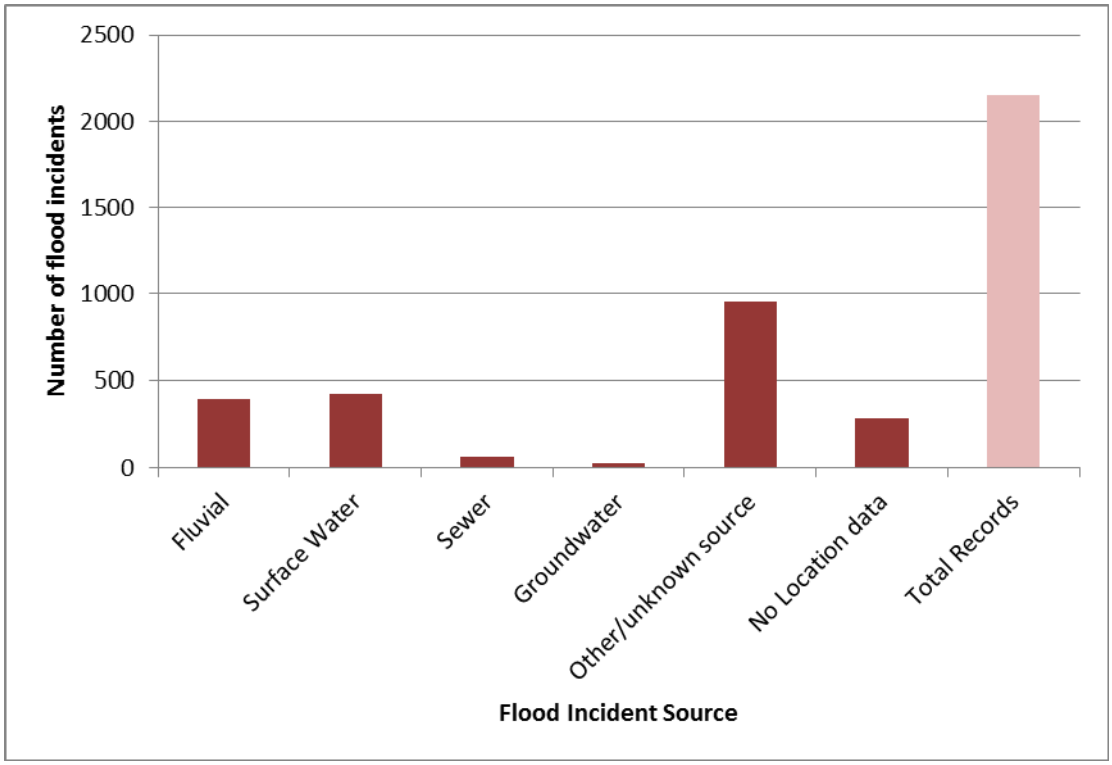
5.4.1 Flood incident records were supplied by a number of stakeholders. These records are detailed in the following section and are discussed based on flood source.

5.4.2 Where grid references were provided for flooding incidents these records were mapped in GIS. The resultant maps provide information on current fluvial flood risk, and records of previous flooding incidents from a number of different sources.

5.4.3 EFDC flood incident records have been compiled from a number of sources; Fire Brigade records, Engineers Reports, members of the public and directly from EFDC officers. Records were grouped based on flood incident category where this information was included. EDFC flood incident records date between 1982 and 2012.

5.4.4 Of 2,150 records supplied, 396 records were identified as having a fluvial source, 426 surface water, 64 sewer and 23 groundwater. 956 incidents were not assigned a clear flood source in the EFDC records and have therefore been identified as having an 'other' or unknown source.

Figure 5.1: Summary of Epping Forest District Council Flood Incident Records



5.4.5 Location information was not provided for all 2,150 records supplied. Where x, y coordinates were provided the flood incident was directly converted from spreadsheet to GIS format. Such information allows the records to be geo-referenced and their location plotted on a map. Where x, y coordinates were not provided, though 6-digit post codes were, the postcodes were converted into x, y co-ordinates. Records could therefore be mapped, though with a lesser accuracy. 285 flood incidents were recorded with no geographical information and therefore could not be mapped.

5.4.6 Highways Agency flood incident records have been obtained from two separate sources: one contractor operating on the M25 and M11 Junction 4-6, a second contractor operating on the M11 Junction 6-9. Highways Agency flood incident records were not supplied in GIS format, or with associated grid references. A number of EFDC flood incident records were also missing grid references. As the information could not be supplied in GIS format the location of the recorded flood incidents could not be defined within the scope of this Level 2 SFRA. These flood incidents could not be mapped.

5.4.7 At the time of writing this Level 2 SFRA no flooding incident records for EFD have been supplied by London Underground or Network Rail.

5.5 Mapping of Flood Risk from Rivers

5.5.1 Fluvial flood incidents were identified from EFDC records. For the purposes of this Level 2 SFRA no distinction was made between flooding from main rivers and ordinary watercourses. The records were mapped in GIS where x, y co-ordinates were available, or where 6-digit postcodes allowed conversion into x, y co-ordinates.

5.5.2 All overtopping records provided by the C&RT were classified as flooding from a fluvial source, with the exclusion of one flood incident, where flooding was identified as occurring due to a water pipe discharging on to the towpath.

5.6 Mapping of Flood Risk from Surface Water

5.6.1 Surface water flood incidents were primarily identified from EFDC records. For the purposes of the flood incident mapping, incidents with a number of different sources were grouped together and classified purely as having a surface water source. Where flood incidents were identified as being ‘Highways’, ‘Storm’, ‘Runoff from adjacent land’ and ‘Runoff from land/TWUL sewer’ they were grouped together as being records of surface water flooding. One record provided by the Canal and River Trust was identified as surface water flooding.

5.6.2 Potential flood risk to Proposed Development Sites from surface water was mapped using the Environment Agency uFMfSW dataset, and is presented in Figure 4 in Appendix A. The uFMfSW mapping is discussed in Section 4.2.4 to Section 4.2.7. The mapping identifies those areas at risk of surface water flooding during 3.33% AEP, 1% AEP and 0.1% AEP rainfall events.

5.7 Mapping of Flood Risk from Sewers

5.7.1 DG5 sewer flooding records were provided by TWUL. Flood incident records are not provided to street level detail, and are instead grouped into 4 digit post code areas. The records were supplied as a spreadsheet detailing the number of incidents in the period of the last 1 to 10 years and 1 to 20 years, grouped as internal and external property flooding. For the purposes of the flood mapping exercise, records of internal and external flooding incidents from the past 1 to 20 years were used. In order for the incidents to be mapped they were cross-referenced with GIS polygon layers of 4-digit post code areas (post code sectors).

5.7.2 Correspondence with AWS confirmed that they are the sewage undertaker for a small area within EFD; High Ongar and Roydon. Anglian Water confirmed that they do not hold any records of flooding within their administrative area in EFD.

5.7.3 As flood incident records are not provided to street level it is not possible to identify whether sewer flooding has occurred within the specific boundary of a Proposed Development Site. Instead it can only be determined whether a Proposed Development Site is located within a wider area with a history of previous sewer flooding incidents. Where a Proposed Development Site boundary crossed more than one post code sector, the number of internal and external flood incidents for the development site was taken from the post code sector with the greatest number of recorded incidents.

5.7.4 EFDC provided a record of flood incidents of various sources which have occurred within EFD. All those records identified as sewer flooding were included as such in the mapping. The records provided by EDFC allow a more detailed analysis of the presence of previous sewer flooding in proximity to a proposed development site.

5.8 Mapping of Flood Risk from Groundwater

5.8.1 The Environment Agency provided a limited number of groundwater flood incident records for the district. The data was provided as a spreadsheet with x and y coordinates included. The records could therefore be geo-referenced and mapped in GIS.

5.8.2 EFDC records identified as groundwater seepage were included as groundwater incidents.

5.9 Mapping of Flood Risk from Artificial Sources

5.9.1 All overtopping records provided by the C&RT were classified as flooding from a fluvial source, with the exclusion of one flood incident, where flooding was identified as occurring due to a water pipe discharging on to the towpath. The overtopping records have been classified as originating from a fluvial source as the River Lee Navigation and Stort Navigation are both canalised rivers classified as main rivers by the Environment Agency. Therefore there are no records of flooding from artificial sources.

5.10 Application of the Sequential Test using Flood Risk Mapping

5.10.1 Once all flood zones and flood incident records had been collated and mapped, analysis of the flood risk to Proposed Development Sites was carried out in order to apply the Sequential Test. Only data which was provided in GIS format, or which could be converted into a GIS-compatible format was analysed.

5.10.2 A number of GIS queries were carried out to quantify the percentage of each proposed development site within Flood Zone 3b, Flood Zone 3a, Flood Zone 2 and Flood Zone 1. Similarly, queries were carried out to define the number of flood incidents from each source which have been recorded within a proposed development site.

5.10.3 The flood statistics for each proposed development site are presented as a spreadsheet in Appendix B, allowing detailed assessment of existing flood risk and historic flood events.

5.10.4 Sites were ranked according to the following hierarchy, based on the confidence with the available data, with those sites which are least preferred at the top:

- Site within Flood Zone 1;
- Site within Flood Zone 2;
- Site within Flood Zone 3a;

- Site within Flood Zone 3b;
- Number of fluvial flood incidents within the site boundary;
- % area within a high surface water flood risk area (3.3% AEP event);
- Number of surface water flood incidents within the site boundary;
- Site within an area of recorded sewer flood incidents;
- Number of groundwater flood incidents within the site boundary;
- Number of flood incidents from artificial sources within the site boundary;
- Number of flood incidents from other/unknown sources within the site boundary;
- Proposed development site reference – this allows identification of strategic regions of multiple sites with a certain flood risk.

6 PROPOSED DEVELOPMENT SITES

6.1.1 The NPPF consists of a framework within which councils and local people can produce local and neighbourhood plans that reflect the needs and priorities of their communities.

6.1.2 The EFDC Local Plan Issues and Options Consultation Document (Local Plan I&O)[9] has been prepared and presented for consultation, following which a Preferred Options/Draft Local Plan will also be prepared and made available for consultation. The Local Plan I &O document is not a policy document and does not replace the current Local Plan (2006). Instead the Local Plan I&O presents current planning issues and potential options within the district, inviting comment from stakeholders and the public.

6.1.3 At the time of the Local Plan I&O, the official population forecasts for the Local Plan period, taking into account existing permissions etc., projected a need for 10,200 new dwellings within 2011/12 to 2032/33. However updated forecasts were accepted into the Local Plan Evidence Base in December 2013, and further population forecasting work is ongoing as new data is released. The Council has yet to determine a housing target for the new Local Plan.

6.1.4 Furthermore at the time of the Local Plan I&O, the most up to date information on economic development need came from the Employment Land Review of 2010. This predicted net growth of 1,000 jobs up to the year 2031 within EFD, with an equivalent 5.83ha hectares of employment land required. The Employment Land Review concluded that it is necessary for EFDC to identify additional sites to accommodate this predicted growth. As with population projections, further work on forecasting economic development needs is ongoing as new data is released. The Council has yet to determine an economic development target for the new Local Plan.

6.1.5 The majority of the Proposed Development Sites presented in this Level 2 SFRA were initially submitted as part of the Call for Sites process[10] and subsequently included in the Strategic Land Availability Assessment (SLAA)[11]. A number of sites were also included from the Employment Land Review.

6.1.6 Table 6.1 presents details of the Proposed Development Sites including information on potential flood risk, and the requirement and rationale for a site-specific FRA.

Table 6.1 Proposed Development Sites

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
ABR - A	Abridge	6.8	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA -SR-0330
ABR - B	Abridge	2.9	1			Ordinary Watercourse	Medium	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA -SR-0027
ADD - 1	Waltham Abbey	0.5	2, 3a	N/A	0	Offline Storage	Low	Housing	More Vulnerable	Exception Test is required.	This site should be subject to a FRA.	No	SLAA -SR-0239
BKH - 1	Buckhurst Hill	1.2	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0176
BKH - 2	Buckhurst Hill	0.2	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0230
CHG - 1	Chigwell	0.4	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0014
CHG - B	Chigwell	1.8	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	incorporating part of SLAA - SR-0318
CHG - D	Chigwell	14.7	1, 2, 3a, 3b	13.98	13.97	Main River and Ordinary Watercourse	None	Housing/ Employment	More Vulnerable	No	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0098
EPG - A	Epping Green	4.1	1			Offline Storage	None	Housing / Employment (1.2ha) / Community facility	More Vulnerable	Yes	This site should be subject to a FRA.	No	Call for Sites / Incorporating W part of SR-0098 SLAA – SR-0132a
EPG - B	Epping Green	5.1	1			Ordinary Watercourse	Medium	Housing / Employment	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA – SR-0132a
EPG - C	Epping Green	2.2	1			Ordinary Watercourse	Low	Housing / Employment	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA – SR-0132a
EPG - D	Epping Green	3.1	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA – SR-0407
EPP - 1	Epping	1.5	1			No	Low	Consultation options to be included in final local plan	N / A	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0281
EPP - 2	Epping	0.4	1			No	None	Potential Housing/ Sports Centre	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0347
EPP - 3	Epping	0.2	1			No	None	Housing / Employment	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0005

[i] These are the Environment Agency Fluvial and Tidal Flood Zones. All flood zones within the site area are listed.
[ii] Based on the Environment Agency's updated Flood Map for Surface Water (uFMfSW) flood extent mapping.
[iii] Vulnerability classification is based on Table 2 in the Planning Practice Guidance: Flood Risk and Coastal Change (March 2014). The classification here provides a guide and should be re assessed on a site by site basis depending on the specific land use proposed.

