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Executive Summary

Chiltern District Council is situated to the north west of London in the county of Buckinghamshire. The District covers an area of approximately 19,634 hectares and has a population of approximately 92,600 (2011 Census).

The Rivers Chess and Misbourne flow north-west to south-east through the District, with the Vale Brook flowing into the River Chess in Chesham. In general, the river valleys are well defined, and river flooding is not a significant issue to much of the local community. Flooding from the Vale Brook through Chesham is a greater issue since it is predominantly culverted and receives a significant volume of urban runoff. Flooding of roads and properties occurs across the District from more localised sources including surface water, groundwater, sewers and blocked culverts.

Flooding can result not only in costly damage to property, but can also pose a risk to life and livelihood. The likelihood and consequences of flooding are predicted to increase with climate change. It is essential that future development is planned carefully, steering it away from areas that are most at risk from flooding, and ensuring that it does not exacerbate existing known flooding problems. This Strategic Flood Risk Assessment (SFRA) is an important step in this process, and provides one of the building blocks upon which the Council's planning and development control decisions will be made.

This Level 1 SFRA, and the supporting mapping, has been updated from the original published in 2008 and provides key information, including the following, which may affect existing and/or future development within the District:

- A summary and locations of past recorded flooding across the District from all sources including rivers, surface water, groundwater and sewers
- Mapping of areas that have a 'low', 'medium' and 'high' probability of fluvial (river) flooding, based on the Environment Agency's flood maps, and an indication of how these could change with climate change
- Mapping of Areas of Critical Drainage, which are likely to be most at risk of flooding from surface water, groundwater and ordinary watercourses and where sustainable drainage solutions should be a priority
- Development management and spatial planning recommendations within each probability flood zone and Areas of Critical Drainage, including advice on application of the sequential and exception tests and preparation of site-specific Flood Risk Assessments
- General advice on managing flood risk, including property protection, emergency planning (including maps showing key evacuation routes) and Sustainable Drainage Systems (SuDS)

Consultation with a wide range of stakeholders (including neighbouring local authorities) has been undertaken to obtain the best available information on flooding and to seek consistency with relevant local and national policies and best practice. A review of relevant policy, including the National Planning Policy Framework, is provided.

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Glossary

Term	Definition
Adaptation	Adjustments to natural or human systems in response to actual or expected climatic factors or their effects, including from changes in rainfall and rising temperatures, which moderate harm or exploit beneficial opportunities (<i>NPPF definition</i>).
AEP	Annual Exceedance Probability e.g. 1% AEP is equivalent to 1% (1 in 100) probability of flooding occurring in any one year (or, on average, once in every 100 years)
Areas of Critical Drainage	<p>Areas which are likely to be most at risk of flooding from local sources (surface water, groundwater and ordinary watercourses) and where sustainable drainage solutions should be a priority.</p> <p>These areas have been termed Areas of Critical Drainage to differentiate them from Critical Drainage Areas that can be designated by the Environment Agency. The Environment Agency has not designated any Critical Drainage Areas in Chiltern District.</p>
BCC	Buckinghamshire County Council. Under the Flood & Water Management Act 2010 and the Flood Risk Regulations 2009, BCC is the Local Authority responsible for taking the lead on local flood risk management in its administrative area
CDC	Chiltern District Council
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Core Strategy	Part of the Local Plan for Chiltern District, which sets the long-term vision and objectives for the area. It contains a set of strategic policies that are required to deliver the vision including the broad approach to development.
CLG	Department of Community and Local Government
Defra	Department of Environment, Food and Rural Affairs
Development	The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.
Development Plan	This includes adopted Local Plans and neighbourhood plans, and is defined in section 38 of the Planning and Compulsory Purchase Act 2004. (Regional strategies remain part of the development plan until they are abolished by Order using powers taken in the Localism Act. It is the government's clear policy intention to revoke the regional strategies outside of London, subject to the outcome of the environmental assessments that are currently being undertaken) (<i>NPPF definition</i>).
Delivery Development Plan Document (DDPD)	A spatial planning document within the Council's Local Plan, which set out policies for development and the use of land.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding with an annual probability of 1 in 20 (5%) or more.
EA	Environment Agency
Flood & Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which (partly) is to clarify the legislative framework for managing surface water flood risk in England.
Flood Storage Area	Land which provides a function of flood conveyance and/or storage, either through natural processes, or by design

Term	Definition
Flood Zone Map	Nationally consistent delineation of 'high', 'medium' and 'low' probability of fluvial flooding , published on a quarterly basis by the Environment Agency
Formal Flood Management Asset	A feature or structure built and maintained specifically for the purpose of flood risk management
Functional Floodplain (Zone 3b)	NPPF Flood Zone, defined as areas in which water <u>has</u> to flow or be stored in times of flood
Green Infrastructure	A network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities (<i>NPPF definition</i>).
Habitable Room	A room used as living accommodation within a dwelling but excludes bathrooms, toilets, halls, landings or rooms that are only capable of being used for storage. All other rooms, such as kitchens, living rooms, bedrooms, utility rooms and studies are included in this definition.
Informal Flood Management Asset	A feature or structure that provides a flood defence function, however has not been built and/or maintained for this purpose (e.g. boundary wall)
Local Plan	The plan for the future development of the local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004. Current core strategies or other planning policies, which under the regulations would be considered to be development plan documents, form part of the Local Plan. The term includes old policies which have been saved under the 2004 Act. (<i>NPPF definition</i>)
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. N.B. Main River designation is not an indication of size, although it is often the case that they are larger than Ordinary Watercourses.
National Planning Policy Framework (NPPF)	National planning policy, published by the Government in March 2012. It replaces most of the previous Planning Policy Statements, including that regarding flood risk (PPS25).
Neighbourhood Plans	A plan prepared by a Parish Council or Neighbourhood Forum for a particular neighbourhood area (made under the Planning and Compulsory Purchase Act 2004).
Ordinary Watercourse	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a "small" river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.
Planning Policy Statement (PPS)	A series of statements issued by the Government, setting out policy guidance on different aspects of planning. The majority of PPSs have now been replaced by the National Planning Policy Framework, including PPS25 regarding flood risk.
PPS25	Planning Policy Statement 25: Development and Flood Risk – previous government planning policy regarding flood risk, which has now been replaced by the National Planning Policy Framework.
Permitted Development (PD)	Permitted Development rights allow for some minor development, such as certain sizes of building extension, without planning permission.

Term	Definition
Previously Developed (Brownfield) Land	Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or has been occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill purposes where provision for restoration has been made through development control procedures; land in built-up areas such as private residential gardens, parks, recreation grounds and allotments; and land that was previously-developed but where the remains of the permanent structure or fixed surface structure have blended into the landscape in the process of time. <i>(NPPF definition)</i>
Residual Risk	A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the design process
Strategic Environmental Assessment (SEA)	A procedure (set out in the Environmental Assessment of Plans and Programmes Regulations 2004) which requires the formal environmental assessment of certain plans and programmes which are likely to have significant effects on the environment. <i>(NPPF definition)</i>
Supplementary Planning Document (SPD)	Documents which add further detail to the policies in the Local Plan. They can be used to provide further guidance for development on specific sites, or on particular issues, such as design. Supplementary planning documents are capable of being a material consideration in planning decisions but are not part of the development plan. <i>(NPPF definition)</i> SPDs are not subject to independent examination before adoption by a local planning authority.
Sustainability Appraisal (SA)	Appraisal of plans, strategies and proposals to test them against broad sustainability objectives. The SEA forms part of the SA.
Sustainable Development	“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (The World Commission on Environment and Development, 1987).
Sustainable Drainage System (SuDS)	Term covers the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. <i>(Based on NPPF flood risk guidance text)</i>
Zone 1 Low Probability	NPPF Flood Zone, defined as areas outside of Zone 2 Medium Probability. This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Zone 2 Medium Probability	NPPF Flood Zone which comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year.
Zone 3a High Probability	NPPF Flood Zone which comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year.

1 Introduction

1.1 Overview

Chiltern District Council is situated to the north west of London in the county of Buckinghamshire. The District covers an area of approximately 19,634 hectares and has a population of approximately 92,600 (2011 Census).

A relatively small proportion of the District is at risk of flooding from rivers. Notwithstanding this, flooding caused by groundwater, surface water runoff, ordinary watercourses and/or culvert blockage may result in localised flooding at any location, resulting in damage to property and severe disruption. Flooding has received widespread media attention in recent years and potential associated issues with the cost of and obtaining property insurance are well-known. Organisational responsibilities for managing flood risk have changed substantially in the last few years. The following provides definitions of the principal local sources of flooding referred to in this SFRA.

Local Flood Risk

Buckinghamshire County Council, Chiltern District Council and their partners have responsibilities for managing local flood risk, i.e. flood risk from sources other than Main Rivers, the sea and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses.

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

Groundwater – water which is below the surface of the ground and in direct contact with the ground or subsoil. It is most likely to occur in areas underlain by permeable rocks, called aquifers. These can be extensive, regional aquifers, such as the Chalk of the Chilterns, or may be more local sand or river gravels in valley bottoms underlain by less permeable rocks.

