CAPITA SYMONDS

WOKING AND SURREY HEATH STRATEGIC FLOOD RISK ASSESSMENT

For WOKING BOROUGH COUNCIL and SURREY HEATH BOROUGH COUNCIL

MARCH 2007

VOLUME 1: MAIN REPORT

(FINAL)

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Woking and Surrey Heath Strategic Flood Risk Assessment

Technical Document

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PREFACE

It is accepted that the technical content of the Woking & Surrey Heath SFRA will need to be reviewed and amended as new information becomes available.

Although there is no statutory consultation requirement at this stage the nature of the intended end use for the information makes it appropriate to obtain feedback relating to the report in order to contribute to the overall robustness and credibility of this work. This information will also be an aid when formulating the necessary next steps in engaging those parties who will be involved in the future.

It is the responsibility of the reader to be satisfied that they are using the most up to date information and that this has been included within the Woking & Surrey Heath SFRA.

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DOCUMENT REGISTER

The Woking and Surrey Heath SFRA (this document) is a live document requiring review in the event of an improvement or change in the fundamental principles or best available data underpinning the strategy. This is likely to include, but should not be limited to:

(i) An improvement in the best available information or a reduction in uncertainty.

(ii) Revision to relevant policy, plans or guidance.

(iii) Outcomes of neighbouring strategies.

Revisions to this document should be recorded below in Table 1.0 to maintain clarity for those making decisions involving flood risk issues.

Table 1.0 Document Register

Version	*Date*	*Issued by*	*Issued to*
FINAL REV 0.0	19th March 2007	CSL	WBC & SHBC

GLOSSARY

Actual Risk	The risk from flooding based on best available information and representing the influence of flood defences and the distribution of risk within the Flood Zones.
BHS	British Hydrological Society
cu.m (cumecs)	Cubic metres of water per second
DCLG	Department for Communities and Local Government (previously ODPM)
DEFRA	Department for Environment, Food and Rural Affairs
DTM	Digital Terrain Model created using LiDAR, IfSAR or Photogrammetry data.
EA	Environment Agency
FEH	The Flood Estimation Handbook (1999) gives guidance on rainfall and river flood frequency estimation in the UK and is the main method used for the calculation of peak flood flows. The Handbook is accompanied by the FEH CD-ROM containing catchment descriptors and gauging station details for catchments throughout the UK.
Flood Zones	This refers to the Flood Zones in accordance with Table D1 of PPS 25 derived for this Woking and Surrey Heath SFRA and do not refer to the Environment Agency's Flood Zones.
Flood Zones (EA)	This refers to the Environment Agency's Flood Zones.
FSR	Flood Studies Report (1975) the predecessor method of flood peak estimation in the UK largely superseded by the Flood Estimation Handbook.
GIS	Geographical Information System
IFSAR (NEXTmap)	Interferometric Synthetic Aperture - An aircraft-mounted sensor designed to measure surface elevation, which is used to produce topographic imagery. Sold under the name NEXTmap.
iSIS	iSIS Flow is a one-dimensional fully hydrodynamic simulator for modelling flows and levels in open channels and estuaries; it incorporates both unsteady and steady flow solvers.

JFLOW	JFLOW is a 2-D flood routing program developed by JBA, which is able to calculate time travel across flood cells and simulate inundation extent based on the accuracy of an underlying Digital Elevation Model
Km^2	Square kilometres
LiDAR	Light Detection and Ranging survey method used to collect data for construction of a ground model.
M	Metres
m/sec	Metres per second
mAOD	Metres Above Ordnance Datum
Main River	As Defined by the Environment Agency *main rivers* are usually larger streams and rivers, but also include smaller watercourses of strategic drainage importance. A main river is defined as a watercourse shown as such on a main river map, and can include any structure or appliance for controlling or regulating the flow of water in, into or out of the main river. The Agency's powers to carry out flood defence works apply to main rivers only. Main rivers are designated by the Department for Environment, Food & Rural Affairs in England and by the Welsh Assembly Government.
mm	Millimetres
NEXTMAP	Digital terrain elevation and radar image data
ODPM	Office of the Deputy Prime Minister (now DCLG)
Ordinary Watercourse	As Defined by the Environment Agency an *ordinary watercourse* is every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than public sewer) and passage through which water flows which does not form part of a main river. On ordinary watercourses, the local authority and, where relevant, IDBs have similar permissive powers as the Agency has on main rivers.
PPG 25	Policy Planning Guidance Note 25: Development and Flood Risk - Guidance explaining how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and loss of life.

PPS 11	PPS11 Regional Spatial Strategies. This Statement replaces Planning Policy Guidance note 11 - Regional Planning and sets out the procedural policy on the nature of Regional Spatial Strategies (RSS) and focuses on procedural policy, on what 'should' happen in preparing revisions to them and explains how this relates to the Act and associated regulations.
PPS 12	PPS12 Local Development Frameworks. This statement replaces Planning Policy Guidance note 12 - Development Plans and sets out the Government's policy on the preparation of local development documents which will comprise the local development framework.
PPS 25	Planning Policy Statement 25. Development and Flood Risk Guidance replacing PPG 25 in December 2006 and outlining how flood risk should be considered at all stages of the development process.
Precautionary Principle	*"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation*". The precautionary principle was stated in the Rio Declaration in 1992. Its application in dealing with the hazard of flooding acknowledges the uncertainty inherent in flood estimation.
QMED	The median flood flow calculated in the FEH method and used to estimate flood peaks by the statistical method in the WINFAP package. This is the flood that can be said to occur with a return period of two years (50% annual probability).
Residual Risk	An event more severe than that for which particular flood defences have been designed to provide protection.
Return Period	The average time until the next occurrence of a defined event.
Section 105	Environment Agency Floodplain Modelling produced from hydrological and hydraulic modelling.
Sequential risk-based assessment	Priority in allocating or permitting sites for development, in descending order to the Flood Zones set out in Table D1 of PPS 25, including the sub divisions in Zone 3. Those responsible for land development plans or deciding applications for development would be expected to demonstrate that there are no reasonable options available in a lower- risk category.

SFRA	Strategic Flood Risk Assessment
SHBC	Surrey Heath Borough Council
Study Area	Refers to the combined Woking and Surrey Heath Boroughs.
TUFLOW	A two-dimensional fully hydrodynamic modelling package. The TUFLOW model differs from the iSIS model in that it models the whole floodplain as 2D domains, providing a more complete description of flood behaviour where complex overland flows and backwater filling occur.
WBC	Woking Borough Council
WINFAP-FEH	WINFAP is the software package associated with the Flood Estimation Handbook and FEH flood peak dataset used to calculate flood flow peaks by the FEH statistical method.
1D	1 Dimensional
2D	2 Dimensional
1 in 20 year return period flood event	The flood event that is predicted to occur with an annual probability of 5.0% (there is a 1 in 20 (5%) chance each year this event will be witnessed).
1 in 100 year return period flood event	The flood event that is predicted to occur with an annual probability of 1.0% (there is a 1 in 100 (1%) chance each year this event will be witnessed)
1 in 1000 year return period flood event	The flood event that is predicted to occur with an annual probability of 0.1% (there is a 1 in 1000 (0.1%) chance each year this event will be witnessed)

LONG TERM MANAGEMENT

The Woking and Surrey Heath SFRA is based on information that will inevitably be amended by better data, changes in the baseline condition due to development, and changing institutional and policy conditions. To be robust and able to withstand challenge in the planning process there is a need to ensure the Woking and Surrey Heath SFRA reflects conditions at the time particular evaluations are made. Failure to maintain the SFRA may reduce the effectiveness of flood risk management measures; delay plan making and development processes; and potentially lead to the neglect of flood risk considerations and the failure to capture strategic responses and interventions.

The Planning Policy Teams at WBC and SHBC will have the prime responsibility for managing and maintaining this SFRA. The SFRA will be reviewed annually as part of the annual monitoring report.

The Planning Policy Teams may decide it is necessary to identify a "Management Group" of appropriately selected parties with responsibility for monitoring, managing, and maintaining the Woking and Surrey Heath SFRA. This group would be led by representatives from the respective Boroughs. However the group may also include representatives from other influential organisations. The EA are likely to play a key role in providing technical and process guidance to this management process.

The roles and terms of reference for a Management Group have not been identified in this report but will be crucial in making the technical information contained in the Woking and Surrey Heath SFRA accessible and transparent to those responsible for land use decisions.

1. INTRODUCTION

1.1 This document is Volume 1 - The Main SFRA Report which accompanies and should be read in conjunction with the Woking and Surrey Heath SFRA Volume 2 - Technical Report. The Main Report provides a summary of the background and methodology adopted for assessing strategic flood risk. Volume 1 (this document) also includes the Strategic Flood Risk Assessment itself, which is also described in chapter 12 of Volume 2 - Technical Report.

1.2 **Volume 1 – Main Report** provides guidance for planners and developers, and supports the practical use of the maps contained in Volume 3 – Appendices to asses land allocations in relation to flood risk both now and in the future.

1.3 **Volume 2 - Technical Report** outlines and explains in detail the technical methodology adopted to assess strategic flood risk issues in the Woking and Surrey Heath Boroughs.

1.4 **Volume 3 – Appendices**, contains the maps developed in this study which should be used in applying the SFRA.

1.5 The principal requirement for adopting a strategic approach to the assessment and consideration of flood risk is in accordance with advice given in Planning Policy Statement 25 (PPS 25); Development and Flood Risk.

1.6 The approach adopted for this SFRA has primarily been developed in recognition of the need to provide flood risk information to support appropriate land use allocations within the Woking and Surrey Heath Boroughs and to allow the robust application of the Sequential and Exception Tests described in PPS 25. The SFRA will be used to inform DC policies and Area Action Plans.

1.7 The underlying objective is to initiate a strategy that provides a framework for the consistent consideration of flood risk in seeking to accommodate current practice and best available data for the lifetime of the planning process. This framework will be used to inform the emerging Local Development Framework (LDF).