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
EPP - 4	Epping	1.9	1			No	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0278
EPP - A	Epping	13	1			Ordinary Watercourse – in site	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0071
EPP - B	Epping	7.6	1			Ordinary Watercourse – in site	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0406
EPP - C	Epping	12.2	1			Main River, Ordinary Watercourse – in site	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0132a
EPP - D	Epping	54.3	1			Ordinary Watercourse – in site	Low	Housing/ Employment/ Community Facility	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0132a
EPP - E	Epping	2	1			No	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0208
EPP - F	Epping	17.1	1			Main River and Ordinary Watercourse	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0069, 0333b
EPP - G	Epping	26.4	1			Main River – in site	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA. In addition to surface water, a FRA should identify the flood risk from the main river flowing through the site.	Y	SLAA - SR-0113
EPP - H	Epping	22.8	1, 2a, 3a	N/A	22.75	Ordinary Watercourse – in site	Low	Housing/ Employment/ Community Facility	More Vulnerable	Exception Test is required.	This site should be subject to a FRA.	Y	SLAA - SR-0153, 0343
FYF - A	Fyfield	0.8	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	No	SLAA -SR-0050
FYF - B	Fyfield	2.6	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA -SR-0049
HAR - A	Harlow	75.5	1, 2a, 3a	N/A	75.33	Ordinary Watercourse – in site	None	Housing	More Vulnerable	Exception Test is required.	This site should be subject to a FRA.	Y	SLAA - SR-0009, 0068, 0086, 0091, 0105, 0106, 0107, 0109, 0214, 0215
HAR - B	Harlow	58.8	1, 2			Ordinary Watercourse – in site	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0068, 0107, 0109
HAR - C	Harlow	36.4	1			Ordinary Watercourse and Offline Storage – in site	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0006, 0046, 0139
HAR - D	Harlow	3.7	1			Ordinary Watercourse – in site	None	Employment	Less Vulnerable	Yes	This site should be subject to a FRA.		
HAR - E	Harlow	139.8	1, 2, 3a	N/A	128.44	Main River and	Low	Housing /	More Vulnerable	Exception Test	This site should be subject to a FRA.	Y	SLAA - SR-0146

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
						Ordinary Watercourse – in site, Offline Storage		Employment		is required.			
HON - A	High Ongar	1.4	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	No	SLAA -SR-0054
HON - B	High Ongar	0.3	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	No	SLAA -SR-0181
LOU - 1	Loughton	2.5	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	Call for sites. SLAA - SR-0058
LOU - 10	Loughton	0.5	1			No	None	Employment	Less Vulnerable	Yes	Located within a FRAZ and over 235m^2 and therefore this site should be subject to a full FRA.	Y	Employment Land Review / SLAA - SR-0280
LOU - 11	Loughton	0.3	1			No	None	Housing	More Vulnerable	Yes	Located within a FRAZ and over 235m^2 and therefore this site should be subject to a full FRA.	Y	Call for Sites / SLAA - SR-0059
LOU - 2	Loughton	9.4	1, 2, 3a, 3b	9.17	9.17	Main River and Offline Storage	None	Housing / Employment	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0325
LOU - 3	Loughton	33.4	1, 2, 3a	N/A	33.36	Main River and Ordinary Watercourse	None	Employment	Less Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0355
LOU - 4	Loughton	6.2	1, 2, 3a, 3b	5.77	4.96	Main River	High	Housing / Employment	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	Call for Sites. SLAA - SR-0018
LOU - 5	Loughton	4.1	1, 2, 3a	N/A	2.01	No	High	Employment	Less Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0279
LOU - 6	Loughton	0.8	1			No	None	Housing / Retail	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0289
LOU - 7	Loughton	0.2	1			No	None	Housing or Retail	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0285
LOU - 8	Loughton	0.5	1			No	None	Housing or Retail	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0284
LOU - 9	Loughton	1.4	1			No	None	Housing or Retail	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0286
LSH - A	Lower Sheering	0.5	1			Ordinary Watercourse – in site	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	SLAA - SR-0121
LSH - B	Lower Sheering	22	1			Ordinary Watercourse and Offline Storage – in site	None	Housing / Employment / Community	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0032; SR-0313
MOR - A	Moreton	0.7	1			No	None	Housing /	More Vulnerable	Yes	This site should be subject to a FRA, as	No	SLAA -SR-0075

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
								Employment			per Local Plan Alterations 2006 Policy U2B		
NAZ - 1	Lower Nazeing	14	1, 2, 3a, 3b	12.6	11.81	Main River and Ordinary Watercourse – in site	High	Housing	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	Call for Sites. Could include all or parts of SLAA sites SR-0135a, 0135b, 0136, 0166, 0168, 0276, part of 0302.
NAZ - A	Lower Nazeing	23.3	1			Ordinary Watercourse and Offline Storage – in site	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	Call for Sites. Could include all or parts of SLAA sites SR-0301 and 0150.
NAZ - B	Lower Nazeing	12.2	1			No	None	Housing / Employment	More Vulnerable	Yes	This site should be subject to a FRA.	Y	Call for Sites. Could include all or parts of the SLAA sites SR-0011, 0101 and 0300
NWA A	North Weald Airfield	13.7	1			No	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0119
NWA B	North Weald Airfield	2.9	1			No	Low	Housing / Employment	More Vulnerable	Yes	This site should be subject to a FRA.	Y	
NWA C	North Weald Airfield	23	1			No	Low	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0119
NWA D	North Weald Airfield	24	1, 2, 3a	N/A	23.76	Ordinary Watercourse and Offline Storage – in site	Low	Housing	More Vulnerable	Exception Test is required.	This site should be subject to a FRA.	Y	SLAA - SR-0003, 0119, 0158b
NWB - 1	North Weald Bassett	7.9	1			No	None	Employment	Less Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0274
NWB - 3	North Weald Bassett	0.4	1			Ordinary Watercourse	Low	Housing	More Vulnerable	Yes	Located within a FRAZ and over 235m^2 and therefore this site should be subject to a full FRA.	Y	SLAA - SR-0240
NWB - A	North Weald Bassett	35.2	1			Ordinary Watercourse	Low	Housing / Employment	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0036; SR-0072; SR-0158a
NWB - B	North Weald Bassett	3.6	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA.	Y	SLAA - SR-0036
ONG - 1	Chipping Ongar	0.1	1			No	None	Housing	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	Call for Site / SLAA - SR-0022
ONG - A	Chipping Ongar	26.8	1			No	None	Housing/ Employment/ Community Facility	More Vulnerable	Yes	This site should be subject to a FRA.	Y	Could include all or parts of SLAA sites: SR-0055, 0183, 0184, 0185, 0186 and part of 0395
ONG - D	Chipping Ongar	55.7	1, 2, 3a, 3b	55.38	55.38	No	None	Housing/ Employment/ Community Facility	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	Call for sites / Could include all or parts of SLAA sites SR-0053, 0090, 0267 and 0391

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
ONG – E	Chipping Ongar	17.7	1			Ordinary Watercourse	None	Housing/ Employment/ Community Facility	More Vulnerable	Yes	This site should be subject to a FRA.	Y	Parts Call for Sites / Could include all or parts of SLAA sites SR-0112 and 0268
ONG - F	Chipping Ongar	83.7	1, 2, 3a, 3b	73.87	73.04	Main River and Ordinary Watercourse – in site	Medium	Housing/ Employment/ Community Facility/ School	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	Most of area suggested in Call for Sites / Could include all or parts of SLAA sites SR-0067 (all 3 parts) 0120 and 0390
ONG - G	Chipping Ongar	20.9	1, 2, 3a, 3b	19.15	18.66	Main River – in site	Low	Housing/ Employment/ Community Facility	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	Parts Call for Sites / Could include part or all of SLAA site SR-0102 and E part of SLAA - SR-0395
ROY - A	Roydon	8.9	1, 2, 3a	N/A	8.88	Main River	Medium	Housing/ Commercial/ Community Uses	More Vulnerable	Exception Test is required.	This site should be subject to a FRA.	Y	SLAA - SR-0169, 0304
ROY - B	Roydon	0.5	1			No	None	Housing/ Commercial/ Community Uses	More Vulnerable	Yes	This site should be subject to a FRA, as per Local Plan Alterations 2006 Policy U2B	Y	Call for Sites / SR-0197
ROY - C	Roydon	24.5	1, 2, 3a	N/A	24.07	Ordinary Watercourse – in site, Main River	Low	Housing/ Commercial/ Community Uses	More Vulnerable	Exception Test is required.	This site would be subject to a FRA.	Y	SLAA - SR-0035, 0117, 0303
SHE - A	Sheering	3	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0073
SHE - B	Sheering	14.7	1			Ordinary Watercourse	Low	Housing / Employment	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0033, 0311
SHE - C	Sheering	6.1	1			No	None	Housing / Employment	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0265
STA - A	Stapleford Abbots / Bournebridge	3.9	1			Ordinary Watercourse	Low	Housing / Employment	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA -SR-0057, 0256
STA - B	Stapleford Abbots / Bournebridge	1.1	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA - SR-0025
STA - C	Stapleford Abbots / Bournebridge	0.8	1			Ordinary Watercourse	High	Housing	More Vulnerable	Yes	It is recommended that a FRA is carried out due to the high risk of surface water flooding.	No	SLAA -SR-0223
STA - D	Stapleford Abbots / Bournebridge	0.7	1			No	None	Housing	More Vulnerable	Yes	Located within a FRAZ and over 235m^2 and therefore this site should be subject to a full FRA.	No	SLAA - SR-0243

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
STA - E	Stapleford Abbots / Bournebridge	2.1	1			Ordinary Watercourse	Low	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA - SR-0242
STA - F	Stapleford Abbots / Bournebridge	2.1	1			Ordinary Watercourse – in site	High	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA - SR-0047
STA - G	Stapleford Abbots / Bournebridge	1.1	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA -SR-0251
THB - A	Theydon Bois	6.6	1			Ordinary Watercourse – in site	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0327b, 0070
THB - B	Theydon Bois	2.1	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0080
THB - C	Theydon Bois	32.7	1			No	None	Housing/ Commercial/ Community Facilities	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0342
THO - 1	Thornwood	0.7	1, 2, 3a	N/A	0.68	Main River	High	Housing/ Small-scale retail	More Vulnerable	Exception Test is required.	This site would be subject to a FRA.	Y	SLAA - SR-0271
THO - 2	Thornwood	0.4	1, 2, 3a	N/A	0.39	Main River – in site	None	Housing	More Vulnerable	Exception Test is required.	This site would be subject to a FRA.	Y	SLAA - SR-0203
THO - A	Thornwood	9.4	1, 2, 3a, 3b	9.39	9.15	Main River	None	Residential/ Commercial (11,400m2)	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	Call for Sites/SLAA - SR-0149, 0043
THO - B	Thornwood	0.5	1, 2, 3a	N/A	0.49	Main River	None	Housing	More Vulnerable	Exception Test is required.	This site would be subject to a FRA.	Y	Call for Sites/SLAA - SR-0023
THO - C	Thornwood	4	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	Y	Call for Sites/SLAA - SR-0410
WAL - 1	Waltham Abbey	13.7	1, 2, 3a, 3b	13.57	10.23	Main River – in site	Low	Commercial	Less Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0283, 0380, 0381, 0382
WAL - 2	Waltham Abbey	11.4	2, 3a, 3b	10.67	0.02	Ordinary Watercourse – in site, Main River	Low	Housing, commercial or tourism	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0085
WAL - 3	Waltham Abbey	0.2	1			Main River	None	Housing	More Vulnerable	Yes	Located within a FRAZ and over 235m^2 and therefore this site should be subject to a full FRA.	Y	SLAA - SR-0021
WAL - 4	Waltham Abbey	7.1	1, 2, 3a, 3b	7.09	6.3	Main River	Low	Housing / Education / Sports Centre	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0384
WAL - A	Waltham	26.7	1			Offline Storage	None	Housing/	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0065, 0100

SITE REFERENCE	BROAD LOCATION AREA	SITE AREA (HA)	FLOOD ZONE[i]	AREA OUTSIDE FLOOD ZONE 3B (HA)	AREA OUTSIDE FLOOD ZONE 3A AND 3B (HA)	ADJACENT TO WATERCOURSE	SURFACE WATER FLOOD RISK[ii]	PROPOSED USE	VULNERABILITY CLASSIFICATION[iii]	IS IT COMPATIBLE WITH THE SEQUENTIAL TEST?	COMMENTS	INCLUDED IN LOCAL PLAN I AND O	HOW WAS THE SITE BROUGHT FORWARD?
	Abbey							Commercial (20,000m2)/ Community facility					
WAL - B	Waltham Abbey	18.7	1, 2, 3a, 3b	18.18	17.97	Main River and Ordinary Watercourse – in site	High	Housing/ Community facilities	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0034, 0253, 0277
WAL - C	Waltham Abbey	28.8	1, 2, 3a, 3b	28.71	28.67	Main River and Ordinary Watercourse – in site	None	Housing/ Commercial (54,500m2)/ Retail/ Community facilities	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0372
WAL - E	Waltham Abbey	17.8	1, 2, 3a, 3b	15.39	11.24	Main River – in site	High	Housing/ Community facilities	More Vulnerable	Not compatible	Would not pass the Sequential or Exception Tests and requires further assessment.	Y	SLAA - SR-0020, 0083, 0161
WAL - F	Waltham Abbey	41.6	1, 2			Ordinary Watercourse – in site, Main River	Low	Housing/ Commercial/ Community facilities	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0089a. 0089b, 0099, 0104, 0376
WAL - G	Waltham Abbey	26.3	1			Offline Storage	None	Housing/ Employment (104,000m^2)	More Vulnerable	Yes	This site would be subject to a FRA.	Y	SLAA - SR-0061 (northern part); 0370
WIL - A	Willingale	1.4	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA -SR-0127
WIL - C	Willingale	1.6	1			No	None	Housing	More Vulnerable	Yes	This site would be subject to a FRA.	No	SLAA -SR-0122

7 SEQUENTIAL TEST

7.1 Overview

7.1.1 The NPPF and its accompanying Planning Practice Guidance: Flood Risk and Coastal Change sets out the government's policy on flood risk. Its overall aims are to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such high risk areas, policy aims to make it safe without increasing flood risk elsewhere and, where possible, reducing flood risk overall.

7.1.2 The Sequential Test is the tool employed by the LPA when allocating land for development. The test should demonstrate that there are no reasonably available alternative sites for development within the local authority area, classified as having a lower probability of flooding when compared to the site in question. The areas under comparison must be appropriate to the types of development or land use proposed in relation to the NPPF.

Development Vulnerability Classifications

7.1.3 The NPPF classifies developments according to their vulnerability. Five vulnerability classifications are defined, these are:

- Essential Infrastructure;
- Highly Vulnerable;
- More Vulnerable;
- Less Vulnerable, and
- Water Compatible.