Ordinary watercourse – all watercourses that are not designated Main River, and which are the responsibility of local authorities

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

The National Planning Policy Framework (NPPF) requires that local planning authorities prepare a Strategic Flood Risk Assessment (SFRA) in consultation with the Environment Agency and others. The primary purpose of the SFRA is to determine the variation in flood risk across the District, based upon data from a variety of sources. Robust information on flood risk is essential to inform and support the Council's revised flooding policies in its emerging Local Plan.

Jacobs was commissioned to develop the original Chiltern District Council Strategic Flood Risk Assessment (SFRA) to inform the development of the Core Strategy for the district; the original Level 1 SFRA was published in February 2008. A Level 2

SFRA was published in June 2008, which assesses the flood risk at potential development sites in further detail; several of these sites were subsequently allocated for development in the Core Strategy, all of which were in areas of low fluvial flood risk (Zone 1).

Chiltern District is currently preparing its Delivery Development Plan Document (DDPD). In this respect, Jacobs has been commissioned to update the Level 1 SFRA as part of the evidence base that informs this process.

This report (and the supporting mapping) represents the Level 1 SFRA¹, and should be used by the Council to inform the application of the Sequential Test. Following the application of the Sequential Test, it may be necessary to develop a more detailed SFRA² should it be shown that any further proposed allocations fall within a flood affected area of the District. The more detailed SFRA should consider the risk of flooding in greater detail within a local context to ensure that the site can be developed in a safe and sustainable manner.

1.2 SFRA Approach and Update

The primary objective of the Chiltern SFRA is to inform the development and review of policies related to flood risk management and also policies for the allocation of land for future development, within the emerging Local Plan. The SFRA has a broader purpose however, and in providing a robust depiction of flood risk across the District, it can:

- inform the development of Council policy that will underpin decision making within the District, particularly within areas that are affected by (and/or may adversely impact upon) flooding;
- assist the development management process by providing a more informed response to development proposals which may be affected by flooding, influencing the acceptability and design of future development within the District;
- help to identify and implement strategic solutions to flood risk, providing the basis for possible future flood attenuation works by a range of agencies with responsibility for flood risk management;
- support and inform the Council's emergency planning response to flooding.

Government provides no specific methodology for the SFRA process. Therefore, to meet these broader objectives, the SFRA has been developed in a pragmatic manner in close consultation with Chiltern District Council (CDC), Buckinghamshire County Council (BCC) and the Environment Agency (EA).

Knowledge exists with respect to flood risk within the District, provided largely in the form of records of observed flooding and provided from a variety of sources. The Chiltern SFRA has gathered and built upon this existing knowledge, underpinning the delineation of the District into zones of 'high', 'medium' and 'low' probability of fluvial flooding, in accordance with the NPPF, and together with Areas of Critical

¹ Refer paragraphs 6 and 7 of the Technical Guidance to the National Planning Policy Framework (March 2012) and paragraphs 3.53 to 3.57 of the Planning Policy Statement 25 Practice Guide (December 2009)

² Refer paragraph 8 of the Technical Guidance to the National Planning Policy Framework (March 2012) and paragraphs 3.58 to 3.62 of the Planning Policy Statement 25 Practice Guide (December 2009)

Drainage. These zones have then been used to provide a robust and transparent evidence base for the development of flooding related policy, and the allocation of sites for new development as part of the Local Plan.

The original 2008 SFRA contained a series of questions to be addressed as part of the review process to identify the need for an SFRA update (see Section 6). Responses to these questions, leading to this updated SFRA, are detailed in the table below.

Prompt Question	Response Leading to This Update
Has any flooding been observed within the District since the previous review?	Flooding has occurred within the District since the publication of the original 2008 SFRA. Information on recent flooding has been requested from a wide range of consultees in October 2012 as part of the SFRA update (see Appendix A).
Have any amendments to PPS25 or the Practice Companion Guide been released since the previous review?	The PPS25 Practice Companion Guide has been updated since the adoption of the original SFRA in 2008. PPS25 itself has also been replaced by the NPPF and new accompanying guidance to the NPPF has been produced. Although much of the key items covered by PPS25 have been carried forward into the NPPF, some re-wording has occurred, such that the recommendations of the previous SFRA do not fully represent national planning policy. The latest national policy context is contained in Section 2.
Has the EA issued any amendments to their flood risk mapping and/or standing guidance since the previous policy review?	The EA has issued revised flood risk mapping upon which the Flood Zones in this SFRA are based. Some of the development control recommendations contained in the original 2008 SFRA do now contradict the latest EA advice and require updating. Updated recommendations have been provided in Section 5 and have been written to maximise flexibility to allow for future changes in EA advice.
Has the implementation of the SFRA within the spatial planning and/or development control functions of the Council raised any particular issues or concerns that need to be reviewed as part of the SFRA process?	None have been reported. However, the spatial planning team recognised that the SFRA was likely to be out of date in relation to both policy and flooding data (and so the resulting mapping) and that an updated SFRA was required in order to adequately support the production of the forthcoming Delivery DPD.

1.3 Consultation and Co-operation

Consultation and co-operation has formed a key part of the development of the updated Chiltern SFRA. This is particularly important in light of the ‘Duty to Cooperate’ brought in by the Localism Act 2011 (Section 110). In addition, paragraph 157 of the NPPF states that Local Plans should “*be based on co-operation with neighbouring authorities, public, voluntary and private sector organisations*”. One of the roles of this SFRA is to support the production of Development Plan Documents.

Two phases of consultation were carried out in the production of this SFRA:

- Letters were sent to a range of consultees in October 2012, including bodies operating in Chiltern District and neighbouring authorities, specifically seeking their comments on the original 2008 SFRA (particularly with regards to its implementation) and any data that may be of use in updating the SFRA.

- An internal consultation process with Chiltern District Council (CDC), Buckinghamshire County Council (BCC) and the Environment Agency (EA) in relation to the draft of this updated SFRA, which took place throughout December 2012 and early January 2013 to seek feedback from various stakeholders on the document.

In addition, CDC, BCC and the EA were regularly consulted to seek their feedback on specific issues throughout the development of the SFRA and have co-operated fully in the process. Opportunities for further co-operation with BCC and the EA were also sought, particularly to avoid this updated SFRA repeating or contradicting the public advice that those organisations already provide. The key roles played by the EA and BCC with regard to fluvial flooding and flooding from local sources, respectively, are such that they are in a better position than Chiltern District Council to lead in providing advice on such issues. BCC and the EA were closely involved in ensuring that this SFRA integrates with the advice, guidance and services they already provide and are proposing to provide with respect to flooding.

The River Misbourne and River Chess catchments encompass a number of Districts within the region, and future development within Chiltern District could influence the risk of flooding posed to neighbouring areas if not carefully managed. Although no issues with cross border management of flows are known to the District Council or were highlighted through the consultation on this updated SFRA, it is imperative that all local authorities clearly understand the core issues that flood risk raises within their respective Districts and the potential knock on effects to other Districts, and adapt their decision making accordingly. They must be aware of the impact that planning policies and development management decisions may have, not only locally, but upon adjoining Districts.

A number of authorities across the region have been, and are continuing to, carry out similar strategic flood risk investigations. These will help provide the evidence base for the documents and site allocations that will form part of the Local Plan that all local planning authorities must produce. They will also provide valuable information for use in the development management process. Whilst the delivery teams and programmes underpinning these studies vary from one district to the next, all are being developed in close liaison with the EA. Consistency in the adopted approach and decision making with respect to the effective management of flood risk throughout the region is imperative. Regular discussions with the EA have been carried out throughout the SFRA process to this end, seeking clarity and consistency where needed.

Details of the consultation process and a full list of consultees are provided in Appendix A.

2 Policy Framework

2.1 Introduction

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

The success of the SFRA is heavily dependent upon the ability of the Council to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning policies and development management recommendations (refer to Section 5). The National Planning Policy Framework (NPPF) provides guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish 'sound' planning policies that will ensure future sustainability with respect to flood risk.

The policy framework informing the development of this Level 1 SFRA has changed significantly since it was first published in February 2008. At the national level, there have been several updates to Planning Policy Statement 25 (PPS25) (regarding flood risk) and its supporting guidance, all of which has then been replaced with the National Planning Policy Framework (NPPF) in 2012. At the regional level, the South East Plan, which was in draft at the time of the previous edition of the SFRA, has since been published, replacing the County Structure Plan. Now the government is seeking the repeal of regional plans³. At the local level, County Councils and District Councils have been given new responsibilities through the Flood & Water Management Act 2010 with regard to managing local flood risk and best practice and knowledge with regard to the production of SFRA's continues to evolve.

2.2 National Planning Policy

National planning policy is set out in the National Planning Policy Framework (NPPF), which was published by the Government in March 2012. It forms a more succinct replacement for numerous topic-specific Planning Policy Statements (PPSs) and Planning Policy Guidance Notes (PPGs), including PPS25 on flood risk. The NPPF is accompanied by a Technical Guide providing further guidance on specific issues, including flood risk, which retains some of the detailed guidance provided in association with PPS25⁴. In addition, the Practice Guidance that accompanied PPS25 remains in force, although this is currently under review by the Government.