1.8 The assessment evaluates risk as the product of the probability and the consequence of a particular hazard event. Probability is defined as the frequency and magnitude of floods that are generated by fluvial flows and intense rainfall activity. The consequence is defined as the impact of floodwater on receptors (people, property, land, etc). This approach is sympathetic to the concept of source, path and receptor now adopted for flood risk management.

1.9 This document does not replace, and should be read in conjunction with, national and regional policy including PPS 25 and relevant regional policy. The SFRA does not replace the responsibility at a broader level to consider wider catchment flood risk management approaches and solutions, nor does it remove the requirement for appropriately focused local/site FRA's.

1.10 National policy on development and flood risk was given in PPG 25 (ODPM, July 2001). The consultation draft of PPS 25 was issued in December 2005 and replaced PPG 25 in December 2006. PPS 25 generally follows the guidance described in PPG 25, advising that a strategic approach to flood risk should be adopted in keeping with Government's aims to ensure that new development is sustainable. PPS 25 reclassifies the Flood Zones as being

"Low probability", "Medium probability" and "High probability". It identifies the need to apply Strategic Flood Risk Assessment to decisions taken at all levels of planning, i.e. the need for assessment at the Regional Spatial Strategy level. Volume 2 - Technical Report provides further information regarding national and regional flood risk and planning policy.

1.11 The information provided in this SFRA is based on the best currently available information, it is precautionary in accordance with PPS 25, considers current and future flood risk, addresses the need to accommodate changes in the level of uncertainty, relies on the hydrological and hydraulic modelling of existing and future conditions where available. This SFRA aims to facilitate the provision of consistent flood risk management measures within the Study Area and provide a transparent tool for the long term management, maintenance, and review of flood risk.

1.12 Planning policies and decisions should recognise that the consideration of flood risk and its management needs to be applied on a whole catchment basis and not restricted to floodplains.

1.13 This Strategic Flood Risk Assessment (SFRA) assesses the Flood Zones, Actual Flood Risk and Residual Risk for the existing and future conditions within the Study Area (as defined in Appendices C, D and E). It also identifies sources of flooding not related to fluvial watercourses, e.g. sewer, groundwater, and canal flooding.

1.14 This Volume 1 report summarises the catchment setting and basic SFRA methodology (chapter 2), before moving on to the main SFRA (chapter 3). Chapter 3 describes how the Flood Zones, Actual, and Residual Risk should be considered within the planning process, and should read in conjunction with the maps in Volume 3 – Appendices. The flow charts in Section 4 show this process schematically and provide guidance for the application of the principles of the SFRA.

2. CATCHMENT SUMMARY AND METHODOLOGY

Catchments

2.1 The Woking and Surrey Heath SFRA covers an area of 90km^2 and within this area are the Addlestone and Hale Bourne catchments, which are the focus of this study. Current flood risk management measures are confined to localised flood bunds, bank protection, balancing ponds, and sluices. Towards Addlestone a number of improvements have been made to the channel with the aim of increasing conveyance. No formal raised defences exist within the SFRA study area.

2.2 A short section of the River Blackwater also falls within the SFRA area, flowing along the western boundary of Surrey Heath Borough. The Study Area also contains the Basingstoke Canal, which is managed and owned by British Waterways, and used mainly by leisure boats.

Methodology

2.3 A strategic approach to risk assessment requires that proposals take account of present and future flood risks within the Study Area. Additionally PPS 25 advocates a precautionary, risk based sequential approach when assessing flooding. It is conventional to consider risk as the product of the probability and magnitude of the hazard and the severity of the consequences.

2.4 In accordance with the guidance on SFRA in PPS 25, the approach addresses the consequences of inundation for designated scenarios. The platform that can be used for the sequential characterisation of flood risk is described in Annex D, Table D.1 of PPS 25 as shown in **Appendix A**.

2.5 **The Flood Zones** provide an initial broad indication of the areas which may be at risk. The Environment Agency Flood Zones indicate areas which maybe at risk based on broad scale modelling techniques. The Environment Agency Flood Zones do not take account of manmade structures and hence can often be inaccurate in urban areas. The Flood Zones in this SFRA supplement those provided by the Environment Agency and provide additional information on the 1 in 100 and 1 in 1000 year flood extents where more detailed modelling is available. The use of these Flood Zones is complemented by the preparation of plans identifying Actual Risk and Residual Risk, which provide additional information based on the more detailed hydraulic modelling.

2.6 This SFRA uses the modelled 1 in 100 year flood depths as a basis for assessing **Actual Risk** and the modelled 1 in 1000 year flood depths as a basis for assessing **Residual Risk**. Flood outlines have been created using a number of detailed models, which were provided by the EA and WBC, or developed specifically for this SFRA. Further information on these models is provided in Volume 2 – Technical Report. Where detailed models were not available the EA Flood Zones have been used to assess Actual Risk.

2.7 Where detailed hydraulic models of the watercourses were available the 1 in 20 year flood event was also derived and used to indicate the extent of the Functional Floodplain when

assessing Actual Risk. In addition to this the 1 in 100 flood event plus 20% increase in flows, was used to investigate the impacts of climate change on flood extent.

2.8 Having identified the level of risk associated with particular areas it is possible to identify appropriate development land use and also any requirement for strategic responses or flood risk management commitments.

2.9 This SFRA does not remove the requirement for detailed, site specific, Flood Risk Assessments to advise planning applications. Detailed Flood Risk Assessments for particular applications will need to draw on information provided in the Woking and Surrey Heath SFRA in conjunction with more detailed data collection and the hydrological and hydraulic analyses of the river and floodplain system. More detailed information prepared for future development proposals should feed back into the SFRA and future updates of the SFRA should consider any new information and analysis.

2.10 Detailed Flood Risk Assessments for specific sites should asses risks associated with all types of flooding, both in combination and individually. Types of flooding which should be considered and may occur within the area covered by this SFRA include fluvial flooding, groundwater flooding, and flooding from overland flows, artificial drainage systems, and infrastructure failure, including the Basingstoke Canal. Historic and anecdotal evidence of flooding should be considered as part of the assessment.

2.11 A GIS layer is provided with this SFRA which summarises known information on these 'other' sources of flooding. This data set is based on information provided by SHBC, WBC, and the EA and is a record of known flooding problems and past events.

Uncertainties in Flood Risk Assessment

2.12 When assessing risk, the impact of uncertainties associated with the predictions of the hazard and the consequences should be recognised and appreciated so informed decisions can be made.

2.13 The strategy for risk management requires that all phases of the planning and implementation process are fully co-ordinated. The level of detail on flood risk assigned to particular proposals will be limited by the information available at the time of the submission of respective planning applications. It should be noted that the outputs of the SFRA are only as good as the data inputs.

2.14 The Woking and Surrey Heath SFRA will be kept as a live document, reviewed and updated as necessary as the best available information is improved or the inherent uncertainties identified are reduced. In particular it should be noted that an improvement in topographic data may result in a change in the flood extents presented in this SFRA. The implementation of measures or strategic options may change the Actual Risk, Residual Risk and Flood Hazard.

2.15 Both generic and specific risks and uncertainties associated with this SFRA are detailed in Volume 2 - Technical Report.

3. STRATEGIC FLOOD RISK ASSESSMENT

Introduction

3.1 A Strategic Flood Risk Assessment (SFRA) is the term currently used for a flood risk assessment undertaken to inform the spatial planning process at the local scale[1]. A SFRA is not a spatial plan or a planning policy, rather it informs the planning process of the present, and likely future, flood risks. It is part of an iterative, whole-life process and should not be considered in isolation from the flood risk management requirements resulting from the spatial plan. The SFRA is a means of applying a risk-based search sequence as advocated by PPS 25 in the land use planning and development control process. The SFRA may be used to apply the Sequential Test and as a starting point for applying the Exception Test to land allocations.

3.2 A SFRA, by providing information on flood risk, also enables Local Planning Authorities (as well as those involved in strategic planning and decision-making) to identify and designate those areas which are more or less suitable for particular types of different development following a risk-based sequential test[2]. The SFRA can be used to inform:

- Regional Spatial Strategies;
- Local Development Frameworks;
- Area Action Plans
- Sustainability Appraisals
- Development Control; and
- Flood Risk Management.

Justification and Statutory Responsibilities

3.3 National planning guidance notes PPS 11 and PPS 12 identify that guidance given in PPG 25 (now superseded by PPS 25) should be used when considering flood risk. The thrust of Government planning guidance is that new development should be located and designed so that the overall risks of flooding are reduced and that allowance should be made in a precautionary fashion for climate change impacts, particularly in areas exposed directly to 'sea level rise' effects, or in areas where increased fluvial flows could be experienced in the future. PPS 25 includes these concepts by advising the adoption of a strategic approach with the objectives of minimising the exposure of development allocations to flood risk, using a sequential search sequence. In addition to Government guidance, the EA has policies for consideration in respect of development affected by flood risk.

3.4 The SFRA is the primary mechanism by which the strategic planning process is informed of the implications of flood risk and is strategic by virtue of the fact that it is spatially extensive and considers the potential impact of future climate change effects.

3.5 Decision-making on land use, development form, essential services, emergency procedures and strategic flood risk management solutions can be developed from information

[1] Flood Risk Assessment Guidance for New Development: Phase 2, FD2320/2
[2] Planning Policy Statement 25: Development and Flood Risk

from the Woking and Surrey Heath SFRA. The process enables the vulnerability of particular types of development to be considered in the context of flood risk and potential hazards. This may then influence the spatial distribution of particular development types, with the aim of placing the most vulnerable development in the least hazardous areas and the least vulnerable development in areas that are subject to greatest risk. This is important since the consequences of flood risk affect the social, economic and environmental sustainability of the developments within the Study Area. The outputs from the process can also be used to specify Development Control advice, such as guidance on the 'built form' of development so that development can be implemented in a way that minimises consequences in the event of a flood. Finally it can identify and evaluate the efficiency of strategic interventions that could contribute to a reduction in flood risk.