7.1.4 Full definitions are provided in Table 2 of the Planning Practice Guidance: Flood Risk and Coastal Change including the types of development that fall under these classifications (reproduced as Table 7.1).

Table 7.1 Flood Risk Vulnerability Classification (from Planning Practice Guidance: Flood Risk and Coastal Change , Table 2)

Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	• Police stations and Ambulance stations, Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.

More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Police, ambulance and fire stations which are **not** required to be operational during flooding • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants which do not need to remain operational during times of flood. • •Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

7.1.5 The NPPF also stipulates where the differing types of vulnerable development may be appropriate based on flood risk. This is presented in Table 3 of Planning Practice Guidance: Flood Risk and Coastal Change, which is reproduced in Table 7.2.

Table 7.2: Planning Practice Guidance: Flood Risk and Coastal Change, Table 3, Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test Required	✓	✓
	3A	Exception Test Required	✓	✗	Exception Test Required	✓
	3B	Exception Test Required	✓	✗	✗	✗

✓ – Development is appropriate ✗ – Development should not be permitted

7.1.6 When allocating sites for development, preference should be given to sites in Flood Zone 1. If there are 'no reasonably available sites in Flood Zone 1, the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3 sequentially. Within each Flood Zone 'new development should be directed to sites at the lowest probability of flooding from all flood sources'.

7.1.7 For sites that partially lie in flood zones defined as 'high probability flooding' it can be possible to direct development to specific parts of the site that are at lower risk. The NPPF outlines that within each flood zone, new development should be directed first to sites at the lowest probability of flooding and the flood vulnerability of the intended use matched to the flood risk of the site e.g. higher vulnerability uses located on parts of the site at lowest probability of flooding.

7.1.8 In some situations it may be necessary to situate some form of development on land identified to be at risk of flooding.

7.2 Epping Forest Sequential Test

7.2.1 In accordance with the guidance set out in the NPPF and Planning Practice Guidance: Flood Risk and Coastal Change, the Sequential Test has been applied to all Proposed Development Sites, and is detailed in Table 7.3.

Table 7.3 Epping Forest District Council Sequential Test

1. ARE THE PROPOSED DEVELOPMENT SITES IN FLOOD ZONE 1 – 'LOW PROBABILITY' OF FLOOD RISK?	
Yes	The following sites are located wholly in Flood Zone 1: ABR - A†, ABR - B†, BKH - 1†, BKH – 2, CHG – 1, CHG - B†, EPG - A†, EPG - B†, EPG - C†, EPG - D†, EPP - 1†, EPP – 2, EPP – 3, EPP - 4†, EPP - A†, EPP - C*†, EPP - D†, EPP - E†, EPP - F*†, EPP - G*†, FYF – A, FYF - B†, HAR - C†, HAR - D†, HON - A†, HON – B, LOU - 1†, LOU – 11, LOU – 6, LOU – 7, LOU – 8, LOU - 9†, LOU – 10, LSH – A, LSH - B†, MOR – A, NAZ - A†, NAZ - B†, NWA - A†, NWA - B†, NWA - C†, NWB - 1†, NWB – 3, NWB - A*, NWB - B†, ONG – 1, ONG - A†, ONG - E†, ROY – B, SHE - A†, SHE - B†, SHE - C†, STA - A†, STA - B†, STA – C, STA – D, STA - E†, STA - F†, STA - G†, THB - A†, THB - B†, THB - C†, THO - C†, WAL – 3, WAL - A†, WAL - G†, WIL - A†, WIL - C† **All development sites fall within Environment Agency Flood Zone 1 and would be considered appropriate development and pass the Sequential Test in line with the NPPF.** Flood Risk Mapping in Figure 4 in Appendix A and Table 6.1 should be consulted for information on flood risk to the sites aside from that posed by fluvial and tidal sources. The flood risk from ordinary watercourses and main rivers where flood zones have not been mapped should also be considered in a site-specific FRA for all Proposed Developments. Where sites are marked * a main river is located either within the site or in close proximity to the site but does not have an associated Flood Zone, potentially due to a lack of detailed modelling being carried out and lack of historic flood data. Surface water flooding may be a constraint for some sites across the district, and the Environment Agency's Updated Flood Map for Surface Water should be the primary source for information to inform flood risk to each site from this source. uFMfSW mapping is presented in Figure 4 in Appendix A and discussed further in Section 9.4. Adequate considerations should be made for surface water attenuation and drainage. All sites greater than 1 hectare, marked with a †, require a flood risk assessment focusing on surface water management. All remaining sites require a site-specific FRA under EFDC policy.

QUESTION 1 CONTINUED	
No	The following sites are located within Flood Zone 2: HAR - B WAL - F The following sites are located within Flood Zones 2 and 3a: ADD - 1, EPP - H, HAR - A, HAR - E, LOU – 3, LOU - 5, NWA - D, THO - B, THO - 1, THO - 2, ROY - A, ROY - C The following sites are located within Flood Zones 2, 3a and 3b: CHG - D, LOU - 2, LOU - 4, ONG - D, NAZ - 1, ONG - G, ONG - F, THO - A, WAL - B, WAL - C, WAL -E, WAL - 1, WAL - 2, WAL - 4

2. COULD THE PROPOSED DEVELOPMENT SITES LOCATED IN FLOOD ZONE 2, 3A AND 3B ALTERNATIVELY BE LOCATED IN AN AREA AT LOW RISK OF FLOODING?	
A number of sites identified in the SLAA were not brought forward to the Local Plan I&O stage due to a number of factors, for example flood risk, location within or proximity to areas of various environmental designations, non-sustainable location (i.e. located away from existing settlements and facilities) and conflict with other designations.	

3. FOR SITES LOCATED IN FLOOD ZONE 2 – 'MEDIUM PROBABILITY'	
3a. Are any of the development proposals classified as 'Highly Vulnerable'? (Note – Not all development sites have a single proposed future use and so will fall in more than one category of vulnerability; therefore the most vulnerable classification has been used).	
No	No sites are classified as 'highly vulnerable' according to the NPPF. Should basement dwellings be proposed for any development sites, these land uses **would be classified as 'highly vulnerable'** and therefore would not be appropriate in Flood Zone 3a and **would fail the Sequential and Exception Tests**.
3b. Are any of the development proposals classified as 'More Vulnerable'?	
Yes	HAR – B WAL – F **More vulnerable development located in Flood Zone 2 would be classed as appropriate development and pass the Sequential Test.** Site specific Flood Risk Assessments would be required for the potential development sites to provide a greater level of understanding of the flood risks posed to the proposed developments.

4. FOR SITES LOCATED IN ENVIRONMENT AGENCY FLOOD ZONE 2 AND 3A – 'MEDIUM PROBABILITY' AND 'HIGH PROBABILITY'.			
4a. Are any of the development proposals classified as 'Highly Vulnerable'?			
No	No sites are classified as 'highly vulnerable' according to the NPPF. Should basement dwellings be proposed for any development sites, these land uses **would be classified as 'highly vulnerable'** and therefore not be appropriate in Flood Zone 3a and **would fail the Sequential and Exception Tests**. **Should highly vulnerable development be proposed it should be directed to the other parts of the site at lower flood risk.**		
4b. Are any of the development proposals classified as 'More Vulnerable'?			
Yes	ADD - 1 EPP - H HAR - A HAR – E	NWA - D THO - B THO - 1	THO - 2 ROY - A ROY - C
	The 'more vulnerable' proposed uses at these sites are only compatible in Flood Zones 1 and 2. The sites do not pass the Sequential Test and therefore require application of the Exception Test for development due to their location within Flood Zone 3a, unless all elements of the development can be located in Flood Zone 1 or 2 sections of the site		
4c. Are any of the development proposals classified as 'Less Vulnerable'?			
	The following sites are classified as Less Vulnerable: LOU – 3 LOU – 5 **Less vulnerable development located in Flood Zone 3a would be classed as appropriate development and pass the Sequential Test.**		

5. FOR SITES LOCATED IN ENVIRONMENT AGENCY FLOOD ZONE 2, 3 AND 3B – 'MEDIUM PROBABILITY', 'HIGH PROBABILITY' AND 'FUNCTIONAL FLOOD PLAIN'			
5a. Are any of the development proposals classified as 'Highly Vulnerable'?			
No	No sites are classified as 'highly vulnerable' according to the NPPF. Should basement dwellings be proposed for any development sites, these land uses **would be classified as 'highly vulnerable'** and therefore not be appropriate in Flood Zone 3a or Flood Zone 3b and **would fail the Sequential and Exception Tests**. **Should highly vulnerable development be proposed it should be directed to the other parts of the site at lower flood risk.**		
5b. Are any of the development proposals classified as 'More Vulnerable'?			
Yes	ADD – 1 CHG – D EPP – H HAR – A HAR – E LOU – 2* - m/l LOU – 4* - m/l NAZ – 1 ONG – D ONG – F	ONG – G ROY – A ROY – C THO – 1 THO – 2 THO – A THO – B WAL – 2 WAL – 4	WAL – B WAL – C WAL – E* m/l
Unknown:	NWA – D WAL – 1		
	No development types, apart from 'essential infrastructure' and 'water compatible development', are compatible with Flood Zone 3b. For all development sites listed above, Flood Zone 3b covers less than a fifth of the site, and site area is above 5ha. It is therefore considered possible to direct development to parts of the site where there is a lower risk of flooding and the sites are eligible for application of the Exception Test. **Development within the Flood Zone 3b areas of the site would NOT be considered to pass the Sequential Test or Exception Test and should be directed to the other parts of the site at lower flood risk.** **The proposed uses at these sites are only compatible in Flood Zone 1 and Flood Zone 2. Development within Flood Zone 3a would not be considered to pass the Sequential Test and would require demonstration of the Exception Test.** Site-specific Flood Risk Assessments would be required for the potential development sites to provide a greater level of understanding of the flood risks posed to the proposed developments. The FRAs would also be required to demonstrate that the development is safe with regards to flood risk.		

7.3 Summary

Sequentially Appropriate Development

7.3.1 The Sequential Test has been applied for all 97 Proposed Development Sites. The following Sites are located in Flood Zone 1 and are therefore **sequentially appropriate** in accordance with the NPPF and considered to pass the Sequential Test:

- ABR – A;
- ABR – B;
- BKH – 1;
- BKH – 2;
- CHG – 1;
- CHG – B;
- EPG – A;
- EPG – B;
- EPG – C;
- EPG – D;
- EPP – 1;
- EPP – 2;

- EPP – 3;
- EPP – 4;
- EPP – A;
- EPP – C;
- EPP – D;
- EPP – E;
- EPP – F;
- EPP – G;
- FYF – A;
- FYF – B;
- HAR – C;
- HAR - D;
- HON - A;
- HON – B;
- LOU – 1;
- LOU – 6;
- LOU – 7;
- LOU – 8;
- LOU – 9;
- LOU – 10;
- LOU – 11;
- LSH – A;
- LSH – B;
- MOR – A;
- NAZ – A;
- NAZ – B;
- NWA – A;
- NWA – B;
- NWA – C;
- NWB – 1;
- NWB – 3;
- NWB – A;
- NWB – B;
- ONG – 1;
- ONG – A;
- ONG – E;
- ROY – B;
- SHE – A;
- SHE – B;
- SHE – C;
- STA – A;
- STA – B;
- STA – C;
- STA – D;
- STA – E;
- STA – F;
- STA – G;
- THB – A;
- THB – B;
- THB – C;
- THO – C;
- WAL – 3;
- WAL – A;
- WAL – G;
- WIL – A;
- WIL – C.

7.3.2 The following Proposed Development Sites are located partially within Flood Zone 1 and Flood Zone 2 and classed as 'More Vulnerable' development and are therefore **sequentially appropriate** in accordance with the NPPF and considered to pass the Sequential Test:

- HAR – B;
- WAL – F.

7.3.3 The following Proposed Development Sites are located partially within Flood Zone 1, Flood Zone 2 and Flood Zone 3a and are classed as 'less vulnerable' development and are therefore **sequentially appropriate** in accordance with the NPPF and considered to pass the Sequential Test:

- LOU – 3;
- LOU – 5.

Development not Sequentially Appropriate

7.3.4 The following Proposed Development Sites are **not sequentially appropriate** in accordance with the NPPF, unless all development could be directed within the Flood Zone 1 and Flood Zone 2 sections of the site, the developments would need to undergo the Exception Test to justify any development proposed in Flood Zone 3a and Flood Zone 3b:

- ADD – 1;
- CHG – D;
- EPP – H;
- HAR – A;
- HAR – E;
- LOU – 2;
- LOU – 4;
- NAZ – 1;
- NWA – D;
- ONG – D;
- ONG – F;
- ONG – G;
- ROY – A;
- ROY – C;
- THO – 1;
- THO – 2;
- THO – A;
- THO – B;
- WAL – 1;
- WAL – 2;
- WAL – 4;
- WAL – B;
- WAL – C;
- WAL – E*.

7.4 Sequential Approach to Location of Development within a Site

7.4.1 With regards to proposed development in areas of flooding, the NPPF states that:

7.4.2 *'When determining planning applications, local planning authorities should…only consider development in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:*

- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location.'

7.4.3 Twenty four Proposed Development Sites have been identified that would not pass the Sequential Test. Fourteen of these Sites are located partially within Flood Zone 3b, and proposing More Vulnerable development. As per Table 3 of the Planning Practice Guidance: Flood Risk and Coastal Change, development should not be permitted within Flood Zone 3b. However, in order to fully assess the potential for safe development within EFD, the sites have been included in the Exception Test, as there is potential for appropriate development within lower flood risk areas within the Proposed Development Sites.

8 EXCEPTION TEST

8.1.1 The purpose of the Exception Test is to ensure that new development is only permitted in medium and high flood risk areas where flood risk is clearly outweighed by other sustainability factors and where the development will be safe during its lifetime, considering climate change. As set out in the NPPF the Exception Test comprises two criteria, part a) and b), both of which must be satisfied before a development may be considered appropriate within an area of medium or high flood risk.

8.1.2 'More vulnerable' development such as residential or educational uses should, according to the Sequential Test, only be permitted in Flood Zone 3a if the Exception Test is passed. In some cases, it may be found that it will not be possible to demonstrate that the development will be safe and therefore the chosen site is not appropriate for development.