The NPPF covers a full range of planning issues drawing on the central issue of sustainable development. Central themes include the re-use of previously developed land of low environmental value, promoting economic growth and high quality design, and transitioning to a low carbon future, including taking full account of flood risk.

The NPPF underpins the process by which local planning authorities are to account for flood risk as an integral part of the planning process. The overarching aims set

³ With the exception of the London Plan.

⁴ Planning Policy Statement 25: Development and Flood Risk – Practice Guide (December 2009)

out by the NPPF for the management of flood risk at a planning authority level are encapsulated in Paragraph 100 of the document:

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

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

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

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

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

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

2.3 Regional Planning Policy

The Regional Spatial Strategy (RSS) for the South East of England (within which Chiltern is situated) is entitled ‘The South East Plan’. It was adopted in 2009 and sets out the vision for the South East up to 2026. The Government has set out its intentions to repeal Regional Spatial Strategies, including the South East Plan, as soon as possible; however, until this occurs, the document will continue to form part of the Development Plan and so its content is summarised below.

Of most relevance to flooding is Policy NRM4 of the South East Plan which states that authorities should follow the sequential approach to development in flood risk areas in line with national policy.

It continues that 'Inappropriate development should not be allocated or permitted in Flood Zones 2 and 3, areas at risk of surface water flooding (critical drainage areas) or areas with a history of groundwater flooding, or where it would increase flood risk elsewhere, unless there is over-riding need and absence of suitable alternatives'.

The policy recommends that local authorities produce an SFRA for their area to facilitate the allocation of sites 'in a decreasing probability of flood risk. The SFRA should assess future climate change and identify appropriate types of development in accordance with the [NPPF] sequential test and flood vulnerability of different land uses.'

Policy NRM4 states that 'Existing flood defences will be protected from development. Where development is permitted in appropriately defended floodplains it must be designed to be resilient to flooding (to minimise potential damage) and to allow for the future maintenance, realignment or management of the defences to be undertaken.'

It further states that 'In the preparation of local development documents and considering planning applications, local authorities in conjunction with the EA, should also:

- i. take account of River Basin Management Plans, Catchment Flood Management Plans, Shoreline Management Plans and Surface Water Management Plans in developing local development documents and other strategies. Where locationally specific flood risk and land management options such as flood storage, managed realignment and set back from coastal defences are identified, land should be safeguarded for these purposes and appropriate land use and land management practices should be encouraged
- ii. consider the associated social and environmental costs and benefits to fisheries, biodiversity and the built and historic environment in assessment of new flood management schemes
- iii. require incorporation and management of Sustainable Drainage Systems (SuDS), other water retention and flood storage measures to minimise direct surface run-off, unless there are practical or environmental reasons for not doing so
- iv. take account of increased surface water drainage on sewage effluent flows on fluvial flood risk.

Policy CC2 on climate change states that the South East region should adapt to the risks and opportunities presented by climate change through a number of measures, which include those relating to flooding. The policy states that: strategic development should be guided to locations offering greater protection from impacts such as flooding; SuDS, flood resilience and water efficiency measures should be incorporated into new developments; flood storage capacity should be increased; and the most should be made of opportunities and options for sustainable flood management.

The need to increase flood storage capacity and incorporate SuDS is also highlighted by Policy NRM1: Sustainable Water Resources and Groundwater Quality.

Policy CC7 on infrastructure and implementation highlights the importance of infrastructure being sufficient to cope with the scale and pace of new development, including that required in relation to flooding. In order to facilitate this, Policy CC7 states that 'local development documents (LDDs) will identify the necessary additional infrastructure and services required to serve the area and the development they propose together with the means, broad cost and timing of their provision related to the timing of development'. In addition, 'contributions from development will also be required to help deliver necessary infrastructure. To provide clarity for landowners and prospective developers, local authorities should include policies and prepare clear guidance in their LDDs, in conjunction with other key agencies, on the role and scope of development contributions towards infrastructure'.

Housing targets for each district are set out under Policy H1 of the Plan. Chiltern's target is 145 per annum (on average) – a total of 2,900 over the period to 2026; this figure was included in the Core Strategy housing allocation range of 2,650 – 2,900 dwellings up to 2026.

2.4 Adopted Local Planning Policy

2.4.1 Adopted Chiltern Core Strategy

The Core Strategy, covering the period to 2026, was adopted in November 2011, with the original SFRA (2008) forming part of the evidence base.

Policy CS1 (The Spatial Strategy) seeks to focus residential and commercial development in the built-up areas of Chesham, Amersham / Amersham-on-the-Hill, Chalfont St Peter and Little Chalfont, with limited development in other villages outside of the Green Belt. In terms of residential development, Policy CS2 seeks the provision of 2,650-2,900 new dwellings in the period to 2026. Informed by a Level 2 SFRA (2008), the proposed development sites allocated in the Core Strategy are all within Flood Zone 1 (checked against 2013 data; see Figure 30) and so are at low probability of flooding from rivers. Two of the sites in Chalfont St Peter are near to Areas of Critical Drainage (as redefined in 2013) where surface water flooding of roads has previously been reported. Sustainable drainage solutions will be carefully considered.

The key policy with regard to flood risk is CS4, which seeks to ensure that all new development is sustainable. It seeks the 'assessment of surface water drainage impacts and the inclusion of Sustainable Drainage Systems (SuDS) which consider all SuDS options and ground conditions, under advice set out in national policy. The design and consideration of SuDS in the Critical Drainage Areas should be given particular attention so that it will not increase the risk of flooding within the site and to adjoining land / properties'. It should be noted that the term 'Critical Drainage Areas' strictly applies to areas so designated by the Environment Agency, although the Environment Agency has not currently designated any Critical Drainage Areas in Chiltern District. However, all existing CDC policy with regard to Critical Drainage Areas applies equally to Areas of Critical Drainage as identified in this updated SFRA as those areas which may be most at risk of local flooding and where SuDS solutions should be a priority. The 'Critical Drainage Areas' referred to in the Core Strategy are therefore those identified in this SFRA as 'Areas of Critical Drainage', although their extent has been substantially updated. In addition, Policy CS4 seeks the 'reduced risk of flooding in appropriate circumstances as a result of the new development'.

Policy CS31 recognises that new infrastructure will be required to meet the needs of residents and businesses within the District; this includes flood management infrastructure. To tackle this, Policy CS31 states that proposals for new development ‘must ensure that adequate infrastructure capacity is available to meet the needs of future occupiers and not intensify existing deficiencies, in accordance with details set out in the Council’s Delivery DPD and Infrastructure Delivery Plan. The necessary infrastructure should be put in place in a timely manner, and, where appropriate, prior to the occupation of the development’. In addition, Policy CS31 states that the Council ‘will work closely with statutory undertakers and infrastructure providers in the District to identify solutions to remedy existing infrastructure deficiencies and to ensure that the infrastructure requirements of new development are met. If the need is identified, the Council will seek financial contributions from new development to help meet infrastructure provision in the District. Infrastructure requirements will be dealt with in more detail in the Delivery DPD’.

Policy CS32 seeks the identification, protection and enhancement of strategic green infrastructure assets in the District, which can include SuDS schemes.

2.4.2 Saved Policies from the Adopted Chiltern Local Plan

The Chiltern Local Plan was adopted in September 1997, setting out the Council’s policies and proposals for development and land use in the District over the plan period up until 2006. In 2007, many of its policies were saved until replaced by the various documents that form the new Chiltern Local Plan, such as policy GC10 as set out below⁵; further policies were superseded or cancelled as a result of the adoption of the Core Strategy in 2011.

Flooding is considered under saved Policy GC10. Paragraph 3.47 of the 1997 Local Plan identifies that there are some areas within the District that are liable to flood events in certain circumstances. Consequently within these areas development may be at direct risk of flooding. Saved Policy GC10 outlines the District Council’s broad policy for flooding and states:

“The Council will not permit further development, intensification of existing development, or the raising of land levels in areas at risk from flooding as shown on the Proposals Map. Exceptionally, where development is permitted in areas at risk from flooding, appropriate flood protection measures will be required.

The Council will not grant permission for development outside the floodplain which would increase the risk of flooding downstream due to additional surface water run-off. Exceptionally, if such development is to be permitted, it must include appropriate run-off attenuation measures.

This Policy applies both in the areas as defined on the Proposals Map in respect of areas liable to flooding and throughout the District for development outside the floodplain.

Where development is acceptable in accordance with this Policy, planning permission will be granted provided that other Policies in this Local Plan would also be complied with.”

⁵ Government Office South East (GOSE) agreed to save CDC Local Plan policies September 2007

Whilst this policy continues to be used for Development Management purposes, it was written before the publication of the NPPF and therefore is superseded by the principles set out in that document. Relevant saved policies will be replaced by new policies, most likely those contained in the forthcoming Delivery DPD.

2.5 Emerging Local Planning Policy – Chiltern District Delivery Development Plan Document (DPD)

Chiltern District Council's Local Development Scheme, which sets out the programme for forthcoming planning policy development, explains that the Delivery DPD (DDPD) "...will relate to the whole of Chiltern District and contain development management policies which will replace many of the remaining policies in the Local Plan. It will also include site allocations (e.g. sites for community, business and housing) and land use designations (e.g. re-designation of employment sites). Taking into account the Government's 'localism' agenda within planning, it is intended that the DDPD will include "locally focussed" policies which will reflect the characteristics and needs of particular areas and assist neighbourhoods to achieve physical improvements for their local area."