3.6 The objective of the Woking and Surrey Heath SFRA is to supply guidance that informs those responsible for decision-making in a context that is demonstrably compatible with the guidance given in PPS 25.

3.7 The Woking and Surrey Heath SFRA relies on the Risk Evaluation Procedure to identify Flood Zones, predict Actual Flood Risk, identify Residual Risk and examine Flood Hazard, as described in **Appendix A** and the relevant guidance in PPS 25. The predictions of Flood Zones and Actual Flood Risk provide evidence to assist in demonstrating that there are no reasonable development options available in a lower-risk category, consistent with all other sustainable development objectives. This process of allocation therefore meets the requirements of a sequential risk based assessment as defined in PPS 25 and can also identify strategic responses that may deliver a long term reduction in flood risk.

Approach

3.8 In keeping with the guidance in PPS 25 there is a need to adopt the following staged Risk Evaluation Procedure to the sequential examination of flood risk, this four step procedure is outlined in greater detail in the figure shown in **Appendix A**:

- ***Stage 1 Flood Zones -*** To investigate the extent of the Flood Zones as described in Table D.1 of PPS 25.
- ***Stage 2 Actual Risk -*** To assess the actual level of flood risk taking account of man made structures and any defences or features not included in the Flood Zones.
- ***Stage 3 Residual Risk -*** To examine the Residual Risk posed by an event more severe than that for which particular flood mitigation measures or spatial planning responses have been designed.
- ***Stage 4 Breach Hazard -*** To examine the risk associated with the failure of any relevant man made structures or flood protection works.

3.9 It would be normal to include an assessment of the risks of a flood defence breach as part of Stage 4. However due to the absence of formal raised flood defences on the main rivers within the study area this Stage has only considered the risk of canal breach.

3.10 It is intended that all current and subsequent development plans and planning applications within the study area refer to and take account of the results from the Woking and

Surrey Heath SFRA. As stated earlier in this document, the Woking and Surrey Heath SFRA is considered a live document based upon the existing conditions at January 2007 and there will be a need in the future to review the Woking and Surrey Heath SFRA such that it takes account of all the best available information at the time particular planning decisions are taken.

3.11 The Woking and Surrey Heath SFRA facilitates the delivery of a suite of co-ordinated responses that will deliver sustainable development and long term reduction in flood risk. This can only be achieved if a commitment is made to the appropriate long term delivery of strategic goals. The suite of responses that the Woking and Surrey Heath SFRA makes available includes:

(i) Influencing development allocation through the provision of Strategic Planning Guidance;

(ii) Identification of strategic interventions that contribute to flood risk reduction;

(iii) Influencing Development Control; and

(iv) Identification of emerging planning procedure.

STAGE 1 – Flood Zone Review

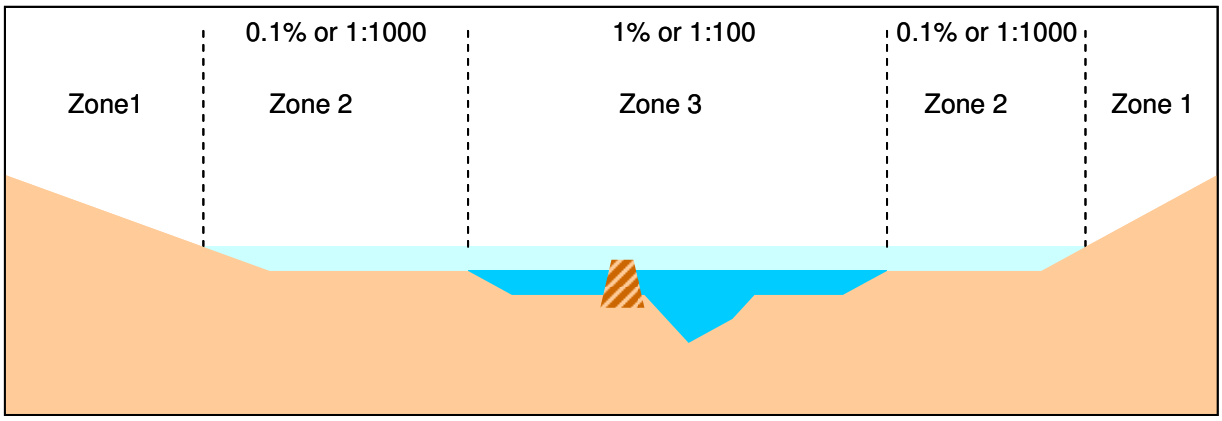
3.12 Flood Zones are defined in Table D.1 of PPS 25 reproduced in **Appendix A**. It is important to recognise that the basic Environment Agency Flood Zone maps, as represented on the EA website**,** do not necessarily describe an actual level of flood risk since they are derived on the basis of a broad scale topography which often does not include important features such as flood defences, man made topography, such as road and rail embankments, and hydraulic structures, such as bridges and culverts, all of which have a significant effect on the spatial distribution of flood hazard.

3.13 Within the Woking and Surrey Heath SFRA the EA Flood Zones have been revised based on more detailed information where this was available. For the purposes of modelling Flood Zones within the SFRA it would be normal to remove all flood walls and fixed defences as defined by the EA, however structures of this type are largely absent from the Woking and Surrey Heath Study Area. Conveyance structures such as flood relief channels and culverts remain in the baseline model. The Flood Zone maps in this SFRA can be used to inform a risk-based search sequence. In the case of the Woking and Surrey Heath SFRA the absence of formal flood defences has meant that the Flood Zone extents can be taken to be representative of Actual Risk and Residual Risk flood extents. The Actual and Residual risk maps provide additional information on flood depths and the distribution of risk within the defined flood zones as well as information on the effects of climate change.

3.14 Flood Zone boundaries are defined by water levels associated with a defined probability of occurrence. The Flood Zones for the Woking and Surrey Heath SFRA are based primarily on detailed hydraulic modelling of the Addlestone and Hale Bourne catchment. This provides an improved level of information on the baseline flooding situation.

3.15 Figure 3.1 shows a graphical definition of the Flood Zones.

Figure 3.1 Conceptual definition of Flood Zones as defined in Table D1 of PPS 25



Source: Capita Symonds Ltd

3.16 The results from the computational hydraulic modelling have been used to predict the water levels for prescribed flood events. The flood events appropriate for the definition of Flood Zones in the Woking and Surrey Heath SFRA study area have been adopted in agreement with the EA during the consultation period. The watercourses within the study area are not subject to tidal influence, therefore the Flood Zone are defined as:

- Zone 1: This zone comprises land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (<0.1%).
- Zone 2: This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) in any year.
- Zone3: This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year.

Flood Zones Observations

3.17 The hydraulic modelling, as discussed in Section 8 of the Technical Report, has been used for the generation of Flood Zones where modelling data was available (results presented in **Appendix C**). The modelling data provides a more detailed and accurate assessment of the EA Flood Zones, which are based on a broad scale model used to produce flood extents for the whole country. It should be noted that some of the detailed modelling data used has been provided by the EA. Not all watercourses within the Study Area have been modelled and hence there is a need to use the Environment Agency Flood Zones for assessing flood risk in those areas not covered by the models. The EA Flood Zones have been included on the maps where more detailed modelled data was unavailable (refer **Appendix C to E**).

3.18 The Flood Zone figures for the Woking and Surrey Heath Boroughs (**Appendix C** – SFRA Modelled Flood Zones) show extensive areas of land within Flood Zone 3, however much of this area has remained sparsely developed or undeveloped.

3.19 There are however isolated pockets of moderate development intensities within Flood Zone 3. The suitability of redevelopment within these areas would require careful

consideration given the high risk of flooding. An assessment of the risk to these areas is covered in more detail in **STAGE 2 – Assessment of Actual Risk**.

3.20 Flood Zone 2 covers a wider area outside Flood Zone 3. In the upper part of the catchment Flood Zone 2 is significantly larger than Flood Zone 3; however in the lower part of the catchment it is not substantially wider than Flood Zone 3. The areas of particular note, where Flood Zone 2 is much larger than Flood Zone 3 include Goldsworth Park, land south of Chobham, and Penny Pot.

3.21 Although the floodplain areas within the Study Area are generally sparsely developed there are a number of transport links within the floodplain considered at high risk of flooding.

3.22 Accordingly it can be concluded that:

(i) Generally existing development is at limited risk of flooding within the study area (particular exceptions noted in Stage 2)

(ii) The Flood Zones should be taken into consideration as part of the Woking and Surrey Heath Development Frameworks, and by Development Control, ensuring that vulnerable land uses (including residential and essential infrastructure) are kept outside high risk areas wherever possible.

(iii) Future development within Flood Zones 2 and 3 should take into consideration the potential to alter the Flood Zones via diversion, obstruction or increasing peak flow rates, thus increasing flood risk.

3.23 For further information on the flood risk associated with Flood Zone 2 refer to **STAGE 3 – Assessment of Residual Risk**. For further information on the flood risk associated with Flood Zone 3 refer to **STAGE 2 – Assessment of Actual Risk** below.

STAGE 2 – Assessment of Actual Risk

Introduction

3.24 PPS 25 advises Local Planning Authorities to give appropriate weight to information on flood-risk and how it might be affected by climate change in preparing development plans and considering individual proposals for development. Such guidance is equally applicable to all stakeholders, authorities and organisations involved in strategic planning and decision making.

3.25 The sequential risk-based approach is based on the premise that land use decisions are based on the Actual Risk and should take account of:

(i) the area at risk from flooding;

(ii) the probability of it occurring, both now and over time;

(iii) the extent and standard of any existing defences and their effectiveness over time;

(iv) the likely depth of flooding;

(v) the rates of flow likely to be involved;

(vi) the likelihood of impacts to other areas, properties and habitats;

(vii) the effects of climate change; and

(viii) the nature, vulnerability and currently expected lifetime of the development proposed and the extent to which it is designed to deal with flood risk.