8.1.3 Paragraph 102 of the NPPF states that:

8.1.4 *'If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For the Exception Test to be passed:*

a. it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and

b. a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'

8.1.5 Part (a) of the Exception Test has been carried out for the Proposed Development Sites as part of this Level 2 SFRA, and is detailed below. Analysis of flood risk to each site has also been carried out to give a preliminary indication of the potential for development to be located within areas of lower flood risk, following the sequential approach to site layout. However, in order to fully satisfy Part (b) of the Exception Test, site-specific FRAs will be required to accompany the planning application submitted to EFDC as and when each site is advanced for development. Guidance on the requirements for site-specific FRAs is detailed in Section 9.

8.2 Sustainability Appraisal

8.2.1 In order to satisfy part (a) of the Exception Test, the objectives of the Sustainability Appraisal (SA) can be used to score each potential development site. The Epping Forest Interim SA[12] was completed as part of the EFDC Issues and Options Local Plan Consultation Document in order to consider:

8.2.2 *"the impacts of a draft plan approach, and alternatives to that approach, in terms of key sustainability issues, with a view to avoiding and mitigating adverse impacts and maximising the positives."*

8.2.3 The EFDC SA includes a series of criteria which allow quantification of the sustainable performance of the potential development sites included in the Local Plan. The criteria allow consistency in the analysis of sites.

8.2.4 The sustainability criteria are detailed in Appendix C. Each criterion has been split into bands using a traffic-light approach to highlight how site sustainability was defined. Green highlights the most sustainable criteria, with red highlighting least sustainable criteria, for example the location of a site within 400m of a Site of Special Scientific Interest (SSSI). Where the necessary data for each sustainability criteria was not available in GIS format this has been noted in Appendix C, and was omitted from the analysis. The sustainability score of each site is presented in Table 8.1.

8.2.5 Where a site matched a 'green' criteria, 2 'points' were awarded to the site. Where an amber or red criteria was met, 1 or 0 points respectively were awarded to a site. The process was repeated for all sustainability criteria, giving each site a final sustainability 'score', which was converted to a percentage to allow the performance of each site to be easily assessed against the maximum potential sustainability score.

8.2.6 The total sustainability score (%) of each site is presented in Appendix C. The sites are ranked initially on proportion of the site within Flood Zone 3a and Flood Zone 3b, in order to clearly highlight the potential flood risk constraint on potential development. Those sites with the smallest proportion located within Flood Zone 3 are presented towards the top of Table 8.1, with proportion within Flood Zone 3 increasing down the table.

Table 8.1: Flood Risk and Sustainability Scores for sites included in the Exception Test

OPPORTUNITY AREAS	AREA (HA)	SUSTAINABILITY SCORE (%)	HIGHEST FLOOD ZONE	SURFACE WATER FLOOD RISK	AREA IN FZ3A+B	% OF SITE IN FZ3A+B	AREA IN FZ2	% OF SITE IN FZ2	AREA IN FZ1	% OF SITE IN FZ1
EPP - H	22.8	74	3A	Low	0.1	0.2	0.1	0.3	22.7	99.7
HAR - A	75.5	44	3A	None	0.2	0.2	0.2	0.3	75.3	99.7
ROY - A	8.9	50	3A	Medium	0.0	0.3	0.3	3.4	8.6	96.6
WAL - C	28.8	54	3B	None	0.1	0.4	0.6	2.1	28.2	97.9
ONG - D	55.7	64	3B	None	0.3	0.6	2.5	4.5	53.2	95.5
NWA - D	24	68	3A	Low	0.2	1.0	0.3	1.3	23.7	98.8
THO - 2	0.4	50	3A	None	0.0	1.7	0.3	80.0	0.1	20.0
ROY - C	24.5	52	3A	Low	0.4	1.7	2.2	9.1	22.3	90.9
CHG - D	14.7	78	3B	None	0.3	2.3	0.4	2.7	14.3	97.3
THO - B	0.5	54	3A	None	0.0	2.3	0.5	96.0	0.0	4.0
LOU - 2	9.4	76	3B	None	0.2	2.4	0.6	6.5	8.8	93.5
THO - A	9.4	46	3B	None	0.3	2.7	0.7	7.1	8.7	92.9
THO - 1	0.7	52	3A	High	0.0	2.9	0.7	94.3	0.0	5.7
WAL - B	18.7	66	3B	High	0.7	3.9	5.1	27.2	13.6	72.8
HAR - E	139.8	50	3A	Low	11.4	8.1	15.1	10.8	124.7	89.2
ONG - G	20.9	62	3B	Low	2.2	10.7	2.8	13.5	18.1	86.5
WAL - 4	7.1	76	3B	Low	0.8	11.3	2.2	31.1	4.9	68.9
ONG - F	83.7	60	3B	Medium	11.0	13.2	16.4	19.6	67.3	80.4
NAZ - 1	14	60	3B	High	2.2	15.6	3.8	27.0	10.2	73.0
LOU - 4	6.2	78	3B	High	1.2	20.0	3.4	55.5	2.8	44.5
WAL-1	13.7	62	3B	Low	3.5	25.3	3.6	26.4	10.1	73.6
WAL-E	17.8	74	3B	High	6.6	36.9	9.6	53.7	8.3	46.3
WAL-2	11.4	74	3B	Low	11.4	99.8	11.4	100.0	0.0	0.0
ADD - 1	0.5	74	3A	Low	0.5	100.0	0.5	100.0	0.0	0.0

Development Sustainability Score

8.2.7 The majority of Proposed Development Sites gained sustainability scores above 60%. This indicates that such sites offer a number of sustainability benefits, such as proximity to public services reducing the need for car use, proximity to public transport, or distance from environmentally designated sites. However this does not mean that there are no constraints associated with the Proposed Development Sites. Constraints may still exist, for example the existence of Tree Preservation Orders on-site or nearby listed buildings which may be impacted on by development. All such constraints must be accounted for if and when a planning application is submitted for development within a Proposed Development Site.

8.2.8 The following sites, which underwent the Exception Test, scored relatively poorly with regards to sustainability, with sustainability scores of less than 60%:

- HAR – A;
- HAR – E;
- ROY – A;
- ROY – C;
- THO – 1;
- THO – 2;
- THO – A;
- THO – B;
- WAL – C.

8.2.9 However, as discussed above, a large proportion of each of the sites is located within areas of lower flood risk where development would be appropriate based on the flood risk and land use vulnerability. Therefore, despite the relatively poor sustainability scores, from a flood risk perspective there may still be potential for the sites to be brought forward for development.

8.2.10 A site-specific FRA would be required to demonstrate that development would be located in areas of lower flood risk where it was appropriate based on its flood vulnerability classification and that the site was safe.

8.3 'Safe' Development

8.3.1 Point (b) of the NPPF Exception Test requires that:

8.3.2 *'a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'*

8.3.3 Development should be constructed in an area of lowest flood risk. The mapped outputs of this Level 2 SFRA and the uFMfSW should be used to determine the areas of lowest risk across each site.

8.3.4 For sites subject to the Exception Test, the NPPF requires the consideration of the following issues in order to demonstrate the safety of the site:

- Actual flood risk throughout the development lifetime;
- Residual flood risk throughout the development lifetime;
- Access and egress routes;
- Flood warning and evacuation procedures.

8.3.5 The actual and residual flood risks to the site should be determined through the investigation of flood risk from all sources of flooding. Consultation of this Level 2 SFRA and the uFMfSW can be used to provide an indication of the risk.

8.3.6 The development of an emergency plan would satisfy the latter two requirements listed in Section 8.3.4. The emergency plan should make use of the flood warning procedures already in place, such as those provided by the Environment Agency, and incorporate these into a response strategy for any development.

8.3.7 The identification of safe access and egress routes from the development away from the flood risk can be informed by the mapped outputs of this Level 2 SFRA and the uFMfSW. These documents should be used to determine the areas at lowest risk of flooding (from fluvial, tidal and surface water sources) and therefore the safest routes from the site.

8.3.8 Developers should seek further advice on flood warning and emergency response procedures from the NPPF and Planning Practice Guidance: Flood Risk and Coastal Change, EFDC's Emergency Planning Team and the Essex Resilience Forum[13].

Use of the Sequential Approach to Location of Development within a Site to reduce flood risk

8.3.9 Fourteen Proposed Development Sites, which failed the Sequential Test are partially located within Flood Zone 3b with proposed land uses which are classified by the NPPF as More Vulnerable:

- LOU – 2;
- LOU – 4;
- NAZ – 1;
- ONG – F;
- CHG – D;
- ONG – D;
- ONG – G;
- THO – A;
- WAL – 1;
- WAL – 2;
- WAL – 4;
- WAL – B;
- WAL – C;
- WAL – E.

8.3.10 Following Table 3 of the Planning Practice Guidance: Flood Risk and Coastal Change, more vulnerable development is not appropriate within Flood Zone 3b and therefore the sites would not be suitable for the Exception Test.

8.3.11 However, site specific analysis of the Proposed Development Sites indicates that the majority of the area of each site is located in areas of lower flood risk. The sites were therefore carried forward to the Exception Test to investigate further whether there was potential for safe development within the sites. In total twenty-four sites underwent the Exception Test.

8.3.12 The following sites have been identified as being the most challenging for future development due to the combination of the level of flood risk and the proportion of the sites actually at risk from flooding:

- WAL-E;
- WAL-2;
- ADD-1.

8.3.13 The Proposed Development Site: **ADD-1** lies entirely within Flood Zone 3a. **WAL-2** is located almost entirely within Flood Zone 3 and both sites are surrounded entirely by areas within Flood Zone 3. There is therefore no potential to sequentially locate development within areas of lower flood risk. Secondly, as both sites are surrounded by areas within Flood Zone 3, no safe access and egress can be guaranteed in the event of a flood. Therefore, should these sites come forward for development, detailed discussion regarding access and egress and safe refuge would be needed with EFDC Emergency Planning Team. Approximately 35% of the Proposed Development Site: **WAL-E** is located within Flood Zone 3, with less than half of the site located within Flood Zone 1. The site has been identified as being at high potential risk of surface water flooding. The site is therefore at relatively high flood risk with reduced potential to locate development within areas of lower flood risk.

8.3.14 With the exception of the following Proposed Development Sites, with approximately 25%, 20% and 16% of their site area located within Flood Zone 3 respectively, Flood Zone 3 represents less than 15% of the area of all remaining Sites carried forward for the Exception Test:

- WAL-1;
- LOU-4;
- NAZ-1.

8.3.15 There is therefore potential to bring forward development which is appropriate based on the flood risk and land use vulnerable. The sequential approach to location of development must be followed in a site-specific FRA for the following proposed development sites in order to ensure that the development is safe, and therefore that Part (b) of the Exception Test is passed:

- ADD – 1;
- CHG – D;
- EPP – H;
- HAR – A;
- HAR – E;
- LOU – 2;
- LOU – 4;
- NAZ – 1;
- NWA – D;
- ONG – D;
- ONG – F;
- ONG – G;
- ROY – A;
- ROY – C;
- THO – 1;
- THO – 2;
- THO – A;
- THO – B;
- WAL – 1;
- WAL – 2;
- WAL – 4;
- WAL – B;
- WAL – C;
- WAL – E.

8.3.16 It should be noted that the housing capacity of Proposed Development Sites may be reduced as a result of being partially located within an area of flood risk. The Exception Test should be justified in a site-specific FRA and would need to be approved by EFDC. Therefore, for sites requiring the Exception Test, discussion with EFDC at an early stage would be beneficial.

9 SITE-SPECIFIC FLOOD RISK ASSESSMENT GUIDANCE

9.1 Overview

9.1.1 This Level 2 SFRA report builds on the Level 1 SFRA, providing more in-depth information about the nature of the potential residual risks and hazards, particularly from surface water. However, this document has a strategic scope and therefore it is essential that site-specific FRAs are also developed for individual development proposals and that where necessary and appropriate, suitable mitigation measures are incorporated.

9.1.2 FRAs should use findings from the SFRA to inform the assessment. This section presents recommendations and guidance on issues that may require consideration as part of a site-specific FRA in order to meet the requirements of the NPPF set out in Section 8.1.3.

9.1.3 Table 6.1 indicates which of the Proposed Development Sites require a Flood Risk Assessment based on the information presented in this SFRA. Should flood risk information change or be updated, the need for a FRA may change and therefore the requirement for a FRA should be based on the most up to date flood risk information available at the time if and when Proposed Development Sites are progressed.

9.2 Risks of Developing in Flood Risk Areas

9.2.1 Developing in flood risk areas can result in significant risk to a development and site users. It is possible to reduce the risk through the incorporation of mitigation measures; however, these do not remove the flood risk altogether and developments situated in the floodplain will always be at risk from flooding. This creates Health and Safety considerations, possible additional costs and potential displacement of future residents during flood events, which could result in homes and businesses being uninhabitable for substantial periods of time.

9.2.2 The guidance in this chapter should identify the requirements of a FRA and the flood risks posed to the site; additional issues to consider include the following:

- Failure to consider wider plans prepared by the Environment Agency or other operating authorities may result in a proposed scheme being objected to;
- Failure to identify flood risk issues early in a development project could necessitate redesign of the site to mitigate flood risk;
- Failure to adequately assess all flood risk sources and construct a development that is safe over its lifetime could increase the number of people at risk from flooding and/or increase the risk to existing populations;
- Failure to mitigate the risk arising from development may lead to claims against the developer if an adverse effect can be demonstrated (i.e. flooding didn't occur prior to development) by neighbouring properties/residents;
- Properties may be un-insurable and therefore un-mortgageable if flood risk management is not adequately provided for the lifetime of the development;
- By installing SuDS without arranging for their adoption or maintenance, there is a risk that they will eventually cease to operate as designed and could therefore present a flood risk to the development and/or neighbouring property;
- The restoration of river corridors and natural floodplains can significantly enhance the quality of the built environment whilst reducing flood risk. Such an approach can significantly reduce the developable area of sites or lead to fragmented developments, however positive planning and integration throughout the master planning process should resolve these potential issues.

9.3 When is a Flood Risk Assessment Required?

9.3.1 The Environment Agency provides flood risk standing advice for applicants and agents on their website: https://www.gov.uk/planning-applications-assessing-flood-risk. This includes information on when a FRA is required and advice on the contents of FRAs for various development types in Flood Zone 1, Flood Zone 2 and Flood Zone 3.