The outcome and recommendations of this SFRA will support the development of the DDPD, assist with the identification of site allocations and the wording of development management policies, and inform the associated Sustainability Appraisal. The DDPD will also include an updated infrastructure delivery schedule which may also include flood risk management infrastructure.

2.6 Chiltern Climate Change Declaration

The Chiltern Climate Change Declaration was agreed by Chiltern District Council on 19 February 2007 and commits the Council to work towards reducing greenhouse gas emissions and to adopting policies in order to tackle climate change. In terms of flood risk, we are required to assess the risk associated with climate change, and the implications for our services and our communities as a result of climate change impacts, and adapt accordingly. Given the prospect that flood hazards may increase as a result of climate change, it is timely now to make a strategic assessment of the existing knowledge base on flood risk data. The SFRA will assist with this process and be a valuable tool in ensuring a more sustainable approach to development.

2.7 Buckinghamshire County Council Strategy for Management of Local Flood Risk

In order to provide better and more comprehensive management of flood risk, the Flood & Water Management Act 2010 has assigned new responsibilities to local authorities. As a result, Buckinghamshire County Council (BCC) and the district councils (Chiltern, Aylesbury Vale, South Bucks and Wycombe) work in partnership with the EA, water companies and others to manage various aspects of flood risk.

BCC published its draft Strategy for the Management of Local Flood Risk for consultation in September 2012⁶. The key aim of the Strategy is to reduce the likelihood and detrimental consequences of flooding in a way which does not compromise the interconnected needs of the economy, society and environment in the future. Further aims of implementing the Strategy are to:

⁶ Available at: www.buckscc.gov.uk/flooding

- Clarify the roles of the key Partners which have responsibilities in the four Districts. However, the Strategy recognises that the public and, in particular, property and land owners also have important roles to play.
- Improve cooperative working between Partners, including across administrative boundaries, through appropriate sharing of information and best practice and enabling the best placed organisations to be involved.
- Improve communication of clear information regarding local flood risk and appropriate responses and involve the public and stakeholders in taking action and making decisions.
- Through adopting best practice and closer working within council and Partner disciplines, seek flood management responses which can also improve the natural habitat and the social environment and thereby provide multiple benefits
- Identify gaps where better understanding of the mechanisms of flooding and appropriate responses is required.
- Facilitate a strategic funding plan so that funding applications can be submitted for priority areas and potential contributors to location-specific actions can be identified.

The Strategy contains three levels of actions which will form the basis for its implementation:

- Ongoing functions which will continue to be undertaken. These include, for example, inspecting and undertaking maintenance of highway drainage and ordinary watercourses on council owned land.
- New functions to be undertaken which have been introduced by the Strategy. These include, for example, sharing of information and investigating certain flood incidents.
- Actions to pursue works at specific locations. These are detailed in an Action Plan which accompanies the Strategy and which will be fully reviewed annually to remove completed actions and include new ones.

Care has been taken to ensure that this updated SFRA is consistent with the policies proposed in the draft Strategy.

3 Data Collection and Methodology

3.1 Overview

This Section details the data used to develop this SFRA, its sources, and the methodology used to analyse the flood risk.

A considerable amount of knowledge exists with respect to flood risk within the District, including (but not limited to):

- experience of council engineers and staff, local councillors and others;
- records and information on past flooding from all sources (primarily river, surface water, groundwater and sewers);
- Environment Agency fluvial Flood Zone maps and Flood Map for Surface Water showing areas most susceptible to local flooding;
- more detailed mapping of flood risk in Chesham following on from the Surface Water Management Plan (SWMP); and
- previous studies including the Chesham SWMP, Preliminary Flood Risk Assessment, BCC Local Flood Risk Management Strategy.

This core dataset has informed the SFRA process. The application of this data has facilitated the delineation of zones of 'high', 'medium' and 'low' probability of fluvial flooding, Areas of Critical Drainage and the formulation of planning and development management recommendations. A summary of the findings based on the analysis is provided in Section 4.

An overview of the core datasets, including their source and their applicability to the SFRA process, is outlined here. It is important to note that datasets which have been collected and presented at the District scale can inform, but are not a substitute for, site specific investigation of topographic levels, geology, records of past flood etc. It is also noted that information on flood risk is continually changing as new flooding events occur and further modelling is undertaken. Therefore, whilst the datasets used here are the best available at the time of publication, the SFRA should be reviewed periodically (see Section 6 for a checklist), with CDC contacted in the meantime for the latest information.

3.2 Information on Past Flooding

The information on past flooding collated for the 2008 SFRA, the Preliminary Flood Risk Assessment and the Chesham Surface Water Management Plan (SWMP) has been updated through consultation with the following bodies to identify those areas within the District that are known to have been exposed to flooding in recent years:

- Bodies operating within Chiltern District:
 - Chiltern District Council
 - Buckinghamshire County Council
 - Town and Parish Councils in Chiltern District⁷
 - Environment Agency
 - Thames Water

⁷ Town and Parish Councils listed alphabetically are: Amersham, Ashley Green, Chalfont St Giles, Chalfont St Peter, Chartridge, Chenies, Chesham, Chesham Bois, Cholesbury, Coleshill, Great Missenden, Latimer, Little Chalfont, Little Missenden, Penn, Seer Green and The Lee

- Affinity Water (Veolia Water)
- Highways Agency
- Transport for London
- Chilterns Conservation Board
- Chiltern Railways
- Department for Transport
- Neighbouring Authorities
 - Aylesbury Vale District Council
 - South Bucks District Council
 - Wycombe District Council
 - Hertfordshire County Council
 - Dacorum Borough Council
 - Three Rivers District Council

Through consultation with neighbouring authorities, cross-border flooding issues have been identified. The incidents mapped in Figures 1 - 18 and summarised in Section 4 are events in which properties, roads and other receptors have been affected not only by flooding from watercourses, but also from surface water runoff, rising groundwater, surcharging of the underground sewer system and blockage of culverts and gullies. It is recognised that water levels within the Vale Brook and Rivers Chess and Misbourne are traditionally low during dry weather conditions, due largely to the chalk geology. However, the catchments can respond to heavy rainfall and raise river levels relatively quickly, particularly where there is substantial runoff from urban environments, for example the Vale Brook through Chesham.

Thames Water provided information on flooding resulting from surcharge and blockage of surface, combined and foul water sewers. This data, known as DG5 flooding data, is subject to confidentiality issues and specific incidences where individual properties were affected cannot be divulged. However, Thames Water is allowed to confirm how many properties have been subject to DG5 flooding per postcode area (the first four digits of the postcode are provided only).

3.3 Delineation of the Fluvial Flood Zones

The risk of an event (in this instance a flood event) is a function of both the probability that the flood will occur, and the consequence to the community as a direct result of the flood. This SFRA endeavours to assess the likelihood (or probability) of fluvial (river) flooding, categorising the District into zones of low, medium and high probability. It then provides recommendations to assist the Council to manage the consequence of flooding in a sustainable manner, for example through the restriction of vulnerable development in areas of highest flood risk.

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

The EA's Flood Map for Chiltern District, available on its website⁸, shows the natural floodplain, ignoring the presence of defences, and therefore areas potentially at risk of flooding from rivers. The Flood Map shows the area that is susceptible to a 1 in

⁸ <http://www.environment-agency.gov.uk/>

100 (1% annual exceedance probability; AEP) chance of flooding from rivers in any one year. It also indicates the area that has a 1 in 1000 (0.1% AEP) chance of flooding from rivers in any given year. This is also known as the Extreme Flood Outline. The Flood Map outlines for the District have been produced from a combination of a national generalised computer model and available historic flood event outlines. The EA's knowledge of the floodplain is continually being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. The EA has an ongoing programme of improvement, and updates are made on a quarterly basis.

The most recent EA Flood Map has been checked for sensibility as part of this updated SFRA. Minor modifications to these outlines and the derivation of Zone 3b are summarised below and presented in the accompanying maps (Figures 1-16). Importantly, it is noted that whilst the Vale Brook in Chesham was designated as a Main River in 2008, the Flood Map does not show any risk area along the course of the river, to the north of Red Lion Street. Instead of modifying the EA Flood Zones to include risk in this area, flood risk from the Vale Brook is considered as an Area of Critical Drainage, given that the brook receives a substantial volume of urban runoff.

3.3.1 Delineation of Zone 1 Low Probability

Zone 1 Low Probability comprises land assessed as having a less than 1 in 1,000 annual probability of river flooding (<0.1%). For SFRA purposes, this incorporates all land that is outside of the Zone 2 and Zone 3 flood risk areas (as defined below and shaded on Figures 1 - 16).

3.3.2 Delineation of Zone 2 Medium Probability

Zone 2 Medium Probability comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year. In other words, land situated between Zones 1 and 3a. Zone 2 Medium Probability is based on the most recent EA Flood Zone Map.