3.26 Stage 2 of the SFRA assesses the Actual Risk to areas within the SFRA area. Although the basic assessment is related to the 1 in 100 year flood outline (which is the same as the modelled Flood Zone 3 in Stage 1), Stage 2 also considers the impacts of climate change, which can be expected to increase the risk of flooding over the development plan lifetime. Stage 2 also considers the distribution of flood hazard (based on flood depth) within Flood Zone 3 and provides information on the extent of the Functional Floodplain.

3.27 The probability of flooding, both now and over time has been assessed using the relevant probabilities of flows described in Table D1 of PPG 25, where necessary adjusted to allow for future trends driven by potential global warming impacts. For the purposes of this study flows were increased by 20% to assess the possible future impacts of climate change.

3.28 In addition to this there is also a need to consider the Functional Floodplain. This is discussed further in section 3.34. The flood extent for an event with a 1 in 20 year return period has been used to determine which areas may be within the Functional Floodplain. SFRAs should identify this Flood Zone 3b (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

3.29 The flood extents (1 in 20, 1 in 100 and 1 in 100+ 20%) for the Actual Risk scenarios are provided in **Appendix D**.

3.30 Consideration should also be given to flooding from other sources. A CD containing a GIS layer of areas historically recorded as flooding from sources other than fluvial has been included at the back of this report. This information should be consulted to inform planners and developers of flood risk from other sources. The information provided indicates areas where flooding has been recorded in the past. It aims to provide additional information based on that currently available, but does not provide an absolute listing. Areas or roads recorded as flooding are mainly within Woking, Byfleet, Camberley, Frimley, Bagshot, Lightwater, and Chobham but also include Mytchett, Windlesham, Bisley, West End and Send.

3.31 As the data available on other sources of flooding is not complete, does not give comprehensive coverage, and is of varied quality, it should be used as a trigger for further investigation at development sites affected.. The geology of the study area is described in Section 5 of Volume 2 – Technical Report. Within the Addlestone\Hale Bourne catchment the geology is a combination clay, sand, and gravels, the later two being where groundwater flooding is most likely.

Actual Risk Observations

3.32 To aid in the assessment of Actual Risk Flood Hazard Maps have been produced. These maps show the distribution of flood depth during a 1 in 100 year flood event, and can be seen in **Appendix F**. It should be noted that these Flood Hazard Maps have been generated using the supplied topographic data. This data is based on Photogrammetry collected in 1996. Due to the age of this data it may not provide an accurate representation of the current topography. Therefore these maps should be considered indicative only, and not necessarily representative of the true flood depths in a 1 in 100 year flood event.

3.33 The results of the flood risk predictions can be summarised as follows:

5% annual probability (1 in 20 year return period) flow

3.34 In accordance with PPS 25 consideration should be given to development deemed to be in the Functional Floodplain. In line with PPS 25, all development should be kept outside of the Functional Floodplain, with the exception of certain 'water compatible' land uses (e.g. recreational and conservation uses), as well as essential transport/utilities infrastructure that have no viable alternative location. The exception test must be passed for essential infrastructure developments to take place in this zone. The Functional Floodplain zone comprises land where water has to flow or be stored in times of flood. For the purpose of this SFRA the 1 in 20 year return period flood outline has been used as an indication of those areas acting as Functional Floodplain.

3.35 It should be noted that information on the 1 in 20 year floodplain could only be provided where detailed hydraulic modelling has been carried out. Modelling of the Blackwater and a number of tributaries within the Addlestone and Hale Bourne catchment has not been completed as part of this SFRA and EA Flood Zones have been used to assess risk in this area. As no sub-division of the EA Flood Zone 3 information is available, it was not possible to consider the extent of the Functional Floodplain in these areas. However where detailed Flood Risk Assessments for specific sites are completed within Flood Zone 3, and there is currently no information on the 1 in 20 year floodplain, it is recommended that the extent of the Functional Floodplain is assessed. This may be through further modelling, or if this is not possible, information on historic flooding may be of assistance in defining the Functional Floodplain

3.36 The majority of flooding from the 1 in 20 year return period within the Study Area is limited to open space and rural or semi-rural areas. The results of hydraulic modelling demonstrate the following more developed areas may be at risk from a 1 in 20 year return period flood event:

- Properties between Bridge Road (B3029) and Guildford Road in Bagshot are at risk of fluvial flooding from the Hale Bourne.
- Parts of Riverside Avenue in Lightwater are at risk of fluvial flooding.
- Land and property west of the High Street, to the north of the A319 and around Grants bridge at Chobham
- Land and property between the river and Sandpit hall Road at Rothwell Nursery.

- Land and Property at Philpot Lane west of Fairoaks Airport.

1% annual probability (1 in 100 year return period) flow

3.37 The majority of flooding within the Study Area is limited to open space and rural or semi-rural areas. A few developed areas are at high risk from flooding. The results of hydraulic modelling demonstrate that in addition to those listed above the following areas are presently at risk from a 1 in 100 year return period flood event:

- Properties in Bagshot between Bridge Road (B3029) and the railway, and between the railway and Freemantle Road. Flooding is concentrated to the left bank of the Hale Bourne and flood depths are generally below 0.5 m.

- Properties in Lightwater, including properties on Riverside Avenue, The Willows, and Birchwood Drive. Flood Depths are generally below 0.75 m. Possible flooding mechanisms include flow constriction at culverts.

- Land, roads, and property in Chobham south of the A319 and around the High Street flood from the Hale Bourne. Flooding also occurs at Grants bridge from the Addlestone Bourne. Flood depths are generally below 0.5 m.

- Land and property between the river and Sandpit Hall Road at Rothwell Nursery. The floodplain is wide here with flood depths generally less than 0.5 m.

- Land and Property at Philpot Lane west of Fairoaks Airport. This area is upstream of the confluence between the Hale and Addlestone Bournes.

- The flood extent at Mimbridge encroaches into the gardens of properties. Flood depths are less than 0.3 m.

- Property south of the A3046 and a school north of the road is partially within the flood extent. The flood extent extends between the Hale and Addlestone Bournes. The flood depths south of the road and near the school are generally less than 0.25 m.

- A few properties are at risk on Epsom Close, north of Camberley and at York Town between the stream and Stanhope Road. Flooding here originates from the Wish Stream. This is based on EA Flood Zones.

- Gas Holder Station and Industrial units adjacent to the A331 are at risk from the Blackwater.

- Frimley Business Park, Albany Park Industrial Estate, Lyon Way Industrial Estate, and property in Frimley Village to both the north and south of the High Street are within EA Flood Zone 3.

3.38 For further details on predicted flood depths refer to **Appendix F**.

1% annual probability (1 in 100) flow + 20% increase in magnitude combined

3.39 Current predictions of climate change suggest river flows may increase by as much as 20% in extreme events over the next 50 years. It is therefore very necessary to consider how flood risk may change and potentially increase in coming years.

3.40 As expected there is an extension of the floodplain in some areas as a result of increased flows, however generally flooding mechanisms within the Study Area remain the same. Due to the generally well defined river floodplains, which exists on many of the watercourses within the Study Area, the increase in flows resulting from climate change has had only a minimal impact on flood extent in many areas. The spatial impacts on Actual Flood Risk associated with climate change within the Study Area are shown in **Appendix D**. Modelling of the Blackwater has not been completed and EA Flood Zones are being used to assess risk. Therefore it was not possible to consider the impacts climate change in the Camberley area.

3.41 The most notable areas of increased flood extent resulting from potential climate change are as follows:

- The number of properties affected in Bagshot increases, particularly to the east.
- Although the flood extent not much greater in Lightwater, it does incorporate a number of additional properties.
- A few additional properties shown at risk at the Nurseries south of West End on the Guildford Road.

STAGE 3 – Assessment of Residual Risk

Introduction

3.42 In recognition that flood management and mitigation measures including appropriate spatial planning in relation to Actual Risk cannot eliminate flood-risk, there is a need to be aware of the Residual Risk generated by an event more severe than that for which particular flood management/planning and mitigation measures have been designed. Consideration of the Residual Risk is a key requirement of Flood Risk Assessments as defined in Annex E and Annex G of PPS25.

3.43 The Stage 3 – Assessment of Residual Risk provides information on the flood risk associated with extreme events within the Study Area. The Residual Risk will be assessed for the same return period for which Flood Zone 2 was based (1 in 1000 year return period). The assessment of Residual Risk would usually differ from the Flood Zone 2 assessment due to the inclusion of an assessment of the performance of any existing flood defences. Due to the absence of formal raised flood defences within the Woking and Surrey Heath Study Area, the assessment of Residual Risk from fluvial sources is the same as that for Flood Zone 2.

3.44 The flood extents for the Residual Risk scenario are available in **Appendix E**.

Residual Risk Observations

3.45 The results of the residual hazard analyses can be summarised as follows:

0.1% annual probability (1 in 1000 year return period) flow

3.46 As expected the Residual Risk floodplain is significantly larger than the Actual Risk floodplain in some areas as a result of increased flows, however generally flooding mechanisms within the study area remain the same. Where there are informal defence structures or infrastructure, these may impact upon the residual risk. Due to the generally well defined river floodplains, which exist on many of the watercourses within the study area, the increase in flows associated with the Residual Risk flood event has had only a minimal impact on flood extent in many areas within the Study Area. The flood extents associated with the Residual Risk flood event are shown in **Appendix E**.

3.47 Much of the flooding resulting from the Residual Risk flood event within the study area is limited to open space and rural or semi-rural areas. In accordance with PPS 25, highly vulnerable land uses should be avoided in areas potentially susceptible to Residual Flood Risk, unless the exception test is passed.