9.3.2 In the following situations a FRA should always be provided with a planning application:

- The development site is located in Flood Zone 2 and Flood Zone 3;
- The area of the proposed development site is 1 hectare or greater in Flood Zone 1. This is to ensure surface water generated by the site is managed in a sustainable manner and does not increase the burden on existing infrastructure and/or flood risk to neighbouring property. Surface water management will need to be considered as part of the Flood Risk Assessment for sites of 1 hectare or greater in Flood Zone 2 and Flood Zone 3. The uFMfSW should also be utilised to indicate sites with a potential surface water flood risk; and
- The development site is located is an area known to have experienced flooding problems from any flood source, including critical drainage problems, as indicated to EFDC by the Environment Agency and where the proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

9.3.3 In addition to the requirements set by the NPPF, as outlined above, EFDC have set additional requirements for the assessment of flood risk for proposed developments, dependant on the developments' size and location within EFD. The relevant policy is presented in Policy U2B of the Local Plan Alterations (2006).

Requirement for assessment of flood risk beyond NPPF policy

9.3.4 The Level 1 SFRA details requirements for assessment of flood risk for proposed developments beyond those set by the NPPF. As indicated by Figure 3 in Appendix A, there have been a large number of recorded flood incidents within EFD. EFDC has therefore taken a proactive approach regarding flood policy, with strict policies outlined in the Local Plan aimed at reducing flood risk within the District.

9.3.5 EFDC have defined Flood Risk Assessment Zones (FRAZs) (Figure 9 of Appendix A) where a FRA may still be required for development which does not match the NPPF criteria. FRAZs are defined as catchments of ordinary watercourses which have been identified by EFDC. These may contribute to main river watercourses or where there is a known risk or history of flooding.

9.3.6 Policy U2B of the Epping Forest Local Plan Alterations (July 2006) states that:

9.3.7 *'Within the Flood Risk Assessment Zones as shown on the Alterations Proposals Map, Flood Risk Assessments will be required for any development proposals (other than house extensions) which exceed 50m^2. Outside these zones, a flood risk assessment will be required for any proposals which exceed 235m^2.'*

9.3.8 As outlined in the Level 1 SFRA, Policy U2B will be enforced, where appropriate, by attaching planning conditions requiring a FRA to planning permissions. The level of detail required in the FRA is dependent on the size of the developments as well as its location within EFD and a guide is outlined as follows:

- For development less than 50m^2 impermeable area, a FRA is not required;
- For development of between 50 – 100m^2 impermeable area, within a FRAZ, a surface water drainage assessment and maintenance details will need to be submitted. Compliance with the principles of SuDS should be demonstrated;

- For development of between 100 – 235m^2 impermeable area, within a FRAZ, a FRA and Management and Maintenance plan will need to be submitted. The assessment shall demonstrate that adjacent properties shall not be subject to increased flood risk and, dependent upon the capacity of the receiving drainage, shall include calculations of any increased storm run-off and the necessary on-site detention;
- For development over 235m^2 impermeable area, a full FRA and Management and Maintenance plan will need to be submitted. The assessment will need to include calculations of the greenfield runoff rate, increased run-off rates and the associated volume of storm detention. The general principles of a FRA outlined in the NPPF, and in Section 9.6, below, should be used as a minimum requirement.

9.3.9 All Proposed Development Sites assessed in this SFRA are over 235m^2 in area and will therefore a FRA will be required to accompany a planning application.

9.3.10 EFDC is currently working on delivering its new Local Plan and should flood risk policy change from that contained within the Local Plan Alterations Document, Flood Risk Assessment requirements should be updated as necessary.

9.4 Updated Flood Map for Surface Water

9.4.1 The uFMfSW flood extent mapping has been used to indicate Proposed Development Sites with a potential surface water flood risk for 3.33%, 1% and 0.1% AEP storm events. Where more than 10% of a Proposed Development Site is at risk from surface water flooding during a 3.33% AEP storm event, the site has been identified as being at 'High' risk from surface water flooding. Where 10% of the Proposed Development Site is at risk from surface water during the 1% and 0.1% AEP storm events, the site has been classified as being at 'Medium' and 'Low' risk from surface water flooding respectively. Sites at risk from surface water flooding, as defined by the above criteria, are shown below

High Surface Water Flood Risk

- LOU - 4
- LOU - 5
- NAZ - 1
- STA - F
- STA - C
- THO - 1
- WAL - B
- WAL - E

Medium Surface Water Flood Risk

- ABR - B
- EPG - B
- ONG - F
- ROY - A

Low Surface Water Flood Risk

- ADD - 1
- EPG - C
- EPP - 1
- EPP - 4
- EPP - B
- EPP - C
- EPP - D
- EPP - E
- EPP - F
- EPP - G
- EPP - H
- HAR - B
- HAR - C
- HAR - E
- LSH - A
- NWA - A
- NWA - B
- NWA - C
- NWA - D
- NWB - 3
- NWB - A
- ONG - G
- ROY - C
- SHE - B
- STA - A
- STA - E
- WAL - F
- WAL - 1
- WAL - 2
- WAL - 4

9.4.2 Where a site is identified as being at medium to high potential risk from surface water flooding, surface water flooding should be a focus of the site-specific FRA. Specific resilience and mitigation measures should be proposed, appropriate to the level of risk. Due to the strategic nature of the uFMfSW, further investigation should be carried out to examine surface water flood risk to the site. All opportunities to reduce runoff from the above sites should be taken in order to reduce flood risk from surface water elsewhere.

9.5 Site Specific FRA Requirements

9.5.1 The supporting guidance of the NPPF outlines how the objectives of a site-specific FRA are to establish the following:

1. "Whether the proposed development is likely to be affected by current or future flooding from any source;
2. Whether it will increase flood risk elsewhere;
3. Whether the measures proposed to deal with these effects and risk are appropriate;
4. If necessary provide the evidence to the LPA so that the Sequential Test can be applied; and
5. Whether the development will pass the Exception Test if it is appropriate."

9.5.2 More vulnerable development should be directed to areas with the lowest flood risk. Where there are no sites suitable that are at a lower flood risk, the FRA should outline how the development will be made safe as required by point two of the Exceptions Test.

9.5.3 The Sequential Test and Part (a) of the Exception Test have been carried out for all Proposed Development Sites included in this SFRA, where appropriate. Therefore it is not necessary for a site specific FRA for a Proposed Development Site to address point 4 above. The Sequential Test and Part (b) of the Exception Test were carried out based on the best available information regarding Proposed Development Sites. Should a land use different to that indicated in Table 6.1 be proposed for a Site, the vulnerability and therefore the appropriateness of the development may differ. In such cases the Sequential Test, and if necessary, the Exception Test should be carried out again as part of a site-specific FRA.

9.5.4 Windfall sites become available for development unexpectedly and are not considered within the Local Plan and therefore have not been assessed in the Sequential Test and Exception Test Part (a) contained in this Level 2 SFRA. The requirements for Windfall Sites are outlined in Section 10.

9.5.5 For Proposed Development Sites located partially within Flood Zone 2, Flood Zone 3a or Flood Zone 3b, or for a site requiring a FRA as part of EFDC's FRAZ policy, the following items should be addressed as part of the FRA in order to demonstrate that any proposed development is safe:

- The Sequential Approach: Where a more vulnerable development cannot be located in an area of lower flood risk, the sequential approach should be applied to the layout and design of a development. More vulnerable components should be directed to parts of the site where the flood risk is least. The Proposed Development Sites where a sequential approach to the location of development is required are outlined in Section 7.3.4.
- Access and Egress: The NPPF requires there to be safe access and egress from a site to enable the evacuation of people from the site and the access of emergency services to the site. Where possible access should be above the flood level or if not, at low hazard for the flood level at or above the 1% AEP fluvial and 1 in 200 year (0.5% AEP tidal) flood event up to the 0.1% flood event.

- Flood Warning and Emergency Plans: In addition to the Flood Warning provided by the Environment Agency and the Epping Forest Emergency Flood Plan, developers should outline a strategy for a response in the event of the flood, including warning mechanisms, communication and access routes. Developers should make sure that their development will not negatively impact on the emergency services and EFDC in their response.
- Flow Paths and Flood Plain Compensation: The Environment Agency requires floodplain compensation on the basis of 'Level for Level, Volume for Volume'. This will need to be considered if floor levels, access and egress routes require raising to ensure they are above the flood level. The impact to the surrounding area of raising land will need to be considered as part of the FRA.
- Flood Resilient Design: Where there is limited inundation of flood water to a site, flood resilient construction may be considered. Guidance on resilient design can be found in guidance documents such as (Department for) Communities and Local Government (CLG) 'Improving the Flood Performance of New Buildings, Flood Resilient Construction' (2007)[14].

9.6 Site Vulnerability and Site Layout

9.6.1 The sequential approach should be applied within development sites to locate the most vulnerable elements of a development in the lowest risk areas e.g. residential developments should be restricted to areas at lower probability of flooding and parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding.

9.6.2 Development should be sequentially allocated within the site boundary to areas firstly within Flood Zone 1 and then Flood Zone 2 where 'more vulnerable' and 'less vulnerable' development uses would be more appropriate.

9.6.3 Of the ninety-seven Proposed Development Sites, seventy-three have passed the Sequential Test based on the proposed land use and identified flood risk classification. However, for those sites which have passed the Sequential Test but are located partially within Flood Zone 2 and/or Flood Zone 3a, development should still be directed towards areas of the site at lowest risk, where possible. The same approach applies to those sites which did not pass the Sequential Test.

9.6.4 Of the twenty-four sites which did not pass the Sequential Test, fourteen are located partially within Flood Zone 3b and therefore, based on their flood risk vulnerability classification, development should not be permitted. However site specific investigation of the sites indicates there is potential to locate development in areas of lower flood risk, and in some cases potentially entirely within Flood Zone 1.

9.6.5 Should development pressure create a need to develop employment land uses within the site areas within Flood Zone 3 appropriate minimum floor levels should be determined in agreement with the Environment Agency.

9.6.6 It is required that any flood volume displaced as a result of development within the entire Flood Zone 3 plus an allowance for climate change envelope (encapsulating Flood Zones 3a and 3b be compensated for elsewhere within the site boundary on a 'level for level' basis (where a site is undefended).

9.6.7 Appropriate mitigation measures should be incorporated that would not increase the risk of flooding to surrounding areas.

9.6.8 Structures such as (bus, bike) shelters, park benches and refuse bins (and associated storage areas) located in areas with a high flood risk should be flood resilient and be firmly attached to the ground.

9.7 Safe Access and Egress

9.7.1 Safe access and egress is required to enable the evacuation of people from the development, provide the emergency services with access to the development during times of flood and enable flood defence authorities to carry out any necessary duties during periods of flood.

9.7.2 A safe access/egress route should allow occupants to safely enter and exit the buildings and be able to reach land outside the flooded area using public rights of way without the intervention of emergency services or others during design flood conditions, including climate change allowances.

9.7.3 For developments located in areas at flood risk the Environment Agency consider 'safe' access/egress to be in accordance with 'FRA Guidance for new Developments FD 2320' (Defra and Environment Agency, 2005). The requirements for safe access and egress from new developments are as follows in order of preference:

- Safe, dry route for people and vehicles;
- Safe, dry route for people;
- If a dry route for people is not possible, a route for people where the flood hazard, in terms of depth and velocity of flooding, is low and should not cause risk to people;
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles.

9.8 Flood Warning and Evacuation Plans

9.8.1 Flood warning and emergency procedures tend to form part of a higher level emergency management plan for the wider area including information such as repair procedures, evacuation routes, refuge areas, flood warning dissemination and responsibilities.

9.8.2 Evacuation is where flood warnings provided by the Environment Agency can enable timely evacuation of residents to take place unaided, i.e. without the deployment of trained personnel to help people from their homes, businesses and other premises. Rescue by the emergency services is likely to be required where flooding has occurred and prior evacuation has not been possible.

9.8.3 Where necessary, emergency plans held by EFDC and ECC, including the Essex Multi Agency Flood Plan, should be reviewed in the light of information generated by this SFRA and updated where appropriate. This will ensure that emergency plans are appropriate to the conditions expected during a flood event and that the local authority and emergency services are fully aware of the likely conditions and how this may affect their ability to safeguard the local population.

9.8.4 When submitting FRAs for developments within flood risk areas, developers should make reference to local flood warning and emergency procedures to demonstrate their development will not impact on the ability of the local authority and the emergency services to safeguard the current population. The flood hazard in a particular area must be viewed in the context of the potential evacuation and rescue routes to and from that area and discussed as part of a site-specific FRA.

9.9 Flood Routing

9.9.1 In order to demonstrate that 'flood risk is not increased elsewhere', development in the floodplain will need to prove that flood routing is not adversely affected by the development, for example giving rise to backwater affects or diverting floodwaters onto other properties.

9.9.2 Potential overland flow paths should be determined and appropriate solutions proposed to minimise the impact of the development, for example by configuring road and building layouts to preserve existing flow paths and improve flood routing, whilst ensuring that flows are not diverted towards other properties elsewhere.

9.9.3 Careful consideration should be given to the use of fences and landscaping walls so as to prevent causing obstruction to flow routes and increasing the risk of flooding to the site or neighbouring areas.

9.10 Compensatory Floodplain Storage

9.10.1 Where proposed development results in an increase in building footprint, the developer must ensure that it does not impact upon the ability of the floodplain to store water and that it does not impact upon floodwater flow conveyance.

9.10.2 Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain must be provided to ensure that the total volume of the floodplain storage is not reduced.

9.10.3 Floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity of the site and linked to the planning application. Floodplain compensation must be considered in the context of the 1% AEP flood level including an allowance for climate change.

9.10.4 The requirement for no loss of floodplain storage means that it is not possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, however, this would be subject to detailed investigations and agreement with the Environment Agency and EFDC to demonstrate that the proposals would improve and not worsen the existing flooding situation.

9.11 Car Parks

9.11.1 Where car parks are specified as areas for the temporary storage of floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the susceptibility of flooding and flood warning should be available to provide sufficient time for car owners to move their vehicles if necessary.