Compared with the map used in the 2008 SFRA, a slightly lesser flood extent is now delineated along most of the River Misbourne and a greater extent along much of the River Chess. However, the extent of the EA Flood Zone from the River Chess at Pednornmead End in Chesham has reduced and no longer includes Bury Pond. Inspection of the ground levels, however, suggests that Bury Pond and adjacent land is as low lying as other nearby areas. For this reason, and because the area has experienced flooding due to rising groundwater levels in the past, it has been included in the updated Zone 2 map for this SFRA. It is noted, however, that the exact extent around Bury Pond cannot be defined without detailed modelling. Any detailed FRAs in this area of uncertainty must demonstrate the degree of flood risk.

3.3.3 Delineation of Zone 3a High Probability

Zone 3a High Probability comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year. Zone 3a High Probability is based on the most recent EA Flood Zone Map. As for Zone 2, a slightly lesser flood extent is delineated along most of the River Misbourne (and particularly in Chalfont St Peter) and a greater extent along much of the River Chess (except at Pednornmead End in Chesham), when compared with the 2008 mapping. For the same reasons as described above, Bury Pond and adjoining low lying land has been included in the updated Zone 3a map for this SFRA, although the exact extent

cannot be defined without detailed modelling. Any detailed FRAs in this area of uncertainty must demonstrate the degree of flood risk.

3.3.4 Delineation of Zone 3b Functional Floodplain

Zone 3b Functional Floodplain is defined in Table 1 of the NPPF Technical Guidance as those areas in which “water *has* to flow or be stored in times of flood”. The definition of functional floodplain remains somewhat open to subjective interpretation, but the NPPF requires that the boundaries shown in the SFRA should be as agreed with the EA. The NPPF states that “*the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But 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, should provide a starting point for consideration and discussion to identify the functional floodplain.*” (NPPF Technical Guidance, Table 1).

Detailed modelled flood extents for the 5% (1 in 20) AEP design event are not available within Chiltern. For this reason, the February 2008 SFRA developed a simple hydraulic model with river (floodplain) cross-sections to provide an estimation of the 5% (Zone 3b) flood extents. The flood extents encompass primarily those low-lying areas immediately adjoining the River Misbourne and River Chess. Whilst these areas have not changed significantly since 2008, modifications have been made to Flood Zone 3b so that its extent lies within the extent of the updated Zone 3a and to include the privately owned Shardeloes Lake (flood storage area) on the River Misbourne. Therefore, Zone 3b has been defined in the following manner for the Chiltern SFRA, which has been agreed with the EA:

- land where the flow of flood water is not prevented by existing infrastructure or solid buildings⁹ from inundation during an approximately 5% (1 in 20) AEP flood;
- land which provides a function of flood conveyance (i.e. free flow) or flood storage, either through natural processes, or by design (e.g. flood storage areas) during an approximately 5% (1 in 20) AEP flood;

Any development within Flood Zone 3b is likely to measurably impact upon the existing flooding regime, increasing the severity and frequency of flooding elsewhere.

Many existing urban areas within the river corridors are affected by flooding in the 5% (1 in 20) AEP flood event. Discussions with the EA have confirmed that, due to the obstructions to overland flow paths posed by existing development within flood affected areas, existing solid buildings, unless designed to allow the passage of water, together with any other land prevented from flooding in a 5% (1 in 20) AEP event by the presence of solid buildings and existing infrastructure, should not be considered as falling within the functional floodplain, and should instead be considered to be in Zone 3a.

⁹ There is no definition within the NPPF or related guidance as to what constitutes a ‘solid building’. This matter will need to be considered on a case by case basis, relating to the particular characteristics of development sites. Consideration of the potential permeability of a building or structure to flood water, the nature of its construction materials and degree of permanence on the site, as well as emerging policy advice / case law, are matters which could assist in indicating whether a building could be defined as a ‘solid building’ or not.

The open land surrounding existing solid buildings in these areas forms important flow paths and flood storage areas and is included within Zone 3b. It must be protected from development by appropriate planning policies and decisions. Zone 3b should be interpreted in terms of:

- ‘existing development’ (existing development specifically designed to allow the passage of flood water¹⁰) and
- ‘new development’ (including all new development on previously undeveloped land, or on surfaces that are currently permeable, or on surfaces that are currently impermeable but not designed to flood).

It is important to recognise that all areas within Zone 3b are subject to relatively frequent flooding – on average, flooding once in every 20 years. There are clear safety, sustainability and insurance implications associated with future development within these areas, and informed planning decisions must be taken with care. This is reflected in Section 5.

3.3.5 Dry Islands

Areas that are delineated as ‘Dry Islands’ in the adjoining maps are locations that, whilst above flood level, will be surrounded by floodwater during a flood event. For this reason, development proposals in these areas should be accompanied by a flood evacuation plan suitable for the NPPF category into which the surrounding area falls. For example, a development proposal on a dry island site that is categorised as Zone 1 Low Probability, but wholly surrounded by the 1% (1 in 100) AEP floodplain, should be accompanied by an flood evacuation plan appropriate to Zone 3a High Probability.

It should be noted that this is a change of approach from that stated in the previous 2008 SFRA which required entire dry islands to be treated in the same manner for planning purposes as the flood risk category into which the surrounding area falls, thus significantly restricting the type of development permitted on dry islands. This was amended to ensure that the types of development permitted on dry islands are in line with the NPPF, for example with no restrictions on the uses of land for Zone 1 dry islands sites; equally the amended approach seeks to ensure that those living and working on the dry island can safely escape in the event of flood.

3.3.6 Climate Change

There is clear scientific evidence that global climate change is happening now and cannot be ignored. Further information is provided in Section 4.4. As stated in the NPPF Technical Guidance, changes in the extent of inundation due to climate change are likely to be negligible in well-defined valleys, but could be dramatic in very flat areas. Changes in the depth of flooding under the same allowance will increase the probability of a given flood. This means that a site currently located within a lower risk zone (e.g. Zone 2) could in future be re-classified as lying within a high risk zone (e.g. Zone 3a). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding.

In the absence of detailed flood modelling to define the impact of climate change on Flood Zones in this SFRA, the following interpretation of the mapping should be made:

¹⁰ Such as buildings on stilts or car parks designed to flood

- the anticipated extent of Zone 3b (functional floodplain) at the end of this century may be approximated by the current Zone 3a (the 1% AEP flood)
- the anticipated extent of Zone 3a (the 1% AEP flood) at the end of this century may be approximated by the current Zone 2 (the 0.1% AEP flood)
- analysis of ground levels should be made to determine whether a site currently in Zone 1 (<0.1% AEP flood) should be considered as lying within Zone 2 (the 0.1% AEP flood) at the end of this century.

3.4 Delineation of Areas of Critical Drainage

Based on national mapping provided by the Environment Agency, a number of residential and commercial properties in the District could be at risk of flooding from local sources (principally surface runoff generated by intense rainfall, groundwater and ordinary watercourses). In areas susceptible to local flooding, the volume of runoff and sufficiency of the drainage, ordinary watercourse and sewer systems are critical to determining the degree of flood risk. For this reason, this SFRA has delineated Areas of Critical Drainage across the District. The EA has the ability to delineate Critical Drainage Areas (CDAs) to cover such areas, but has not currently done so within Chiltern District. Although Areas of Critical Drainage and CDAs would both cover areas with critical drainage problems, the variation in name has been used to differentiate between those areas delineated by Chiltern District Council's SFRA and those which may be notified by the EA. It should however be noted that the Areas of Critical Drainage were previously described as the CDA in the 2008 SFRA, prior to this differentiation.

In the 2008 SFRA, no mapping was available to define Areas of Critical Drainage and broad areas were identified based on analysis of the geology and topography. However, through the BCC Preliminary Flood Risk Assessment, the Environment Agency's Flood Map for Surface Water (FMfSW) was agreed as best representing those areas which are susceptible to local flooding. **In other words, the mapping identifies areas where flooding from surface water, groundwater and ordinary watercourses is likely to be most severe.** Because of the refinements in the FMfSW over the previously defined Areas of Critical Drainage, and for consistency with wider flood risk management, the FMfSW outline of a 1 in 200 (0.5% AEP) event where flood depths could be greater than 0.1m is used in this SFRA as a basis to define Areas of Critical Drainage in the District¹¹. Because the Areas of Critical Drainage represent flood risk from different sources, no indication of the likely duration of flooding is given. However, it is emphasised that groundwater flooding from the Chalk can last a number of weeks and causes substantial damage and disruption because of the long duration.

In Chesham, flood risk from the now-Main River Vale Brook is considered as an Area of Critical Drainage since the brook performs an important urban drainage function. More detailed modelling has been undertaken for the Vale Brook following on from the Surface Water Management Plan. Therefore, the FMfSW outline has been combined with a 1% (1 in 100) plus climate change event outline, where the Vale Brook culvert has an amount of blockage shown in the most recent CCTV survey and its capacity is 90% restricted at the Market Square due to a theoretical culvert collapse.