3.48 As discussed above, generally the Residual Risk scenario flooding mechanisms and extents are similar to those for Actual Risk due to the generally well defined floodplain. The most notable exceptions to this, which impact on existing developments are discussed below:

- Areas to the east of the A3046, are shown to be at risk in a 1 in 1000 year event from the Hale and Addlestone Bournes.
- Additional properties in the vicinity of Riverside Avenue are at risk from the Lightwater Stream during a 1 in 1000 year event, when compared to the 1 in 100 year flood event.

- Bell Place and properties off Freemantle road are at risk from the Hale Bourne in a 1 in 1000 year event

- Although less developed, the area at risk of flooding to the south of West End increases during a 1 in 100 year event, incorporating a number of additional properties.

- Areas to the west of Camberley, particularly the industrial/commercial area to the east of the A331 has a significantly greater Residual Risk, with the 1 in 100 year flood event outline being significantly larger than the 1 in 100 year outline. This is based on EA Flood Zones.

- The 1 in 1000 year flood event outline is also larger in areas of open land between the Frimley Green, and Mytchett and the A331. This is based on EA Flood Zones.

STAGE 4 – Assessment of Breach Hazard

3.49 The only breach scenarios considered are those relating to the Basingstoke Canal, as there are no formal flood defences in the study area. Areas at potential risk of Canal breach are described in Section 9 of Volume 2 – Technical Report and shown in Appendix H.

Application of the Woking and Surrey Heath SFRA

Introduction

3.50 The remaining sections of this chapter give an initial indication of how the Woking and Surrey Heath SFRA technical information can be used in the decision making process. It is accepted that this guidance will be revised during the SFRA implementation 'start up' period. It is possible to use a largely digital GIS platform to make the procedure easier to access, apply and consider in conjunction with other relevant land use planning data sets.

3.51 An SFRA has been prepared for the Woking and Surrey Heath Study Area so that planning decisions can be made taking into consideration the probability of potential flood hazards and the significance of the potential impact of inundation. The Woking and Surrey Heath SFRA achieves this through:

(i) Delivery of information on those areas that would be affected by frequent flooding;

(ii) Examination of the Actual Risk that will exist over the lifetime of proposed development; and

(iii) Identification of areas that would be vulnerable to the consequences of flooding in the event larger than that for which flood management measures and spatial planning has been developed (Residual Risk).

3.52 All those preparing development proposals, investigating feasibility options or simply performing due diligence exercises on land within the Study Area should make reference to the results of the Woking and Surrey Heath SFRA. In order to be effectively included in the planning and development process, the results of the SFRA need to be available in a simple, clear and well understood process mechanism. To facilitate the use of the strategic flood risk information; a Strategic Risk Evaluation Procedure has been developed. This procedure is further clarified in the Flow Chart in Section 4.

The Strategic Risk Evaluation Procedure

3.53 A Strategic Risk Evaluation Procedure has been developed to make flood risk information and strategic guidance more accessible to decision makers and, with the application of appropriate management protocols, this will ensure that decisions are robust and will withstand challenge. It is essential that the guidance and strategic risk information contained in the SFRA is managed and maintained throughout all phases of implementation. Thus, the Woking and Surrey Heath SFRA documentation is only the starting point for a process that must be continuously applied, monitored and managed

3.54 The Strategic Risk Evaluation Procedure is intended for use by those involved in all levels of planning and development within the Study Area. The procedure consists of four steps and makes reference to a series of four sets of maps. By following the procedure, site specific enquiries on flood risk can be investigated, such as:

(i) Is my site at risk from flooding?

(ii) To what extent is my site affected by flooding?

(iii) What kind of flood mechanisms or storm events may affect my site?

(iv) How do these flood risks affect the planning and development decisions I make at this site?

Step 1: Identification of Flood Zones (refer to Appendix C)

3.55 Identifying the Flood Zones for the area of interest is the first step of the Strategic Risk Evaluation Procedure. The Flood Zones determine areas of high risk, (Zone 3), medium to low risk (Zone 2) and little or no risk (Zone 1).

3.56 The appropriate planning response in each of these Flood Zones is identified in Table D.1 and D.3 of PPS 25, which is reproduced in **Appendix A**.

3.57 Additional strategic guidance is also available in **Section 4**, which gives specific guidance on the application of the principles of the SFRA to allocations or planning applications.

Step 2: Investigation into Actual Risk (refer to Appendix D)

3.58 Step 2 of the Strategic Risk Evaluation Procedure is to investigate the Actual Risk. **Appendix D** provides more detailed information regarding the flood risk and sub-divides Flood Zone 3 into areas at higher and lower risk. **Appendix F** also provides depth information to assist in the determination of Actual Risk.

3.59 The investigation into Actual Risk provides further information on how often a site may flood (including the Functional Floodplains), the likely extent of flooding and possible impacts to other areas, properties and habitats.

3.60 The Actual Risk extent is based on a fluvial 1% annual probability (1 in 100 year) event.

3.61 Appendix D also includes the 1 in 100 +20% (for climate change) flood extent and the 1 in 20 flood extent (to give an indication of the area which maybe defined as Functional Floodplain).

3.62 Information in relation to other, (non river) sources of flooding is provided in a GIS layer accompanying this SFRA. This GIS layer contains all available information on past flooding caused by surface water, sewer flooding and groundwater flooding that have been recorded in the area.

3.63 Strategic advice relating to Actual Risk and land use is provided in **Section 4.** These figures give specific guidance on the application of the principles of the SFRA to allocations or planning applications.

Step 3: Investigation of Residual Risk (refer to Appendix E)

3.64 After determining Actual Risk, the third step of the Procedure is to identify the Residual Risk. **Appendix E** demonstrates the potential Residual Risk within the Study Area.

3.65 The Residual Risk extent is based on an event more severe than that for which particular flood management / planning and mitigation measures have been designed. In the Woking and Surrey Heath Study area Residual Risk can be defined as a fluvial 0.1% annual

probability (1 in 1000 year) event and demonstrates the impact of a low probability but large consequence fluvial event. Residual risk is assessing the impact of a design event larger than that for which any defences or structures have been designed. The 1 in 1000 year event is likely to be larger than any flood event used in the design of existing channel structures and modifications, such as channel widening.

3.66 Strategic advice relating to Residual Risk and land use is provided in **Section 4.** These figures give specific guidance on the application of the principles of the SFRA to allocations or planning applications.

Step 4: Determine Potential Failure Hazard (refer to Appendix H)

3.67 Step 4 of the Strategic Risk Evaluation Procedure is to investigate the potential hazard posed to people, vehicles and property from the breach of defences**.** Sections, C9 and G2 of PPS 25 indicate a consideration of the impact of a breach that should be taken into account when considering development options.

3.68 As there are currently no formal raised flood defences within the study area, a fluvial breach is not considered a possibility. However, this may not always be the case and may require assessment in future revisions of the SFRA.

3.69 The information contained in **Appendix H** provides an indication of those areas that may be at risk from a possible breach of the embankment along the Basingstoke Canal. Prior to development in these locations a site specific assessment of risk should be carried out to ensure that the risks from a breach can be effectively managed.

Implementation of the SFRA

3.70 The emerging Woking Local Development Framework and Surrey Heath Local Development Framework need to take into consideration the recommendations within the SFRA. It is important to recognise that the allocation of future development may impact flood risk, and should be managed carefully.

3.71 Tables 4.3 and 4.4 provide an indicative assessment of the implications for the areas already identified for possible future development in the Study Area. This is an indication of how the SFRA can be used to guide the planning and allocation of potential development sites and should be continually updated as new information becomes available.

3.72 The majority of possible future development sites provided by Woking Borough Council are affected by the Wey catchment covered by Woking and Guildford SFRA. However possible future development sites in the Goldsworth area are affected by the Addlestone and Hale Bourne catchment. Possible future development sites provided by Surrey Heath Borough Council are affected by the Addlestone/Hale Bourne catchment and the River Blackwater which runs along the western boundary of the study area, and flood risk here should also be considered.

3.73 In the longer term there is a need to maintain and manage the information in the SFRA so that further and future decisions are made using the best available data. It will also be necessary for proposals to be validated against the guidance given in the SFRA and adapted as necessary during the delivery and implementation process.

Emergency Planning

3.74 Through the understanding of flood mechanisms and processes developed for the SFRA, with the use of a broad scale 1D hydraulic modelling program (iSIS), several key points relevant to the planning of Emergency Response have been identified;

3.75 Emergency services, evacuation centres and related emergency infrastructure should be located in consideration of the risk of flooding.

3.76 Outcomes from the SFRA should be addressed in a Flood Management Plan, which may then be incorporated into a Local Emergency Plan or Major Incident Plan as seen appropriate. It is expected that other professional partners including Local Authorities, the Environment Agency, Fire Service, Police Service and Health Authority will contribute to the Flood Management Plan. This is an obligation under the *Civil Contingencies Act (July 2004).*

3.77 It is likely the aims of the Flood Management Plan will be to:

- Identify the responsibilities of professional partners and others in the management of flood risk;
- Identify the appropriate response to flood warnings;
- Identify the actions required during instigation of the plan;
- Identify recovery actions following a flood event; and
- Identify clear communications routes between professional partners.

3.78 In particular the Flood Management Plan should include consideration of:

- The risk of isolation of residential areas
- The risk of flooding of major transport routes into and out of the Study Area
- The risk of flooding of vulnerable industry including power infrastructure.

Summary of Strategic Flood Risk Assessment

3.79 The flow chart in **Section 4** provides further guidance in the application of this SFRA to land allocation decisions and to development control.

3.80 The outcome of the assessment identifies that there is an underlying requirement for a Flood Risk Management Strategy for the Study Area. The strategy essentially requires consideration of the following five principal Actual Risk management measures:

(i) Selection of development solutions that complement the least risk options in accordance with Flood Zones, Actual Risk areas and Residual Risk areas;

(ii) Provision of development forms in areas at Actual Risk from fluvial flooding, where such development is permitted, that include appropriate mitigation and management measures;

(iii) Preparation of Flood Risk Assessments for all applications in Zones 2 and 3 that include an appraisal of the strategic considerations;

(iv) Preparation of Flood Management Plan or update of existing plan for incorporation in local Emergency Plan or Major Incident Plan; and

(v) Identification and implementation of strategic interventions that offer a sustainable means of addressing long-term flood risk and hazard, and contribute to a reduction in flood risk.