9.12 Flood Resistant and Resilient Design

9.12.1 In order to mitigate any potential flood damage, there are a range of flood resilient construction techniques that can be implemented in new developments. CLG have published a document: 'Improving the Flood Performance of New Buildings, Flood Resilient Construction', the aim of which is to provide guidance to developers and designers on how to improve the resilience of new properties in low or residual flood risk areas, through the use of suitable materials and construction details.

9.12.2 A number of design strategies are detailed including the Water Exclusion Strategy and Water Entry Strategy. Resistance measures are aimed at preventing water ingress into a building (Water Exclusion Strategy); they are designed to minimise the impact of floodwaters directly affecting buildings and to give occupants more time to relocate ground floor contents. These measures will probably only be effective for short duration, low depth flooding, i.e. less than 0.3m.

9.12.3 For flood depths greater than 0.6m, it is likely that structural damage could occur in traditional masonry construction due to excessive water pressures. In these circumstances, the strategy should be to allow water into the building, i.e. the Water Entry Strategy.

9.12.4 The principle behind the Water Entry Strategy is not only to allow water through the property to avoid the risk of structural damage, but also to implement careful design in order to minimise damage and allow rapid re-occupancy of the building. The NPPF considers these measures to be appropriate for both changes of use and for Less Vulnerable uses where temporary disruption is acceptable and suitable flood warning is received.

9.12.5 Materials should be used which allow the passage of water whilst retaining their structural integrity and they should also have good drying and cleaning properties. Alternatively sacrificial materials can be included for internal and external finishes; for example the use of gypsum plasterboard which can be removed and replaced following a flood event. Flood resilient fittings should be used to at least 0.1m above the design flood level. Resilience measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.

9.12.6 Further specific advice regarding suitable materials and construction techniques for floors, walls, doors and windows and fittings can be found in 'Improving the Flood Performance of New Buildings, Flood Resilient Construction' (CLG, 2007).

9.13 Finished Floor Levels

9.13.1 Where developing in fluvial flood risk areas is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (e.g. residential) land uses, is to ensure internal floor levels are raised a freeboard distance above peak flood water levels. Building finished floor levels should be set a minimum of 300mm above the 1% AEP plus climate change peak flood level and sleeping accommodation should be set a minimum of 300mm above the 0.1% AEP plus climate change peak flood level. The peak flood water level should be derived for the immediate vicinity of the site (i.e. relative to the extent of a site along a watercourse as flood levels are likely to vary with increasing distance downstream) as part of a site-specific FRA.

9.13.2 The Environment Agency's requirements for a freeboard above the peak flood level for finished internal floor levels within Less Vulnerable commercial and industrial units vary, depending upon the proposals. For such land uses, finished internal floor levels may not be required to be raised. However, it is strongly recommended that internal access is provided to upper floors (first floor or a mezzanine level) to provide safe refuge in a flood event. Such refuges will have to be permanent and accessible to all occupants and users of the site.

9.13.3 Sleeping accommodation should be restricted to the first floor or above to offer the required 'safe places'. Internal ground floors below this level could however be occupied by either less vulnerable commercial premises, garages or non-sleeping residential rooms (e.g. kitchen, study, lounge) (i.e. applying a sequential approach within a building).

9.13.4 Further consultation with the Environment Agency will therefore be required during the undertaking of any detailed FRA. For both 'Less and More Vulnerable' developments where internal access to higher floors is provided, the associated plans showing this should be included within any site-specific FRA.

9.13.5 Hotels are classed as 'More Vulnerable' land uses, however, where it is not viable to raise finished floor levels, internal access to higher floors must be provided to give safe refuge to all occupants during times of flood. Sleeping accommodation should be set a minimum of 300mm above the 0.1% AEP plus climate change peak flood level.

9.13.6 In certain situations (e.g. for proposed extensions to buildings with a lower floor level or conversion of existing historical structures with limited existing ceiling levels), it could prove impractical to raise the internal ground floor levels to sufficiently meet the general requirements. In these cases, the Environment Agency should be approached to discuss options for a reduction in the minimum internal ground floor levels provided flood proofing (resistance) measures be implemented up to an agreed level. There are also circumstances where flood proofing (resilience) measures should be considered first. These are described further in Section 9.13.

9.14 Riverside Development

9.14.1 Under Section 109 of the Water Resources Act 1991 and/or Environment Agency Byelaws, any works within 9 metres of any statutory main river (both open channels and culverted sections) requires Environment Agency consent.

9.14.2 In addition, the Environment Agency would seek a 9 metre wide undeveloped buffer strip alongside main fluvial rivers, and would also ask developers to explore opportunities for river restoration as part of any development.

9.15 Basement Dwellings

9.15.1 Basement dwellings are classified as Highly Vulnerable and as such they are not permitted within Flood Zone 3a and Flood Zone 3b. They must pass the Sequential and Exception Tests should they be proposed for Flood Zone 2. Basement dwellings should therefore be discouraged within areas at risk of fluvial, surface water or groundwater flooding. Where they are constructed, access must be situated 300mm above the design flood level, and waterproof construction techniques should be employed to avoid seepage during flood events. An assessment of groundwater conditions will also be required to inform the structural integrity of the basement construction. Similar problems can also occur where excessive surface water ponding occurs close to the sides of buildings, leading to significant infiltration. Surface water flow paths should be assessed to ensure that this does not occur, and to inform the strategic location of SuDS and techniques to route flows around the edge of buildings.

9.16 Storm Water Management and SuDS

9.16.1 When designing buildings, flood risk management policies require that the developments are 'safe', do not increase flood risk elsewhere and where possible reduce flood risk overall.

9.16.2 It is strongly recommended that suitable surface water mitigation measures are incorporated into any development plans in order to reduce and manage surface water flood risk to, and posed by the proposed development. This should ideally be achieved by incorporating SuDS. In EFD this is particularly important for development sites which lie within a FRAZ, including minor development and extensions.

9.16.3 SuDS are typically softer engineering solutions inspired by natural drainage processes such as ponds and swales which manage water as close to its source as possible. Wherever possible, a SuDS technique should seek to contribute to each of the three goals identified below with the preferred system contributing significantly to each objective. Where possible SuDS solutions for a site should seek to:

1. Reduce flood risk (to the site and neighbouring areas);

2. Reduce pollution; and,
3. Provide landscape and wildlife benefits.

9.16.4 These goals can be achieved by utilising a management plan incorporating a chain of techniques, as outlined in Interim Code of Practice for Sustainable Drainage Systems[15], where each component adds to the performance of the whole system:

Table 9.1 - SuDS Management Plan Techniques

MANAGEMENT TECHNIQUE	DESCRIPTION
PREVENTION	Good site design and upkeep to prevent runoff and pollution (e.g. limited paved areas, regular pavement sweeping).
SOURCE CONTROL	Runoff control at/near to source (e.g. rainwater harvesting, green roofs, pervious pavements).
SITE CONTROL	Water management from a multitude of catchments (e.g. route water from roofs, impermeable paved areas to one infiltration/holding site).
REGIONAL CONTROL	Integrate runoff management systems from a number of sites (e.g. into a detention pond).

9.16.5 The application of SuDS is not limited to a single technique per site. Often a successful SuDS solution will utilise a combination of techniques, providing flood risk, pollution and landscape/wildlife benefits. In addition, SuDS can be employed on a strategic scale, for example with a number of sites contributing to large scale jointly funded and managed SuDS. It should be noted, each development site must offset its own increase in runoff and attenuation cannot be "traded" between developments.

9.16.6 SuDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e. natural watercourse or public sewer etc.), which is of particular importance for mineral sites. Various SuDS techniques are available and operate on two main principles:

- Infiltration;
- Attenuation.

9.16.7 All systems generally fall into one of these two categories, or a combination of the two.

9.16.8 SuDS designs should aim to reduce runoff by integrating storm water controls throughout the site in small, discrete units. Through effective control of runoff at source, the need for large flow attenuation and flow control structures should be minimised.

9.16.9 As part of any SuDS scheme, consideration should be given to the long-term maintenance of the SuDS to ensure that it remains functional for the lifetime of the development.

9.16.10 Table 9.2 has been reproduced from the SuDS Manual, CIRIA C679[16] and outlines typical SuDS options and details their typical components.

Table 9.2 Typical SuDS Components

COMPONENT DESCRIPTION	EXAMPLE
Filter Strips	These are wide, gently sloping areas of grass or other dense vegetation that treat runoff from adjacent impermeable areas.
Swales	Swales are broad, shallow channels covered by grass or other suitable vegetation. They are designed to convey and/or store runoff, and can infiltrate the water into the ground (if ground conditions allow).
Infiltration Basins	Infiltration basins are depressions in the surface that are designed to store runoff and infiltrate the water to the ground. They may also be landscaped to provide aesthetic and amenity value.
Wetland Ponds	Wetland ponds are basins that can remove pollutants present within surface water. They also provide runoff attenuation and wildlife benefits.
Extended Detention Basins	Extended detention basins are normally dry, though they may have small permanent pools at the inlet and outlet. They are designed to detain a certain volume of runoff as well as providing water quality treatment.
Constructed Wetlands	Constructed wetlands are ponds with shallow areas and wetland vegetation to improve pollutant removal and enhance wildlife habitat.
Filter Drains and Perforated Pipes	Filter drains are trenches that are filled with permeable material. Surface water from the edge of paved areas flows into the trenches, is filtered and conveyed to other parts of the site. A slotted or perforated pipe may be built into the base of the trench to collect and convey the water.
Infiltration Devices	Infiltration devices temporarily store runoff from a development and allow it to percolate into the ground.
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. It is noted that the use of brown/green roofs should be for betterment purposes and not to be counted towards the provision of on-site storage for surface water. This is because the hydraulic performance during extreme events is similar to a standard roof (CIRIA C697).
Rainwater Harvesting	Storage and use of rainwater for non-potable uses within a building, e.g. toilet flushing. It is noted that storage in these types of systems is not usually considered to count towards the provision of on-site storage for surface water balancing because, given the sporadic nature of the use of harvested water, it cannot be guaranteed that the tanks are available to provide sufficient attenuation for the storm event.

9.16.11 As stated in Section 4.3, almost the entire district is underlain by London Clay or Claygate Member bedrock. The south and south-west of EFD is underlain by impermeable soils which are seasonally waterlogged. The majority of the remainder of Epping Forest is underlain by cracking clay soils. The soil types and geology indicate that for the majority of sites, infiltration SuDS are unlikely to be suitable, and therefore attenuation SuDS are preferred within EFD. Should infiltration SuDS be proposed a site investigation of ground conditions should be carried out.

SuDS Approval Body (SAB)

9.16.12 The Draft National Standards for SuDS[17] were published for consultation[iv] in December 2011. The Draft Standards have been developed in order to define a standardised approach to management of surface water runoff from the design stage all the way through to maintenance of such schemes, in accordance with Schedule 3 to the Flood and Water Management Act 2010.

9.16.13 Under the FWMA, ECC is designated the SuDS Approval Body (SAB) for any new drainage system within the Epping Forest District area, and therefore must approve, adopt and maintain any new SuDS within the area.

9.16.14 The SAB will have responsibility for the approval of proposed drainage systems in new developments and redevelopments, subject to exemptions and thresholds, and approval must be granted before the developer can commence construction.

9.16.15 In order to be approved, proposed drainage systems will have to meet new national standards for sustainable drainage. Where planning permission is required, applications for drainage approval and planning permission may need to be lodged jointly with the planning authority but ECC, as the SAB, will determine the drainage application. Regulations will set a timeframe for the decision so as not to hold up the planning process. This process will require EFDC, as the planning authority, to consult ECC as the SAB during the planning process.

9.16.16 The SAB will also be responsible for adopting and maintaining SuDS which serve more than one property, where they have been approved. ECC, as Highways Authority for Epping Forest District, will be responsible for maintenance of SuDS in public roads, to National Standards.

9.16.17 The SAB must arrange for SuDS on private property, whether they are adopted or not, to be designated under Schedule 1 to the FWMA as features that affect flood risk. The SAB will also be required to arrange for all approved SuDS to be included on the register of structures and features (as a separate category).

9.16.18 The draft National Standards set out the criteria by which the form of drainage appropriate to any particular site or development can be determined, as well as requirements for the design, construction, operation and maintenance of SuDS. Local authorities are represented on the Project Advisory Board (PAB) for the development of these National Standards, which are currently in draft.

9.16.19 The FWMA, in response to Sir Michael Pitt's Review, also makes the right to connect surface water drainage from new development to the public sewerage system conditional on the surface water drainage system being approved by the SAB.

9.16.20 Defra has worked closely with key stakeholders and technical experts including the Environment Agency, Local Authorities, developers and water companies to develop National Standards. The National Standards will apply to construction work (domestic and commercial new developments and redevelopments) and will allow flexibility for local conditions.

9.16.21 The requirements for SuDS in England is yet to be implemented and in the interim period, the on-going requirement is to continue to seek advice from the Environment Agency regarding the design of SuDS and the management of surface water runoff from development sites. The publication of final SuDS guidance is currently expected in 2015.

[iv] The consultation on the Implementation of the Sustainable Drainage Systems provisions in Schedule 3 – Flood and Water Management Act 2010 closed on 13th March 2012.

10 WINDFALL SITES

10.1.1 Windfall Sites are sites which become available for development unexpectedly and are therefore not included as allocated land in a planning authority's development plan. The SLAA (2012) did not assess small sites which would deliver fewer than 6 houses, or be less than 0.2ha in area; however it recognises that windfall sites of 6 houses or more may also come forward in future.

10.1.2 The SLAA states that in the 7 year period between 2005/06 and 2011/12 total housing delivery from windfall sites of all sizes was 1,674 dwellings. Excluding development on gardens, an average of 35 dwellings of 5 houses or less and 184 dwellings of 6 houses or more have been delivered per annum.

10.1.3 The SLAA assumes that the rate of delivery of windfall sites of 6 houses or more is likely to reduce as a result of the allocation of sites in the Local Plan to be adopted in 2014. The assessment identifies a predicted windfall allowance of 36 dwellings per annum of 5 dwellings or under, and 46 dwellings per annum of 6 dwellings or more.

10.1.4 Should a site become available that is not located within one of the Proposed Development Sites, the Sequential Test should be applied on an individual site basis and the developer will need to provide evidence to EFDC that they have adequately considered other reasonably available sites. This will involve considering windfall sites against other sites allocated as suitable for housing plans.