¹¹ It is noted that an update of the FMfSW is anticipated from the EA in 2013

The SFRA mapping of Areas of Critical Drainage is intended to provide a strategic overview of areas that may be at greatest risk and does not provide site specific detail, e.g. flow direction. However, it is recognised that areas outside the identified Areas of Critical Drainage may be sources of groundwater emergence and/or surface runoff, where water runs downhill to pond in an Area of Critical Drainage. It is therefore essential that a more detailed (site based) review is carried out by the developer as part of the planning application and design process (i.e. detailed Flood Risk Assessment). The design of proposed developments should carefully consider the impact that local flooding, and in particular, raised groundwater levels may have upon the operation of SuDS.

3.5 Delineation of Dam Breach

A small number of reservoirs and ponds have been identified within the District including Bury Pond (Pednormead End in Chesham) and a private lake in Shardeloes (near Amersham). These are highlighted in Figures 20 and 21. Of these, Shardeloes Lake falls under the Reservoirs Act, and is therefore managed in accordance with the Flood & Water Management Act 2010 which amended the Reservoirs Act 1975.

Following a recommendation in the Pitt Review, the EA has provided Reservoir Flood Maps for those reservoirs which it regulates under the Reservoirs Act 1975. These show the likely extent of flooding resulting from a dam breach which could be caused by extreme rainfall or floods, as well as structural failure. The data provided by the EA for this SFRA shows the extent of flooding resulting from a breach of Shardeloes Lake (Figure 21). No corresponding information is available for Bury Pond. The extent of flooding from a breach of Shardeloes Lake is predicted to be similar to Flood Zone 2 along the River Misbourne down to Chalfont St Peter. However, the onset of flooding could potentially be far more rapid and pose a risk to life.

3.6 Flood Management Structures and Features

In the complex rural and built environments in which we live, many natural and manmade structures and features can affect the routing of flood waters. Some of these may have been specifically constructed (i.e. known as 'formal') for the purposes of managing water flow and reducing flooding (e.g. flood embankments, culverts and sluices) and are maintained by their respective owner. This could be the EA, Local Authority, or an individual. Others may have been built for a different purpose (i.e. known as 'informal') but which also affect the spread of floods (e.g. buildings, garden walls, railway embankments) but are not maintained for this specific purpose. The structures and features have not necessarily been used in modelling used to generate the flood maps used in this SFRA. However, the location of these assets are mapped and described here since it is important to recognise their function and to ensure that their functionality is not impaired by any development.

The following formal manmade raised flood management assets have been identified in Chiltern from the EA's National Flood and Coastal Defence Database (NFCDD) and provide protection from flooding to a nominal stated 20% (1 in 5) event:

- Moor Road embankment, between Moor Road and Waterside in Chesham
- Bois Mill channel walls on the left and right banks adjacent to Latimer Road, near Chesham.

Note that the EA has no statutory responsibility to maintain Main Rivers (and/or flood management assets) within the UK. This remains the responsibility of the riparian land owner. The EA retains 'permissive powers' however, and using these powers may carry out a programme of monitoring and maintenance.

Other flood management infrastructure (e.g. culverts) has also been identified across the District and is shown on the maps. It is important to recognise the function of these assets and to ensure that their functionality is maintained. For this reason, Buckinghamshire County Council has established and will maintain a register of structures or features¹² (not already on NFCDD) which act to reduce flooding and which can be designated as fulfilling this purpose.

Assets should be carefully reviewed in a local context as part of the detailed site based Flood Risk Assessment (see Section 5). The latest information in the BCC Asset Register should be considered alongside the maps in this SFRA.

Within protected areas there will always be a residual risk of flooding. This may be due to an extreme event that exceeds the design of the asset, changing climatic conditions that increases the frequency and severity of flooding, a structural failure, or flooding behind the asset e.g. due to elevated groundwater levels. Therefore, mitigation measures such as those suggested in Section 5.6 may still be required. It is incumbent on both the Council and developers to ensure that the level and integrity of flood management assets provided within new developments can be assured for the lifetime of the developments.

3.7 Topography & Geology

Broad information on topographic levels and underlying superficial and solid geology is available for the District, and is presented in Figure 1 and Figure 22, respectively. Whilst this information could be used to provide an indication of, for example, likely flow direction or suitability of the ground for different SuDS techniques, the data will be too coarse to be used at the scale of an individual site. Therefore, detailed topographic survey and/or infiltration tests are recommended to identify the local characteristics of a site where development is proposed.

3.8 Chesham Surface Water Management Plan

Surface Water Management Plans identify sustainable responses to manage local flooding and contain Action Plans that provide an evidence base for future decisions. Based on national mapping, Chesham was identified as particularly susceptible to local flooding and a SWMP has been prepared using funding from Defra¹³. The SWMP study, which focussed on the urban area of Chesham but considered inflows from the surrounding catchments, has provided the following:

- Maps showing predicted flood depth and velocity in different flood event scenarios, including consideration of climate change.
- A first appreciation of the cost of damage which could be caused by local flooding: for those residential properties experiencing flooding at least once in the next 100 years, the cost of the flooding is likely to be about £50k per property.

¹² www.buckscc.gov.uk/flooding

¹³ www.buckscc.gov.uk/flooding

- An understanding that the Vale Brook culvert, which performs an important urban drainage function in Chesham, has a design capacity to drain somewhere between the 10% (1 in 10) AEP and 3.33% (1 in 30) AEP rainfall event
- Development of a number of options to improve management of local flooding, both through changes to policy and practice, as well as location-specific actions including individual property protection, control of runoff close to source and design of urban environments to make space for water.

The SWMP made a number of location-specific and policy related recommendations to improve management of local flooding in Chesham. The map summarising location specific options has been included as Appendix B in this SFRA. A number of these actions are being pursued through various funding sources. These actions, as well as those regarding policies, have been included in the Action Plan of the Buckinghamshire Strategy for Management of Local Flood Risk. This Action Plan will be regularly updated and is available at www.buckscc.gov.uk/flooding. Where relevant, the policy related actions from the Chesham SWMP have been included in Section 5 of this SFRA.

3.9 High Speed 2 (HS2)

This SFRA update has been prepared prior to the completion of the Environmental Impact Assessment for the High Speed 2 rail link. The SFRA does not provide any modelling in relation to the potential impacts of High Speed 2.

4 Flood Risk in Chiltern District

4.1 Overview

This Section details the findings of the review of flood risk in Chiltern District, based on the data provided by a range of partners as described in Section 3.

A relatively small number of properties within the District are at risk of flooding from the Rivers Chess and Misbourne. These river valleys are well defined, and river flooding is not a significant issue to the large majority of the local community. Flooding from the Vale Brook watercourse through Chesham is a greater issue since it is predominantly culverted and receives a significant volume of urban runoff. Flooding of roads and properties occurs across the District from more localised sources including surface water, groundwater, sewers and blocked culverts.

4.2 Summary of Past Flooding

Flooding of homes, businesses, agricultural land and roads has occurred in Chiltern District from Main Rivers, as well as from local sources. These local sources principally concern surface runoff generated by intense rainfall, groundwater and ordinary watercourses. Many areas affected by flooding are situated outside of the delineated higher probability Flood Zones. This is an important reminder that the risk of flooding must always be carefully considered when planning future development, irrespective of the site's proximity to a local river or watercourse. Development management decisions must consider all forms of potential flooding to the site. They must also be made with due consideration to the potential impact that future development may have upon known existing flooding problems if not carefully managed.

Information on past flooding in Chiltern District was available from the 2008 SFRA, the Buckinghamshire PFRA, the Chesham SWMP and from recent work in Chesham since the SWMP. A review of the available information confirmed that data presented in the PFRA, published in 2011, represents the most comprehensive and consistent dataset available. For the purposes of this updated SFRA, this available data has been supplemented by updated data provided by the Parish Councils and others, as described in Section 3.2. The following is a broad summary (by Parish in alphabetical order) of flooding from various sources which is presented on the maps in Figures 2 - 19:

Amersham

- The High Street and Broadway in Amersham Old Town suffer from surface water flooding during heavy rainfall
- Some roads, and possibly properties, have flooded from surface water in Amersham on the Hill
- Rising groundwater levels have directly caused, or exacerbated, flooding to several basement properties in Old Amersham

Ashley Green

- Surface water flooding has occurred on some roads (e.g. Hog Lane) to the north of Ashley Green, with field runoff contributing

Chalfont St Giles

- The River Misbourne caused flooding in Chalfont St Giles High Street in 2001
- Surface water flooding of roads has occurred at a number of locations across the Parish, due to poor drainage, raised groundwater levels and runoff from fields

Chalfont St Peter

- The River Misbourne caused flooding in Chalfont St Peter High Street in 2001
- The steep nature of the catchment around Chalfont St Peter means that the town centre could be susceptible to surface water flooding, particularly when groundwater levels are high. Several roads and properties have flooded in the past, with the poor state of the drainage network sometimes contributing.
- Rising groundwater levels have directly caused, or exacerbated, flooding at the foot of Gravel Hill in Chalfont St Peter

Chartridge

- Isolated incidents of surface water flooding of roads has been recorded in Chartridge e.g. Pednor Road and Westdean Lane

Chenies

- With the exception of surface water flooding on Holloway Lane in 2007, no flooding issues have been reported in Chenies Parish.