4. SFRA GUIDANCE FOR PLANNERS

Introduction

4.1 This chapter describes the application of the sequential risk based approach in the formulation of Local Development Framework proposals. It uses information contained in this Strategic Flood Risk Assessment.

Context

4.2 Guidance on Development and Flood Risk is given in PPS 25. PPS 25 requires that flood risk should be considered through the application of a sequential test. The process of how to obtain the information needed to perform the test is described in Figure 4.2. It is also recognised that the information obtained on flood risk must be considered alongside other spatial planning issues such as transport, housing, economic growth, natural resources, regeneration, biodiversity, the historic environment and management of other hazards.

4.3 Accordingly it is assumed that the outcome of the application of the sequential approach ("the test") is collected for use alongside other information to facilitate decision-making on the land use. The flood risk information should be prepared using the risk-based, sequential process described in Figure 4.2 (overleaf). Allocations are thus "tested" on the basis of their flood risk attributes and the outcome used to inform decisions that include other spatial planning issues. Figure 4.1 illustrates the context for the application of the information in the SFRA.

Figure 4.1
How the risk based sequential approach informs decision-making

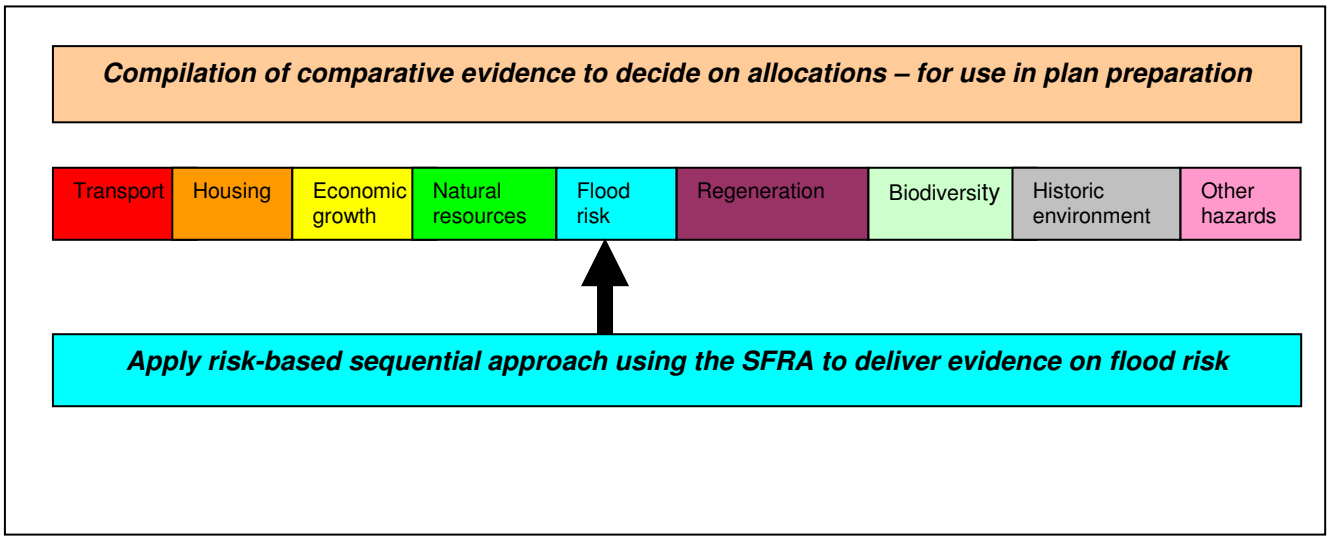


Figure 4.2 – Using the SFRA - Also Refer to Figures D1, D2 & D3 in PPS 25

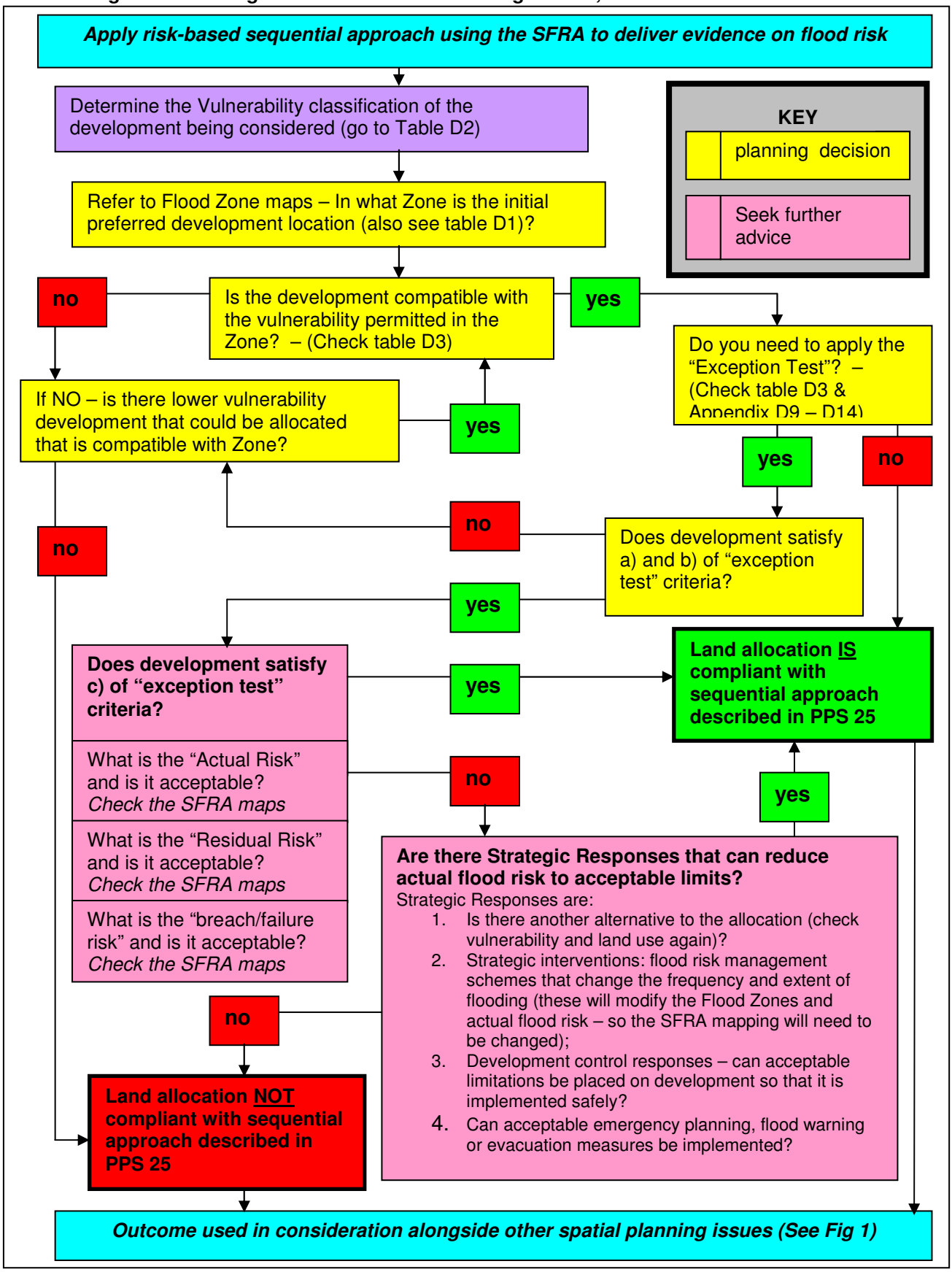


Table 4.3 Areas Identified for Potential Development in the Woking Core Strategy

Potential development sites contained within this table are based on the *Woking Core Strategy, Development Plan Document, Preferred Option. (January 2006)* and GIS layers provide by WBC. This table covers all sites identified in Appendix 1 of the project brief dated April 2006 as well as other sites identified as potentially being at risk of flooding during the course of the SFRA.