10.1.5 The following steps should be followed for windfall sites:

- Identify if the Sequential Test is required; Paragraph 104 of the NPPF states that:

10.1.6 *'Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments.'*

10.1.7 Minor development is defined in the NPPF as non-residential extensions with a footprint of less than 250m^2, alterations not increasing the size of buildings and householder development such as sheds, garages within the curtilage of the existing dwelling, excluding proposed development which would create a separate dwelling.

10.1.8 The application will still need to meet the requirements for FRAs and flood risk reduction as set out in Environment Agency Standing Advice for (https://www.gov.uk/planning-applications-assessing-flood-risk) and EFDC policy as set out in Section 9.3.4.

- If the Sequential Test is required, identify which Flood Zone the site is located within using the Environment Agency flood maps (included in Appendix A).
- Agree the scope and considerations for the site-specific Sequential Test and, where necessary, Exception Test with EFDC and the Environment Agency. Figure 10.1 presents a summary of the procedure that should be followed from identifying a development site through to submission of planning application. Guidance on carrying out the Sequential Test is also provided by the Planning Practice Guidance: Flood Risk and Coastal Change: http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/applying-the-sequential-test-to-individual-planning-applications/
- Using the information documented and mapped within this Level 2 SFRA, the Sequential Test should be undertaken by the developer.

10.1.9 The Level 2 SFRA mapping provides the tools by which the developer can undertake the Sequential Test. This is achieved by presenting information to identify the variation in flood risk across EFD, allowing an area-wide comparison of future development sites with respect to flood risk considerations.

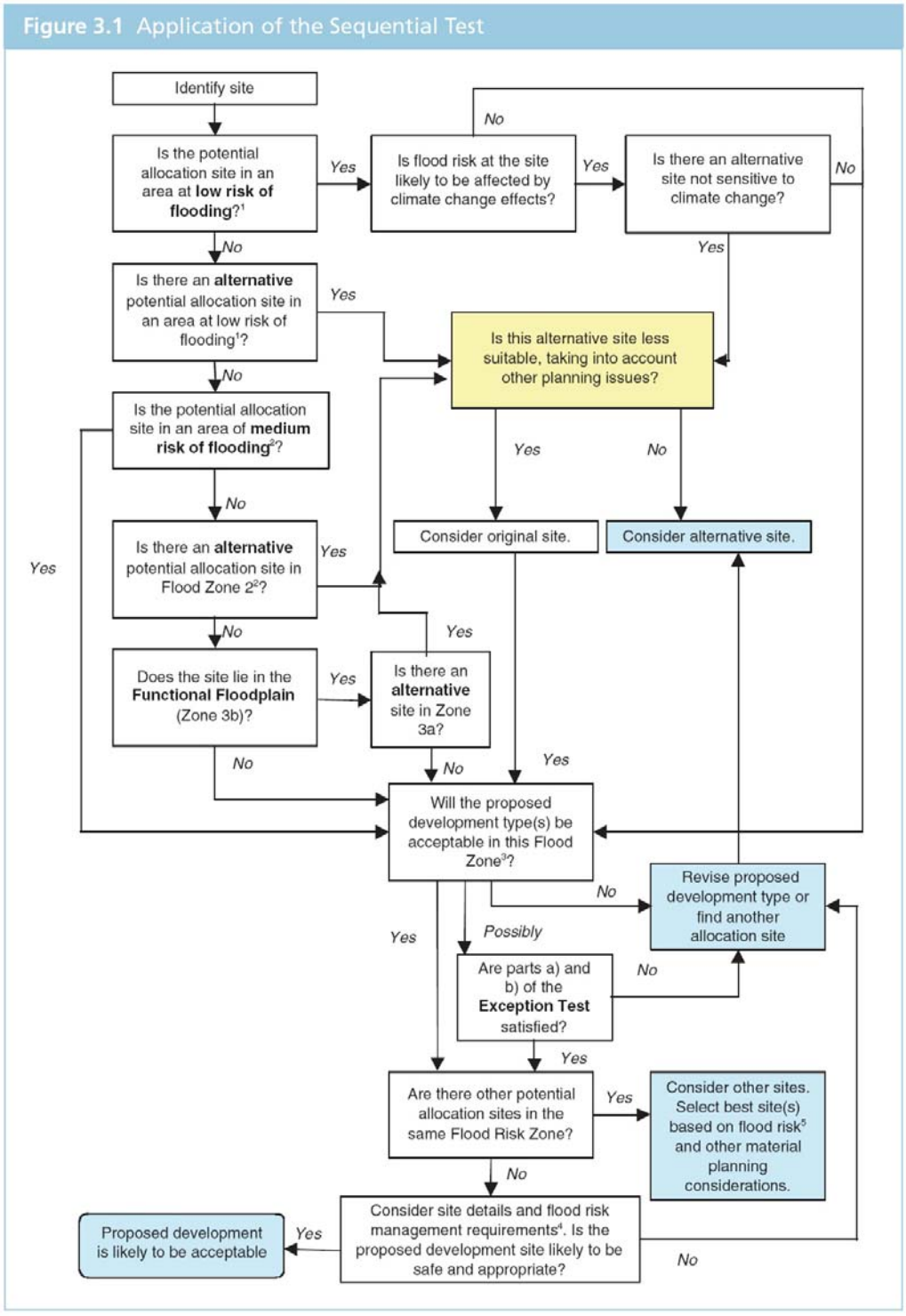
10.1.10 The following flow diagram (Figure 10.1), taken from the Practice Guide Companion to PPS25 (page 67) illustrates how the Sequential Test should be undertaken. The full process is described fully in PPS25, A Practice Guide Companion, 'Living Draft'.

10.2 Guidance for the LPA

10.2.1 When presented with proposals for development of a windfall site, the LPA must ensure that the developer has:

1. Demonstrated that all opportunities to locate development within Flood Zone 1 have been taken by the developer;
2. If the site is located within Flood Zone 2 or Flood Zone 3 and where a Proposed Development Site is located in an area of lower flood risk, the developer has demonstrated that the Proposed Development Site is less suitable than the proposed site based on wider planning issues;
3. Demonstrated that the development will be appropriate within the Flood Zone, as per the NPPF;
4. If there are Proposed Development Sites at comparable flood risk, the developer has demonstrated that the site is at lower flood risk;
5. Should the Exception Test be required, parts (a) and (b) must be met;
6. Demonstrated that the development will be safe, and will not increase flood risk elsewhere.

Figure 10.1: Application of the Sequential Test (adapted from Figure 3.1 of the superseded PPS25: Practice Guide, A 'Living Draft')



11 POLICY RECOMMENDATIONS

11.1.1 In accordance with the NPPF, a specific policy on flood risk should be included in the EFDC Local Plan to ensure:

- Development is located in the lowest risk area where possible;
- New development is flood-proofed to a satisfactory degree and does not increase flood risk elsewhere;
- Surface water is managed effectively on site.

11.1.2 Area wide recommendations have been provided, which provide recommendations for all proposed developments within EFD. Site-specific recommendations are also provided based on analysis of sites carried out within this SFRA.

11.1.3 Developers and LPAs proposing to develop in Flood Zone 2 and Flood Zone 3 should seek opportunities to:

- Reduce flooding by considering the layout and the form of the development and the appropriate application of sustainable drainage techniques;
- Relocating existing development to land in zones with a lower probability of flooding; and
- Create space for flooding to occur by restoring functional floodplains and flood flow pathways and by identifying, allocating and safeguarding open space for storage.

11.2 Area Wide Recommendations

11.2.1 General flood mitigation policies should address the following issues:

NPPF Policy

- The NPPF requires a Flood Risk Assessment (FRA) to be carried out for all proposals in Flood Zone 2 and Flood Zone 3, for all developments greater than 1ha in Flood Zone 1, and where a development site is located in an area known to have experienced flooding problems from any flood source, including critical drainage problems;
- EFDC should ensure the Sequential Test, and where necessary the Exception Test, is undertaken for all windfall sites, with the exception of minor development, to reduce the flood risk to the site and ensure that the vulnerability classification of the proposed development is appropriate to the Flood Zone classification;
- A sequential approach should be used to locate elements of development according to vulnerability and risk of flooding. The most vulnerable development should be located in the areas of the site at lowest risk of flooding and all development should be appropriate to the flood risk;
- The NPPF states that all development must avoid increasing flood risk elsewhere as a minimum. Runoff from the site post-development must not exceed pre-development rates for all storm events up to and including the 1% AEP storm event with an allowance for climate change. The appropriate climate change allowance should be defined using Environment Agency guidance: 'Climate Change allowances for planners'[18];
- If necessary, attenuation of runoff should be provided on site for these storm events in order to meet runoff requirements;
- Where development within flood risk areas is absolutely necessary, flood resilient and resistant construction methods should be utilised to reduce the impact of flooding;

Core policies for inclusion within the EFDC Local Plan

Flood Risk Assessment

- Beyond the requirements of the NPPF, EFDC requires the following formal assessment of flood risk;
    1. For development of between 50 - 100m^2 impermeable area, within a FRAZ, a surface water drainage assessment and maintenance details will need to be submitted. Compliance with the principles of SuDS should be demonstrated;
    2. For development of between 100 - 235m^2 impermeable area, within a FRAZ, a FRA and Management and Maintenance plan will need to be submitted. The assessment shall demonstrate that adjacent properties shall not be subject to increased flood risk and, dependent upon the capacity of the receiving drainage, shall include calculations of any increased storm run-off and the necessary on-site detention;
    3. For development over 235m^2 impermeable area, a full FRA and Management and Maintenance plan will need to be submitted. The assessment will need to include calculations of the greenfield runoff rate, increased run-off rates and the associated volume of storm detention. The general principles of a FRA outlined in the NPPF, and in Section 9.6, below, should be used as a minimum requirement.
- FRAs are required for all developments identified as at high risk from sources of flooding other than fluvial;
- EFDC expects all development proposals to show a reduction in flood risk onsite and, where appropriate, elsewhere within the catchment. All development should aspire to achieve greenfield runoff rates from the site up to and including the 1% AEP (plus climate change) storm event;
- All new development greater than 1ha in size should be required to match greenfield runoff rates, with appropriate runoff attenuation up to and including the 1% AEP (plus climate change) storm event;
- Space should be specifically set aside for SuDS, which will be a requirement for all appropriate new development and used to inform the overall site layout. The drainage systems must be appropriate for local soil and geology conditions;

Finished Floor Levels/Lower Level Development

- It is recommended that, for development located in areas of potential surface water flood risk, potential flood depths are identified by the Environment Agency's website: http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=357683&y=355134&scale=2. Care should be taken when interpreting the uFMfSW as it is not intended for assessing flood risk at property level;
- It is recommended that, should any development be located in an area of medium to high surface water risk (1% AEP and 3.33% AEP storm events) it should be designed with appropriate building thresholds in order to reduce the risk of surface water inundation;
- In areas at risk of flooding, undercroft or ground floor parking would be preferred to habitable rooms at ground floor level. Restrictions may apply to the provision of ground floor bedrooms;
- The construction of habitable basements, which are classified by the NPPF as highly vulnerable development, are not appropriate within Flood Zone 3 and would be discouraged in Flood Zone 2;

- If development is to be constructed with less vulnerable uses on the ground level, agreements need to be in place to prevent future alteration of these areas to 'more vulnerable' uses without further study into flood risk;
- Single storey residential development should not normally be considered in high flood risk areas as they offer no opportunity for safe refuge areas on upper floors.

Emergency Planning

- In areas at risk of flooding, safe refuge should be provided within the building. An area of safe refuge should be located at least 300mm above the 1% AEP (with climate change) fluvial flood level;
- Safe access and egress routes should be provided for all residential development in areas of flood risk. Safe access and egress is defined as a route to and from any development, located entirely above the 1% AEP (plus climate change) flood level. Where safe access and egress is a potential issue, this should be discussed with the LPA at the earliest stage;
- Critical infrastructure located in flood zones or other areas of known flooding should be assessed to ensure that there are adequate procedures for access and evacuation;
- In relation to areas identified as being at risk of flooding, the location of vulnerable development and critical infrastructure such as roads should be considered in detail;
- Emergency planning strategies should be put in place in order to direct people to safety during times of flood;
- Current emergency planning strategies should be reviewed to determine the suitability of refuge centres and evacuation routes based on the flood zone mapping produced in this study;
- Safety and resilience should be integral to the overall design of a site, for example dry access and egress routes for pedestrians, liaison with EFDC and ECC Emergency Planning teams, and finished floor levels a minimum of 300mm above the 1% AEP (plus climate change) flood level;
- Where new development is permitted, this must include appropriate resilience and resistance features, and mitigation measures including evacuation plans to address residual risk;

Functional floodplain/flood alleviation and storage schemes

- The functional floodplain and sites identified for flood storage or alleviation should be protected from future development;
- Opportunities should be sought to reinstate as floodplain any areas which have been developed through removal, re-design or relocation of buildings and other structures;
- Opportunities should be sought to make space for water to accommodate climate change in order to assist in managing future flood risk;
- A 9m buffer must be maintained along fluvial river corridors to ensure that maintenance of the channel can be undertaken;
- New development should not involve new, or building over existing, culverts;
- Opportunities to enhance or restore a river corridor should be identified in appropriate applications e.g. de-culverting where possible, to return watercourses to a natural system, reducing back up of flows and under capacity where this does not exacerbate the flooding elsewhere. The design of flood storage areas should also take into account the potential for other land uses. Enhancement schemes and appropriate uses include informal recreation and wildlife habitat creation and conservation.