Chesham

- The River Chess has contributed to flooding in Pednormead End and Lower Bois
- The Vale Brook has contributed to flooding in the Higham Mead area of Chesham. Upstream, a highways drainage ditch on the east side of Vale Road has been created to alleviate the drainage issues in the area. On occasion this ditch has reached capacity and overtopped onto the road. When this occurs the road provides a direct route for the flood water into the centre of Chesham. This has resulted in the flooding of several properties. This problem becomes more susceptible during periods of high groundwater level.
- The fishing lakes off Cresswell Road overflowed and flooded during a 2007 event.
- The ordinary watercourse adjacent to Missenden Road has caused flooding of properties in Pednormead End
- Flooding from surface water has occurred across Chesham, with particularly notable flooding of properties in 2006 along Broad Street/Berkhampstead Road and in Pednormead End and in 2008 in The Spinney and commercial properties along the High Street. Other roads regularly affected by surface water flooding include Germain Street and Hivings Hill.
- Rising groundwater levels have directly caused, or exacerbated, flooding to a number of properties in Chesham. Rising groundwater levels have affected Bury Pond, which has subsequently overflowed and flooded properties in the Pednormead End area, Chesham.

Chesham Bois

- Isolated incidents of surface water flooding have been recorded in the Parish

Cholesbury

- Oak Lane to the south of Buckland Common has flooded from surface water at times of heavy rainfall

Coleshill

- One record of surface water flooding in 2007 exists for Coleshill

Great Missenden

- The River Misbourne has caused flooding in Great Missenden
- Rising groundwater levels have exacerbated the impact of blocked drains and surface water flooding of several properties at Church Street in Great Missenden. Flooding has also occurred at the junction of London Road and the A413, and in the fields south of Innisfree Farm.
- Surface water flooding has also occurred in Great Missenden and South Heath

Latimer

- The River Chess has contributed to flooding in Latimer Park
- Surface water flooding of roads and, potentially, properties has occurred at locations in Botley and Latimer, including at Pinner Green, Flaunden Bottom and Latimer Bridge

Little Chalfont

- Surface water flooding has occurred in locations in Little Chalfont during heavy rainfall e.g. Burton's Lane, Nightingales Lane, Beel Close and Lodge Lane

Little Missenden

- The River Misbourne has caused flooding in Little Missenden¹⁴
- Surface water flooding has occurred in some locations in the Parish, mostly around Little Kingshill

Penn

- Surface water flooding has occurred in some locations in the Parish, predominantly in the vicinity of Knotty Green

Seer Green

- Surface water flooding is recorded as having occurred at a number of locations in Seer Green, predominantly due to inadequate drainage and runoff from adjacent fields. Locations include Long Bottom Lane, School Lane, Chalfont Road and Newbarn Lane

¹⁴ Note that no information was available to plot this incidence on the accompanying map

The Lee

- Isolated incidents of surface water flooding have been recorded in the Parish

Postcode data provided by Thames Water (to October 2012) suggests that a number of areas have experienced sewer flooding either internally or externally to properties. The greatest number of occurrences have been in:

- Postcode region SL9 9, Chalfont St Peter has had 11 incidents of sewer flooding in the past ten years, 4 of which have caused internal property flooding
- Postcode region HP6 5, Old Amersham, Chesham Bois and Hyde Heath have had 6 incidents of external sewer flooding in the past 10 years
- Postcode region SL9 0, Chalfont Common has had 7 incidents of either internal or external sewer flooding in the past 20 years

4.3 Interpretation of Flood Risk Mapping

4.3.1 Overview

The following maps accompany this SFRA:

- **Figures 1 to 16** focus on fluvial flooding and show the river centrelines, extent of Main Rivers, Flood Zones and recorded incidents of flooding (from all sources) along the course of the Rivers Chess and Misbourne. The maps provide an initial indication of the potential severity of flooding at a proposed development site.
- **Figures 17 and 18** focus on local sources of flooding and show Areas of Critical Drainage and recorded incidents of flooding (from all sources) across the District. The maps provide an initial indication of the potential susceptibility of a proposed development site to flooding from surface water, groundwater or ordinary watercourses.
- **Figure 19** shows those postcode districts within which properties have experienced sewer flooding.
- **Figures 20 and 21** show the location of recorded flood risk management structures and features, including flood storage areas and reservoir flood extents. Development should take the location of these assets into consideration.
- **Figure 22** shows the superficial and solid geology underlying the District. This map could assist with determining whether infiltration or attenuation SuDS techniques may be suitable.
- **Figures 23 to 29** indicate the possible maximum depth of flooding on key access roads in areas at risk of fluvial flooding, and potential evacuation routes. It is noted that these evacuation routes may vary depending on the flood event.
- **Figure 30** shows the location of allocated development sites relative to Areas of Critical Drainage

4.3.2 Fluvial Flood Risk

Following sensibility checks on the Environment Agency's fluvial Flood Map and some modifications, the District has been delineated into the Flood Zones in line with the NPPF. The risk shown by the Flood Zones (Figures 1 - 16) is interpreted here for the main settlements along the Rivers Chess and Misbourne.

It is important to note that even shallow flood waters can be extremely dangerous. Some people will be at risk when the water depth is only 0.5m if the velocity is 1m/s (about 2 mph). If the velocity increases to 2m/s (about 4mph), some people will be unable to stand in a depth of water of only 0.3m. Most people will be unable to stand when the velocity is 2m/s and the depth is 0.6m¹⁵.

Amersham

The River Misbourne flows from west to east through Amersham Old Town. Several properties in the town are situated within Flood Zone 3a including properties on Broadway, Market Square, Church Street and High Street. Several properties at Church Street are also within Flood Zone 3b.

During periods of prolonged rainfall the River Misbourne overtops its banks flooding local properties and the road network. The roads channel the flow into other areas at a faster rate than might otherwise occur. The 1% (1 in 100) AEP flood depths in Amersham generally do not exceed 0.5 metres but even shallow water flowing at velocity can pose a risk to life, as noted above.

Chalfont St Giles

The River Misbourne flows from north to south through the town of Chalfont St Giles. Several properties in the town are situated within Flood Zone 3a including properties on High Street and The Green. Water can flow over the top of Pheasant Hill Bridge (due to the capacity of the bridge), onto the road and cause localised flooding. . The 1% (1 in 100) AEP flood depth on High Street is lower than 0.5 metres but the risk to life is dependent on the water velocity, as noted above.

Chalfont St Peter

The River Misbourne flows from north to south through the town of Chalfont St Peter. Several areas of the town are situated within Flood Zone 3a including a number of properties on the A413, Lower Road, Chiltern Hill and High Street. Commercial properties at Chalfont Park are also in Flood Zone 3a. Several properties on the A413 are in Flood Zone 3b.

During periods of prolonged rainfall the River Misbourne overtops its banks at several locations potentially causing a narrow band of flooding through the town. The 1% (1 in 100) AEP flood depth in the town would be approximately 0.5 metres and may pose a problem to both people and emergency vehicles, particularly if velocities are high, as noted above.

¹⁵ Further information is contained in the Defra guidance document "Flood Risks to People" available at www.defra.gov.uk/

Chesham

The River Chess flows from west to east through the town of Chesham. Several properties in the town are situated within Flood Zone 3a including properties on Moor Road, Amersham Road, Amy Lane, Meades Lane, Germain Street, King Street, Wey Lane and Church Street. Several properties fall within Flood Zone 3b, subject to flooding in the 5% (1 in 20) AEP flood event. During periods of prolonged rainfall the River Chess may overtop its banks resulting in flooding to several properties within Pednormead End, Waterside and Lower Bois. Flood depths in the town can be in excess of 0.5 metres in the 1% (1 in 100) AEP event, potentially causing problems to pedestrians and vehicles, particularly if velocities are high, as noted above.

Flood risk from the Vale Brook, although now Main River, is considered below under local flooding since it performs an important urban drainage function and no Flood Zones have been produced by the EA.

Great Missenden

The River Misbourne flows from north to south through Great Missenden. Several properties in the town are situated within Flood Zone 3a including properties on Church Street and Link Road. Properties on Church Street are also within Flood Zone 3b. During a flood event the River Misbourne may overtop causing flooding to several properties in the floodplain. Flood depths through Great Missenden are approximately 0.5 metres which may pose a risk to pedestrians and vehicles, particularly if velocities are high, as noted above.

Little Missenden

The River Misbourne flows from west to east through Little Missenden. Several properties in the town are situated within Flood Zone 3a including properties on High Street and Taylors Lane where one property is situated within Flood Zone 3b. The River Misbourne in Little Missenden overtops its banks flooding agricultural areas and some buildings. Properties in the Manor Farm area may flood to a depth of less than 0.5 metres. However, properties at Mill End are at risk from flooding of depths in excess of one metre. This is likely to pose a risk to both people and vehicles, particularly if velocities are high, as noted above.

4.3.3 Local Flood Risk

Based on national mapping provided by the EA, a high number of residential and commercial properties in the District could be at risk of flooding from local sources (principally surface runoff generated by intense rainfall, groundwater and ordinary watercourses), with the main concentration in Amersham and Chesham, as well as the Chalfonts and Great and Little Missenden. The EA Flood Map for Surface Water and the more detailed mapping based on the Chesham Surface Water Management Plan have been used to identify Areas of Critical Drainage which may be most susceptible to local flooding. These areas are shown on Figures 17 and 18. A broad summary of the larger Areas of Critical Drainage lying outside fluvial Flood Zones is provided here.