	Sites Identified for Potential Future Development	**Flood Zones**	**Actual Risk** 1% annual probability fluvial event or a 0.5% annual probability tidal event	**Residual Risk** 0.1% annual probability event	**Potential Breach Hazard**	**Additional comments**
1	**Camphill Industrial Estate**	All zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	The site is adjacent to the Basingstoke Canal and therefore potentially at risk of flooding caused by a breach of the canal or culvert failure. Information received from the Basingstoke Canal Authority has indicated that discharge from the canal to the River Ditch could result in flooding of what is referred to as *Area 4* (See **Appendix H**). The site is adjacent to this Area.	Despite possible Residual Risks from breach site is considered suitable for industrial development provided this risk is appropriately managed. This area is not considered at risk of fluvial flooding, however any planning application within this area in excess of 1ha will require a detailed Flood Risk Assessment.
2	**Forsyth Road Industrial Estate**	All zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	The site is located less than 350m from the Basingstoke Canal. Despite its proximity to the Basingstoke Canal, information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach of the canal or culvert failure.	This site is considered suitable for vulnerable development as the site falls within Zone 1. This site is not considered at risk of fluvial flooding however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
3	**Goldsworth Road Industrial Estate**	All zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	The site is located within 350m from the Basingstoke Canal at its nearest point, and therefore potentially at risk of flooding caused by a breach of the canal or culvert failure. Information received from the Basingstoke Canal Authority has indicated that discharge from the canal to the River Ditch could result in flooding of what is referred to as *Area 12* (See **Appendix H**). The site is in the vicinity of this Area.	Despite possible Residual Risks from breach, site is considered suitable development provided this risk is appropriately managed. This area is not considered at risk of fluvial flooding, however any planning application within this area in excess of 1ha will require a detailed Flood Risk Assessment.
4	**Robin Hood Works**	All zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	This site is considered suitable for vulnerable development as the site falls within Zone 1. This site is not considered at risk of fluvial flooding however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
5	**Ash Road PFI Site**	Zone 1- majority Zone 2 – Eastern corner of eastern block Zone 3 – Eastern boundary of eastern block	Low Actual Risk to majority of the site, although some inundation is possible from the eastern boundary.	Low Residual Risk to majority of the site, although some inundation is possible from the eastern boundary.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	This site is considered suitable for vulnerable development as the majority of the site falls within Zone 1. This should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
6	**Moor Lane PFI Site**	Zone 1- majority Zone 2 - South east corner of site currently Little Moor Lane Farm Zone 3 – Eastern boundary of site	Low Actual Risk to majority of the site, although some inundation is possible from the eastern boundary.	Some Residual Risk- with inundation likely at Little Moor Lane Farm corner of site.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	This site is considered suitable for vulnerable development as the majority of the site falls within Zone 1. It is noted that a Flood Risk Assessment has been completed for the site by Bettridge Turner & Partners in June 2006 (refer to Section 13 – References), which confirmed the majority of the site falls within Flood Zone 1.
7	**Brookwood Farm PFI Site**	All Zone 1	The minor watercourse/drain that runs past the Brookwood Farm PFI site has not been modelled and therefore Actual Risk at this site must be based on EA Flood Zones. EA Flood Zones show there to be no Actual Risk at this site.	The minor watercourse/drain that runs past the Brookwood Farm PFI site has not been modelled and therefore Residual Risk at this site must be based on EA Flood Zones. EA Flood Zones show there to be no Residual Risk at this site.	The site is located 350m from the Basingstoke Canal at its nearest point. Despite its proximity to the Basingstoke Canal, Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach of the canal or culvert failure.	This site is considered suitable for vulnerable development as the site falls within Zone 1. It is noted that a Flood Risk Assessment has been completed for the site by Bettridge Turner & Partners in June 2006 (refer to Section 13 – References), which confirmed the sites location within Flood Zone 1.

	Sites Identified for Potential Future Development	Flood Zones	Actual Risk 1% annual probability fluvial event or a 0.5% annual probability tidal event	Residual Risk 0.1% annual probability event	Potential Breach Hazard	Additional comments
8	**Eden Grove Road PFI Site**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely. However it should be noted that the site is very close to the modelled 1000 year flood extents which were based on IFSAR topographic data which can in some instances have in accuracies of up to +/-500mm. Surveyed ground levels on site should be checked against modelled flood levels in **Appendix G**.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	This site is considered suitable for vulnerable development as the site falls within Zone 1. It is noted that a Flood Risk Assessment has been completed for the site by Bettridge Turner & Partners in June 2006 (refer to Section 13 – References). Based on site levels provided in this FRA it may well be the case that the site actually falls within Flood Zone 2. However this does not impact on the suitability of the site provided that the exception test is passed for highly vulnerable developments.
9	**Mayford Infill Village**	Zone 1- majority, including all properties west of Egley Road. Zone 2 - all properties on Drakes Way, and those on the eastern side of Egley Road Zone 3 – all properties on Drakes Way, and a considerable portion of those on the eastern side of Egley Road	High Actual Risk to all properties on Drakes Way, and a considerable portion of those on the eastern side of Egley Road. Low Actual Risk to all other properties within the Mayford Infill Village. It should be noted that the modelled 1 in 100 year flood extents (provided by Atkins/EA) were based on IFSAR topographic data which can in some instances have in accuracies of up to +/-500mm. Surveyed ground levels on site should be checked against modelled flood levels in **Appendix G** to confirm the Actual Risk to specific properties within the Mayford Infill Village.	High Residual Risk to all properties on Drakes Way, and those on the eastern side of Egley Road. Low Residual Risk to those properties to the west of Egley road.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	Areas of the site subject to Actual Risk should not be considered a preferred option for residential development, all areas not subject to Actual Risk may be considered suitable for residential development (however highly vulnerable development should not take place within Zone 2 unless the exception test is passed). The flood risk across the site should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
10	**Old Woking Industrial Area, (Primary Employment Site)**	Zone 1- majority Zone 2 – Southern Boundary of site Zone 3 – Southern Boundary of site	Low Actual Risk to majority of the site, although some inundation is possible from the southern boundary.	Low Residual Risk to majority of the site, although some inundation is possible from the southern boundary.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	Majority of the site is suitable for the proposed commercial land use, provided adequate flood compensation can be achieved in Zone 2 and 3, thus preventing any development in from increasing flood risk elsewhere. It must also be demonstrated that the development can be occupied safely in the event of a flood. This should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
11	**Goldsworth Park Industrial Area, (Primary Employment Site)**	Zone 1- majority Zone 2 – western third of the site	Very low Actual Risk. Inundation unlikely.	Some Residual Risk- potentially at risk of flooding based on EA Flood Zones.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area. The EA have stated that there is not a risk of breach from the adjacent reservoir.	Site is considered suitable for the proposed land use. However, this should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
12	**St Johns Hill Road Retail Area**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Although the site is located adjacent to the Basingstoke Canal, Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach or culvert failure.	Site is suitable for the proposed retail development. This site is not considered at risk of fluvial flooding however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
13	**Woking Town Centre**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	The Woking Town Centre is located adjacent to the Basingstoke Canal and therefore potentially at risk of flooding caused by a breach of the canal or culvert failure. Information received from the Basingstoke Canal Authority has indicated that the following areas are at risk: • *Area 12* (See **Appendix H**) - Large scale flooding of Kinetic building, Old people's home and houses on Vale Farm Road and possibly minor flooding of Mabel street. • *Area 12* (See **Appendix H**) - Large scale flooding of A324 and houses on Horsell Moor.	Despite possible Residual Risks from breach, site is considered suitable for the proposed town centre development provided this risk is appropriately managed. This area is not considered at risk of fluvial flooding, however any planning application within this area in excess of 1ha will require a detailed Flood Risk Assessment.
14	**Monument Way East Industrial Area**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Although the site is located adjacent to the Basingstoke Canal, Information received from	Site is considered suitable for the proposed commercial land use. This site is not

	Sites Identified for Potential Future Development	Flood Zones	Actual Risk 1% annual probability fluvial event or a 0.5% annual probability tidal event	Residual Risk 0.1% annual probability event	Potential Breach Hazard	Additional comments
					the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach or culvert failure.	considered at risk of fluvial flooding, however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
15	**Monument Way East Industrial Area**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Monument Way East Industrial Area is located adjacent to the Basingstoke Canal and therefore potentially at risk of flooding caused by a breach of the canal or culvert failure. Information received from the Basingstoke Canal Authority has indicated that a failure of the culvert which carried the Rive Ditch under the canal or discharge from the canal to the Rive Ditch could result in flooding of what is referred to as *Area 9* (See **Appendix H**), approximately half of the Monument Way East Industrial Area site is considered at risk of flooding caused by a breach of the canal or culvert failure.	Despite possible Residual Risks from breach site is considered suitable for the proposed industrial development provided this risk is appropriately managed. This area is not considered at risk of fluvial flooding, however any planning application within this area in excess of 1ha will require a detailed Flood Risk Assessment.
16	**West Byfleet (including Broadoaks)**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Although the site is located adjacent to the Basingstoke Canal, Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach or culvert failure.	Site is considered suitable for the proposed commercial land use. This site is not considered at risk of fluvial flooding, however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
17	**Byfleet Industrial Estate**	Zone 1- North western corner of site Zone 2 – Majority	Very low Actual Risk. Inundation unlikely.	Considerable Residual Risk with inundation of most of the site likely	The site is located 100m from the Basingstoke Canal at its nearest point. Despite its proximity to the Basingstoke Canal, Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach of the canal or culvert failure.	Site is considered suitable for the proposed industrial land use provided acceptable flood mitigation is included with any design proposals. However, this should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
18	**Byfleet Village Centre**	All Zone 2	Very low Actual Risk. Inundation unlikely.	Considerable Residual Risk with inundation of the entire Village Centre possible	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	Site is considered suitable for all but the most vulnerable land uses provided acceptable flood mitigation is included with any design proposals. The exception test is required for any highly vulnerable development proposals on the site. All development proposals within the Byfleet Village Centre will require a detailed Flood Risk Assessment.
19	**Lansbury Industrial Estate**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	Site is considered suitable for the proposed commercial land use. This site is not considered at risk of fluvial flooding, however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
20	**Pool Road / Butts Road Industrial Estate**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Although the site is located adjacent to the Basingstoke Canal (approx 200m away at its nearest point), Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach or culvert failure.	Site is considered suitable for the proposed commercial land use. This site is not considered at risk of fluvial flooding, however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.
21	**Woking Business Park / Sheerwater Industrial Area**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk- inundation unlikely	Although the site is located adjacent to the Basingstoke Canal, Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach or culvert failure.	Site is considered suitable for the proposed commercial / Industrial land use. This site is not considered at risk of fluvial flooding, however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.

	Sites Identified for Potential Future Development	Flood Zones	Actual Risk 1% annual probability fluvial event or a 0.5% annual probability tidal event	Residual Risk 0.1% annual probability event	Potential Breach Hazard	Additional comments
21	**Hoe Valley Scheme (Westfield Tip)**	Zone 2 – All of proposed housing development (based on EA Wey FRM model) Zone 3 – areas along the boundary of site and the northern corner (Based on Hoe Valley model)	Low Actual Risk to majority of the site, although some inundation is possible along the site boundary particularly towards the northern boundary.	Considerable Residual Risk with inundation of most of the site likely	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	Majority of the site is within Zone 1; however a fair proportion of the northern part of the site is within Flood Zone 3b. Residential development is considered 'more vulnerable' and should generally not be permitted in Flood Zone 3a (unless the exception test is passed (PPS25)) or 3b. However the site has been the focus of a four-year study to provide flood defences along the Hoe Stream, as part of the Hoe Valley Project. The proposed defences will alter the shape of the floodplain, defending existing properties from flooding to the 100 year standard, some of which currently are at risk in the 20 year return period or less. The flood defence scheme has been designed in co-operation with the Environment Agency with sufficient mitigation to ensure that there are no adverse flood impacts to any third party land owners. By virtue of the proposed defences, properties in the areas benefiting from the proposed defences along reaches of the Hoe Stream will effectively be removed from the 100 year floodplain leaving the Residual Risk of flooding at less than 1% in any year.