Additional EFDC policy

- EFDC should work with the Environment Agency to promote greater awareness of flood risk and to encourage more people to sign up to the Flood Warning Direct Services provided by the Environment Agency.
- EFDC should identify sites where developer contributions could be used to fund future flood risk management schemes. However, it should be noted that developer funded defences should not wholly justify development in unsuitable locations;
- Opportunities should be pursued to retrofit SuDS in known problem areas, with developer contributions where appropriate.
- Groundwater flooding will continue to be assessed and methods of mitigation will be investigated;
- Surface Water Management Plans should be prepared for areas with known surface water drainage problems;
- Multi-agency working should be encouraged and supported to improve the management of surface water drainage.
- Flood defences provide flood protection and should continue to be maintained;
- River channel restoration should be undertaken where possible to return the river to its natural state and restore floodplain to reduce the impact of flooding downstream;
- Opportunities should be sought to reduce the risk of flooding from the sewer network through consultation with TWUL/AWS to determine key areas for maintenance and flood alleviation schemes.
- Flood resilience at the individual property level should be promoted;
- Those that own and maintain flood assets should continue to maintain those assets that are effective in managing current and future flood risk;
- Take opportunities to reduce the dependency on assets that do not contribute to effective flood risk management;
- Where a development borders an area benefiting from flood defences, opportunities should be sought for the maintenance of these flood defences to be partly funded by the development for its lifetime.
- Permissions for riverside developments should, subject to consultation with appropriate agencies, include provision for developer contributions for refurbishment of assets such as bridges, culverts, walls etc. to ensure safety during the lifetime of the development;

11.3 Site-Specific Recommendations

Sequential Test

11.3.1 Section 7.3.1 provides a list of the Proposed Development Sites which have been found to pass the Sequential Test. Development within these sites has been deemed to be appropriate based on the flood risk and proposed land use type, defined within either the SLAA or Local Plan Issues and Options document. Should the proposed land use be changed to a land use of higher flood vulnerability, the Sequential Test should be applied again to ensure that development is appropriate. This may be carried out as an update to this Level 2 SFRA, or as part of a site-specific FRA for the site.

11.3.2 Site-specific FRAs are required for all Proposed Development Sites which have passed the Sequential Test.

11.3.3 Table 6.1 indicates potential flood risk issues which should be the focus of a site-specific FRA for each Proposed Development Site.

11.3.4 The sequential approach to location of development should be followed for all sites which have passed the Sequential Test and are partially located in areas at flood risk in order to reduce the flood risk to development as far as possible.

Exception Test

11.3.5 As discussed in Section 8.3.9, fourteen Proposed Development Sites, which failed the Sequential Test are partially located within Flood Zone 3b with proposed land uses which are classified by the NPPF as More Vulnerable. The majority of the area of each site is located in areas of lower flood risk:

- LOU – 2;
- LOU – 4;
- NAZ – 1;
- ONG – F;
- CHG – D;
- ONG – D;
- ONG – G;
- THO – A;
- WAL – 1;
- WAL – 2.

11.3.6 The following sites have been identified as being the most challenging for future development due to the combination of the level of flood risk and the proportion of the sites actually at risk from flooding:

- WAL-E;
- WAL-2;
- ADD-1.

11.3.7 Flood Zone 3 covers 25% or less of each of the remaining Proposed Development Sites and there is therefore potential to bring forward development which is appropriate based on the flood risk and land use vulnerable. The sequential approach to location of development **must be followed in a site-specific FRA** for the following Proposed Development Sites in order to ensure that the development is safe, and therefore that Part (b) of the Exception Test is passed:

- ADD – 1;
- CHG – D;
- EPP – H;
- HAR – A;
- HAR – E;
- LOU – 2;
- LOU – 4;
- NAZ – 1;
- NWA – D;
- ONG – D;
- ONG – F;
- ONG – G;
- ROY – A;
- ROY – C;
- THO – 1;
- THO – 2;
- THO – A;
- THO – B;
- WAL – 1;
- WAL – 2;
- WAL – 4;
- WAL – B;
- WAL – C;
- WAL – E.

Development Sustainability

11.3.8 The following sites, which underwent the Exception Test, scored relatively poorly with regards to sustainability, with sustainability scores of less than 60%:

- HAR – A;
- HAR – E;
- ROY – A;
- THO – A;
- THO – B;
- THO – 1;
- THO – 2;
- ROY – C;
- WAL – C.

11.3.9 Sites of comparable flood risk to those listed above should be preferred for development where their sustainability score is higher. However, as discussed above, a large proportion of each of the sites is located within areas of lower flood risk where development would be appropriate based on the flood risk and land use vulnerability. Therefore, despite the relatively poor sustainability scores, from a flood risk perspective there is still potential for the sites to be brought forward for development.

11.3.10 A site-specific FRA would be required to demonstrate that development would be located in areas of lower flood risk where it was appropriate based on its flood vulnerability classification and that the site was safe.

Site-Specific Flood Risk Assessment Considerations

11.3.11 It is recommended that when preparing a site-specific FRA for a Proposed Development Site, the developers consults Table 6.1 which summarises flood risk considerations of relevance for each site, including the potential flood risk from surface water, the presence of watercourses in proximity to the site, the flood zones within the site and other requirements by EFDC. Mapping included in Appendix A should also be consulted when identifying flood risk.

12 SUMMARY AND CONCLUSIONS

12.1 Updating the SFRA

12.1.1 The Level 2 SFRA is a "living document" and will therefore need to be periodically reviewed. Future reviews may be needed as a result of one (or more) of the following:

- revisions to the NPPF or Planning Practice Guidance: Flood Risk and Coastal Change;
- a major flood event;
- updates to the hydraulic modelling of relevant watercourses; or
- publication of revised climate change allowances.

12.2 Flood Risk within Epping Forest

12.2.1 Flood risk from all sources has been discussed in Section 4, providing a summary of flood risk issues within EFD. The data used and the methodology adopted to map fluvial flood zones and recorded flood incidents are discussed in Section 5. Mapping included in Appendix A presents the flood risk within EFD from fluvial flooding, as well as recorded flood incidents attributed to a number of different sources.

12.2.2 The Environment Agency's latest national surface water modelling, the uFMfSW is presented in Appendix A, Figure 4.

12.3 The Sequential Test

12.3.1 The Sequential Test has been carried out in this Level 2 SFRA for the ninety-seven Proposed Development Sites currently identified within EFDC. Of the ninety-seven Sites, seventy-three have passed the Sequential Test. The remaining twenty-four Proposed Development Sites will need to demonstrate compliance with the NPPF sequential approach in directing More Vulnerable development to areas of lowest risk within each site. This should be presented in a site-specific FRA and the Sequential Test determined by EFDC. Site-specific FRAs are required for all Proposed Development Sites.

12.4 The Exception Test

12.4.1 The Exception Test was carried out for the remaining twenty-four Proposed Development Sites. The potential for locating development in areas of each site with no flood risk, or lower flood risk, has been analysed. All development sites, excluding **WAL-E, WAL-2 and ADD-1** have been assessed as having the potential for locating development outside Flood Zone 3. The sustainability of each site has been assessed, allowing Proposed Development Sites to be ranked. Therefore it is considered likely these sites would be able to demonstrate compliance with Part (b) of the Exception Test.

12.5 Policy Recommendations

12.5.1 Requirements for site-specific FRAs have been outlined, providing developers with information to assist in the delivery of a FRA. Guidance on the assessment of Windfall Sites has also been assed. Finally, EFD wide and site-specific policy recommendations have been outlined, with the aim of ensuring that future flood risk within the district is not increased and, where possible, reduced. The policy recommendations, along with flood risk policy to be included in the EFDC Local Plan should guide EFDCs approach to flood risk in the future.

APPENDIX A – FIGURES

APPENDIX B

Proposed Development Site Flood Risk Statistics

APPENDIX C

Epping Forest District Council Interim Sustainability Appraisal: Sustainability Criteria and Data

SUSTAINABILITY APPRAISAL SUGGESTED CRITERIA	SUSTAINABILITY CRITERIA (BASED ON INTERIM SUSTAINABILITY APPRAISAL)	DATA	STAKEHOLDER	FORMAT
Effects on air quality	Within or adjacent to an Air Quality Management Area (AQMA) <1km of an AQMA >1km of an AQMA	Air Quality Management Areas	EFDC	GIS
Effects on a Site of Special Scientific Interest (SSSI)	<400m of a SSSI 400-800 of a SSSI >800m from a SSSI	SSSIs - (National Receptor Dataset (NRD))	Environment Agency	GIS
Effects on a Local Nature Reserve (LNR), Local Wildlife Site (LoWS), or area of Biodiversity Action Plan Priority Habitat (BAAPH)	Adjacent to a designated area <400m of a designated area >400m of a designated area	Epping Draft LoWS Local Nature Reserves - (NRD)	Environment Agency EFDC	GIS
Effects on the Lee Valley Regional Park (LVRP)	Within the LVRP Adjacent to the LVRP Not adjacent to the LVRP	Lee Valley Regional Park (LVRP) - (Local Plan Alterations, 2006)	EFDC	GIS
Effects on Protected Trees	Site includes more than one tree protected by a Preservation Order Site includes one tree protected by a Preservation Order Site does not include trees protected by a Preservation Order	Tree Preservation Orders	EFDC	GIS
Accessibility to a bus stop (with at least an hourly service)	>800m distant 400-800m distant <400m distant	No Data Available	N/A	N/A
Accessibility to a Central Line station or rail station	>1600m distant 800-1600m distant <800m distant	Central Line stations and railway stations - (NRD)	Environment Agency	GIS
Accessibility to a principal/smaller/district centre	>1600m distant 800-1600m distant <800m distant	Principle Town Centres District Town Centres Smaller Town Centres	EFDC	GIS
Accessibility to a local centre	>1600m distant	Local Town Centres	EFDC	GIS

SUSTAINABILITY APPRAISAL SUGGESTED CRITERIA	SUSTAINABILITY CRITERIA (BASED ON INTERIM SUSTAINABILITY APPRAISAL)	DATA	STAKEHOLDER	FORMAT
	800-1600m distant <800m distant			
Flood Risk	Site is within Flood Risk Zone 3b (Functional Floodplain) Site is within Flood Zone 2 (medium risk) or Flood Zone 3a (high risk) Site is within Flood Zone 1 (little or no risk)	Environment Agency Flood Mapping Flood_Zone_2_Clip_combined Flood_Zone_3_Clip_combined ALL_MODELS_1_in_20_Defended 1993_Clip 2001_Clip	Environment Agency	GIS
Accessibility to a health centre or GP service	>1600m distant 800-1600m distant <800m distant	Health Centre Surgery Clinic - (NRD)	Environment Agency	GIS
Accessibility to a secondary school	>2400m distant 1600-2400m distant <1600m distant	Secondary_Schools - (Local Plan Alterations) - (NRD)	Environment Agency EFDC	GIS
Accessibility to a primary school	>1600m distant 800-1600m distant <800m distant	Primary Schools - (Local Plan Alterations) - (NRD)	Environment Agency EFDC	GIS
Accessibility to an existing (village) shop / post office	>1600m distant 800-1600m distant <800m distant	Post Offices - (NRD)	Environment Agency	GIS
Loss of Urban Open Space	Will result in loss of the majority of an area of open space Will result in some loss of an area of open space Will not result in loss of open space	Urban Open Space - (Local Plan Alterations)	EFDC	GIS
Proximity to utilities	Within (a) 30m of an underground electricity transmission cable or (b) 100m of an electricity overhead line Within 150m of a high pressure gas pipeline. Over 150m from electricity or gas utilities	Electricity_Line_EFD Electricity_Tower_EFD Gas_Site_EFD Gas_Pipe_EFD	EFDC	GIS
Contamination	Known problems on site Potential problems on site	Potentially contaminated sites	EFDC	GIS

SUSTAINABILITY APPRAISAL SUGGESTED CRITERIA	SUSTAINABILITY CRITERIA (BASED ON INTERIM SUSTAINABILITY APPRAISAL)	DATA	STAKEHOLDER	FORMAT
	No potential problems on site	- (Local Plan Consultation Document)		
Noise Problems	Known noise problems Potential noise problems No noise problems	No Data Available	N/A	N/A
Loss of Employment Land	Site identified in the Employment Land Review Site not identified in the Employment Land Review	Employment Land Review	EFDC	PDF
Effect on Listed Buildings, Scheduled Ancient Monuments or Historic Parks and Gardens?	Site includes a heritage asset or is adjacent Site is within 50m of a heritage asset Site is >50m from a heritage asset	Listed Buildings Scheduled Ancient Monuments Registered Parks and Gardens - (NRD)	Environment Agency	GIS
Effect on locally listed buildings	Site includes a heritage asset or is adjacent Site is within 50m of a heritage asset Site is >50m from a heritage asset	Locally Listed Buildings	EFDC	GIS
Effect on a Conservation Area	Site includes a Conservation Area or is adjacent Site is within 50m of a Conservation Area Site is >50m from a Conservation Area	Conservation Areas - (Local Plan Alterations)	EFDC	GIS
Effect on Common Land	Site includes Common Land or is adjacent Site is within 50m of Common Land Site is >50m from Common Land	Common Land - (Local Plan Alterations)	EFDC	GIS
Effect on archaeological remains and their settings	Site includes archaeological remains or is adjacent Site is within 50m of archaeological remains Site is >50m from archaeological remains	No Data Available	N/A	N/A
Effects on a Protected Lane	Site includes Protected Lane	Protected Lanes	EFDC	GIS

SUSTAINABILITY APPRAISAL SUGGESTED CRITERIA	SUSTAINABILITY CRITERIA (BASED ON INTERIM SUSTAINABILITY APPRAISAL)	DATA	STAKEHOLDER	FORMAT
	Site is within 50m of a Protected Lane Site is >50m from a Protected Lane			
Effect on the Green Belt	Site is within Green Belt Site is adjacent to the Green Belt Site is not adjacent to Green Belt	Green Belt - (Local Plan Alterations)	EFDC	GIS
Efficient use of land	Greenfield site not within or adjoining an existing settlement boundary Brownfield site adjoining an existing settlement boundary; brownfield site not within or adjoining an existing settlement boundary; or greenfield site within or adjoining an existing settlement boundary Brownfield site within an existing settlement boundary	Greenfield/Brownfield sites - (Local Plan Issues and Options) Soft and hard settlement edge	EFDC	GIS
Landscape character	Within an area identified as sensitive Within an area identified as moderately sensitive With an area identified as less sensitive	Sensitive Landscape Areas Walth_Abbey_b Thornwood StaplefordAbbotts Sewardstone Roydon NWBasset Morteton LowerSheering_Sheering LowerNazeing Lought_Buck_They_c Lought_Buck_They_b Lought_Buck_They_a Fyfield EppingGreen EppCoopers ChippingOngar_HighOngar Chigwell_ChigwellRow_b Chigwell_ChigwellRow Abridge	EFDC	GIS

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