Table 4.4 Areas Identified for Potential Development in the Surrey Heath Core Strategy

Potential development sites contained within this table are based on the *Surrey Heath Local Plan* and GIS layers provided by SHBC. This table covers all sites identified in Appendix 1 of the project brief dated April 2006 as well as other sites identified as potentially being at risk of flooding during the course of the SFRA.

	Sites Identified for Potential Future Development	Flood Zones	Actual Risk 1% annual probability fluvial event or a 0.5% annual probability tidal event	Residual Risk 0.1% annual probability event	Potential Breach Hazard	Additional comments
1	**Windlesham**	All Zone 1	Very low Actual Risk. Inundation unlikely. (Based on EA Flood Zones only as the Windlesham Ditch has not been modelled)	Very low Residual Risk. Inundation unlikely. (Based on EA Flood Zones only as the Windlesham Ditch has not been modelled)	Breach hazard analysis not undertaken in this area as hydraulic modelling of the Windlesham Ditch has not yet been undertaken.	This site is considered suitable for vulnerable development as the site falls entirely within Zone 1. However given the site area is in excess of 1ha it will require a detailed Flood Risk Assessment. It is recommended that flood risk from the Windlesham Ditch is investigated.
2	**Streets Heath, West End (Allocated Housing site)**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk. Inundation unlikely.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	This site is considered suitable for vulnerable development as the site falls entirely within Zone 1. However given the site area is in excess of 1ha it will require a detailed Flood Risk Assessment.
3	**West End (Housing Reserve site)**	Zone 1 – Majority of site Zone 2 – Southern end of site Zone 3 – Southern end of site	Majority of the site has very low Actual Risk, with inundation unlikely. Considerable Actual Risk with inundation of the very southern end of the site likely from flooding of the Addlestone.	Majority of the site has very low Residual Risk, with inundation unlikely. Considerable Residual Risk with inundation of the very southern end of the site likely from flooding of the Addlestone.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	This site is considered suitable for vulnerable development as the majority falls within Zone 1. With respect to the very southern edge of the site, residential development is considered 'more vulnerable' and should generally not be permitted in Flood Zone 3a (unless the exception test is passed (PPS25)) or 3b. A planning application for this site will be required to be accompanied by a detailed Flood Risk Assessment.
4	**General Intensification in Bagshot**	Zone 1 – Southern and northern extents of town. Zone 2 – Centre of town, north of Guildford Road Zone 3 – Centre of town, north of Guildford Road	Majority of the area has very low Actual Risk, with inundation unlikely. Considerable Actual Risk north of Guildford Road with inundation of the site likely from flooding of the Hale Bourne.	Majority of the area has very low Residual Risk, with inundation unlikely. Considerable Residual Risk north of Guildford Road with inundation of the site likely from flooding of the Hale Bourne.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	The majority of the area is considered suitable for vulnerable development as the site falls within Zone 1. This site is not considered at risk of fluvial flooding however any planning application for this area in excess of 1ha will require a detailed Flood Risk Assessment. Zone 2 is considered suitable for most development. Any proposals for 'highly vulnerable' developments will have to past the exception test. All development proposals within this zone will require a detailed Flood Risk Assessment. Residential development is considered vulnerable and should generally not be permitted in Flood Zone 3a (unless the exception test is passed (PPS25)) or 3b. Alternative sites should be considered.

	Sites Identified for Potential Future Development	Flood Zones	Actual Risk 1% annual probability fluvial event or a 0.5% annual probability tidal event	Residual Risk 0.1% annual probability event	Potential Breach Hazard	Additional comments
5	**General Intensification in Chobham**	Zone 1 – Majority Zone 2 – Areas to the south of Chobham. Zone 3 - Areas to the south of Chobham.	Majority of the north of the area has very low Actual Risk, with inundation unlikely. Considerable Actual Risk south of A319 with inundation of the area likely from flooding of both the Hale and Addlestone Bourne.	Majority of the north of the area has very low Residual Risk, with inundation unlikely. Considerable Residual Risk south of A319 with inundation of the area likely from flooding of both the Hale and Addlestone Bourne.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	The majority of the area is considered suitable for vulnerable development as the site falls within Zone 1. This site is not considered at risk of fluvial flooding however any planning application for this area in excess of 1ha will require a detailed Flood Risk Assessment. Zone 2 is considered suitable for most development. Any proposals for 'highly vulnerable' developments will have to past the exception test. All development proposals within this zone will require a detailed Flood Risk Assessment. Residential development is considered vulnerable and should generally not be permitted in Flood Zone 3a (unless the exception test is passed (PPS25)) or 3b. Alternative sites should be considered.
6	**General Intensification in Lightwater**	Zone 1- Majority Zone 2 – small portion of eastern side of town Zone 3 – small portion of eastern side of town	Very low Actual Risk in the majority of the town. Inundation unlikely. Considerable Actual Risk between Guildford Road (at Riverside Avenue) and the A322, with inundation of the area likely from flooding of the Lightwater Stream.	Very Low Residual Risk in the majority of the town. Inundation unlikely. Considerable Residual Risk between Guildford Road (at Riverside Avenue) and the A322, with inundation of the area likely from flooding of the Lightwater Stream.	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	The majority of the area is considered suitable for vulnerable development as the site falls within Zone 1. This site is not considered at risk of fluvial flooding however any planning application for this area in excess of 1ha will require a detailed Flood Risk Assessment. Zone 2 is considered suitable for most development. Any proposals for 'highly vulnerable' developments will have to past the exception test. All development proposals within this zone will require a detailed Flood Risk Assessment. Residential development is considered vulnerable and should generally not be permitted in Flood Zone 3a (unless the exception test is passed (PPS25)) or 3b. Alternative sites should be considered.
7	**Linsford Farm, Mytchett (housing allocation site)**	Zone 1 – Majority of site Zone 2 - Western section of site	Very low Actual Risk. Inundation unlikely.	Very Low Residual Risk to the majority of the site. Some Residual Risk- with inundation of western corner of site likely. (Based on EA Flood Zones only)	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	The majority of this site is considered suitable for development as it falls within Zone 1. 'Highly vulnerable' development can only be located in Zone 2 if the exception test is passed. This should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
8	**Linsford Farm, Mytchett (small firms allocation site)**	All Zone 2	Very low Actual Risk. Inundation unlikely.	Considerable residual flood risk with the site falling within Flood Zone 2. Inundation of the site likely. (Based on EA Flood Zones only)	Breach hazard analysis not undertaken in this area as topography and absence of defences suggests that there is no hazard of breach in this area.	Site is considered suitable for the proposed commercial land use provided acceptable flood mitigation is included with any design proposals. However, this should be confirmed with a detailed Flood Risk Assessment, which will be required to accompany a planning application for this site.
9	**Mytchett Place Road and Salisbury Terrace**	All Zone 1	Very low Actual Risk. Inundation unlikely.	Very low Residual Risk. Inundation unlikely.	Although the site is located adjacent to the Basingstoke Canal. Information received from the Basingstoke Canal Authority has indicated that this area is not at risk of flooding from a potential breach or culvert failure.	This site is considered suitable for vulnerable development as the site falls within Zone 1. This site is not considered at risk of fluvial flooding however any planning application for this site in excess of 1ha will require a detailed Flood Risk Assessment.

5. CONCLUSIONS

Summary of Flood Risk in the Woking and Surrey Heath SFRA Study Area

5.1 Through the use of a strategic level 1D hydraulic modelling program (iSIS), and the understanding of flood mechanisms and processes developed for the Woking and Surrey Heath SFRA, flood risk in the Study Area can be summarised as follows;

5.2 Much of the flooding in the Study Area is limited to rural/farmland areas and results in limited risk to existing development.

5.3 Within the Study Area there are areas of existing development at Actual Risk of flooding (1 in 100 year return period). The most notable areas are summarised as follows:

- Areas of Bagshot
- Areas to the east of Lightwater
- Areas of Chobham
- Areas to the west of Camberley.

5.4 The potential impacts of climate change have been assessed, and as expected, a significant extension of the floodplain in some areas resulted from increased river flows. However due to the generally well defined river floodplains which exist on many of the watercourses within the study area, the increase in flows resulting from climate change has had only a minimal impact on flood extent in many areas. The climate change scenarios most notably impacted on existing developed areas in Bagshot, Lightwater, and West End. The 1 in 20 year flood extent has also been mapped to aid in defining the Functional Floodplain.

5.5 Within the Study Area there are areas of existing development considered to be at risk of flooding in a Residual Risk flood scenario (1 in 1000 year return period). The Residual Risk scenario flooding mechanisms and extents are similar to those for Actual Risk due to the generally well defined floodplain topography. The most notable exceptions to this, which impact on existing developments, are summarised below:

- Areas to the west of Camberley, particularly the industrial/commercial area to the east of the A33.
- Areas to the south of Chobham;
- Areas to the north east of Guildford Road in Bagshot.

5.6 During a flood event major transport infrastructure may be non operational. An Emergency Plan should be formulated to facilitate an appropriate response should areas become cut off.

5.7 There are areas within the Study Area that are potentially at risk of flooding resulting from a breach or failure along the Basingstoke Canal alignment (refer **Volume 2, Section 9** & **Appendix H**). Other sources of flooding should also be considered and investigated at specific sites.

6. REFERENCES

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