Dry Valleys

The mapping highlights a number of valley features in the Chalk geology which typically have no surface watercourse. However, these dry valleys can become

flowpaths for intense rainfall, for surface runoff when groundwater levels are exceptionally high or when rainfall falls on otherwise impermeable ground (e.g. soils are saturated or frozen). Whilst these valleys may not currently have substantial development, it is important that the potentially infrequent activation of these flowpaths is recognised and not impaired. It is noted that roads follow the base of a number of the dry valleys such that maintenance of highway drains (where they exist) is important to minimising flood risk in these areas. However, this drainage infrastructure is only designed to convey a certain rainfall intensity beyond which flooding may still occur. The largest dry valley features include:

- The Chesham Vale which originates in Aylesbury Vale District and extends through Cholesbury-Cum-St-Leonard's and the Vale Road into the north of Chesham
- The valley which broadly follows Asheridge Road south-east from The Lee into Chesham
- The Pednor valley which broadly follows Pednor Road south-east from Chartridge, The Lee and South Heath into Pednormead End in Chesham
- The valley broadly following Missenden Road east into Pednormead End in Chesham
- The valleys running south and east from Aylesbury Vale and Wycombe Districts into Great Missenden
- The valley system through Seer Green.

Chesham (Vale Brook)

A significant Area of Critical Drainage is defined along the course of the Vale Brook, between Higham Mead and the confluence of the brook with the River Chess downstream of Red Lion Street. This includes Chesham town centre. Furthermore, Broad Street/Berkhampstead Road and Bellingdon Road/Asheridge Roads, where dry valleys enter Chesham, are defined as Areas of Critical Drainage.

The Vale Brook Culvert through the centre of Chesham is susceptible to flooding from both a rainfall event and a rise in the water table. The lack of planning control and maintenance since the initial major construction work understood to be in the 19th Century has led to the capacity of the channel becoming reduced. At places the culvert has collapsed or is restricted with new pipe work. The Vale Brook was given the status of EA Main River in April 2008. In addition to baseflows from the surrounding chalk catchments, the culvert performs an important urban drainage function, receiving discharge from highway gullies along its route. Modelling undertaken in the Surface Water Management Plan (SWMP) for Chesham and follow-on work for the Environment Agency estimated the design capacity of the culvert at somewhere between the 10% (1 in 10) AEP and 3.33% (1 in 30) AEP rainfall events. This capacity is reduced when groundwater levels are high and has led to flooding problems in the past.

In the short-term, works are due to commence in summer 2013 to replace a 40m section of culvert (like-for-like) through Market Square. In the longer term, it is likely that the focus will be on smaller, local schemes to manage surface water runoff in Chesham, although an option to bypass the culvert may be investigated. As recommended in the SWMP (see Options Map included as Appendix B),

opportunities for upstream attenuation, improvement and/or opening of the Chesham culvert (i.e. restoring the natural watercourse) should be sought through any future redevelopment within Chesham, thereby providing a positive reduction in flood risk. Future developments that may change the current flow regime must provide a Flood Risk Assessment (FRA) highlighting how the potential impacts upon flooding elsewhere will be mitigated.

Prestwood

An Area of Critical Drainage is defined southwards from Blacksmith Lane in Prestwood.

Amersham on the Hill

Areas of Critical Drainage are evident in Amersham on the Hill, south eastwards from the A416 and broadly following the railway line until Little Chalfont.

Seer Green

There is an Area of Critical Drainage which approximately follows to the west of School Lane and Bayne Hill before following Longbottom Lane.

4.3.4 Flood Risk from Reservoirs

Because of the requirement for regular inspections by a Supervising Panel Engineer, the likelihood of structural failure of reservoirs is considered to be minimal. The risk of failure remains however, and the EA has mapped the potential extent of flooding resulting from Shardeloes Lake. Since the lake is on-line to the River Misbourne, the flood extent follows and largely lies within Flood Zone 3a defined for the River Misbourne. No similar extent is mapped for a failure of Bury Pond in Chesham, although it would most likely cause flooding through Pednornead End and further along the course of the River Chess.

4.4 Potential Impact of Climate Change

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

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

There is enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we cannot be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25 mm in a day). It

is plausible that the amount of rain in extreme storms (with a 20% (1 in 5) annual chance or less) could increase locally by 40%. If emissions follow a medium future scenario, UKCP09 projected changes for Chiltern District by the 2050s relative to the recent past are:

- winter precipitation increases of around 15% (very likely to be between 2 and 32%)
- precipitation on the wettest day in winter up by around 15% (very unlikely to be more than 31%).

The NPPF Technical Guidance provides further sensitivity ranges to enable the potential effect of climate change on flood risk to be taken into account.

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

As stated in the NPPF Technical Guidance, changes in the extent of inundation due to climate change on fluvial flooding are likely to be negligible in well-defined valleys, but could be dramatic in very flat areas. Changes in the depth of flooding under the same allowance will increase the probability of a given flood. This means that a site currently located within a lower risk zone (e.g. Zone 2) could in future be re-classified as lying within a high risk zone (e.g. Zone 3a). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding. In the absence of detailed flood modelling to define the impact of climate change on Flood Zones in this SFRA, the anticipated extent of Zone 3a (the 1% AEP flood) at the end of the century may be approximated by the current Zone 2 (the 0.1% AEP flood). In terms of existing property flood risk in Zone 3a, this could lead to approximately a 25% increase in the number of properties at risk of flooding. In the same way, the Areas of Critical Drainage could increase in extent and/or depth of flooding with climate change.

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

In planning terms, it is essential that Chiltern District Council consider their response to the potential impacts of climate change within the District. Adopting the pragmatic comparison between Zone 3a and Zone 2 above where detailed modelling has not been carried out, climate change may not markedly increase the extent of fluvial flooding. However, those properties (and areas) that are currently at risk of flooding (i.e. situated within Zone 3a) may be susceptible to more frequent, more severe flooding in future years. Furthermore, there could be an increase in localised surface water issues. It is essential therefore that the development management process (influencing the design of future development within the District) carefully mitigates against the potential impact that climate change may have upon the risk of flooding.

For this reason, all of the development management recommendations set out in Section 5 below require all floor levels, access routes, drainage systems and flood mitigation measures to be designed with an allowance for climate change within Zones 3a and 2, as well as within Areas of Critical Drainage in Zone 1. This provides a robust and sustainable approach to the potential impacts that climate change may have upon the District over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

It is highlighted that, for planning purposes within the context of the current local planning policy, Zone 3a High Probability is defined on the basis of existing (i.e. 2013) flood level predictions.

4.5 Cross-Border Flows

Chiltern lies towards the top of the catchments draining to the Vale Brook and Rivers Chess and Misbourne. Upon leaving Chiltern District, the River Chess flows through Hertfordshire's Three Rivers District before it's confluence with the River Colne in Rickmansworth. The River Misbourne flows through South Bucks District before its confluence with the River Colne at the border with the London Borough of Hillingdon. Therefore decisions in Chiltern regarding flows in the Main Rivers have the potential to impact downstream upon these neighbouring districts.

There is the potential, however, for the flow of surface and groundwater from Aylesbury Vale and Hertfordshire's Dacorum Borough towards the Vale Brook and River Chess in Chesham, and from Aylesbury Vale and Wycombe Districts towards the River Misbourne at Great Missenden. Particularly during periods of exceptionally high groundwater, as experienced in the winter of 2001, management decisions taken upstream of Chiltern could impact on the District.

No issues with cross border management of flows are known to the District Council or were highlighted through the consultation on this updated SFRA. However, it is important that cross-border cooperation to improve flood risk management continues.

Finally, it is important to emphasise that the NPPF – and indeed the Chiltern District SFRA – puts strict development design constraints into place. It will be a requirement in every instance that development is designed specifically NOT to increase flood risk elsewhere, for example by not increasing runoff from the site.. This ensures (on a site level) that future development will not exacerbate the risk of flooding to sites upstream and/or downstream, and in a more holistic sense, makes a contribution towards addressing cross boundary related issues.

4.6 Residual Risk of Flooding

It is essential that the risk of flooding is minimised over the lifetime of the development in all instances. However, it is important to recognise that flood risk can never be eliminated, and there will always be a residual risk of flooding. This residual risk is associated with a number of potential risk factors including (but not limited to):

- a flood event that exceeds the probability of that for which the flood risk management measures have been designed;
- general uncertainties inherent in the prediction of flooding.

The SFRA process has carried out a review of flood risk within the District in accordance with the NPPF Sequential Test, identifying a number of areas that fall within Zone 3a High Probability. The modelling of flood flows and flood levels is not an exact science. There are limitations in the methodologies used for prediction, and the models developed are reliant upon observed flow data for calibration. For this reason, there are inherent uncertainties in the prediction of flood levels used in the assessment and management of flood risk.

It is incumbent on applicants to carry out a detailed Flood Risk Assessment as part of the design process. A review of uncertainty should be undertaken as an integral outcome of this more detailed investigation.

5 Sustainable Flood Risk Management

5.1 Overview

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

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

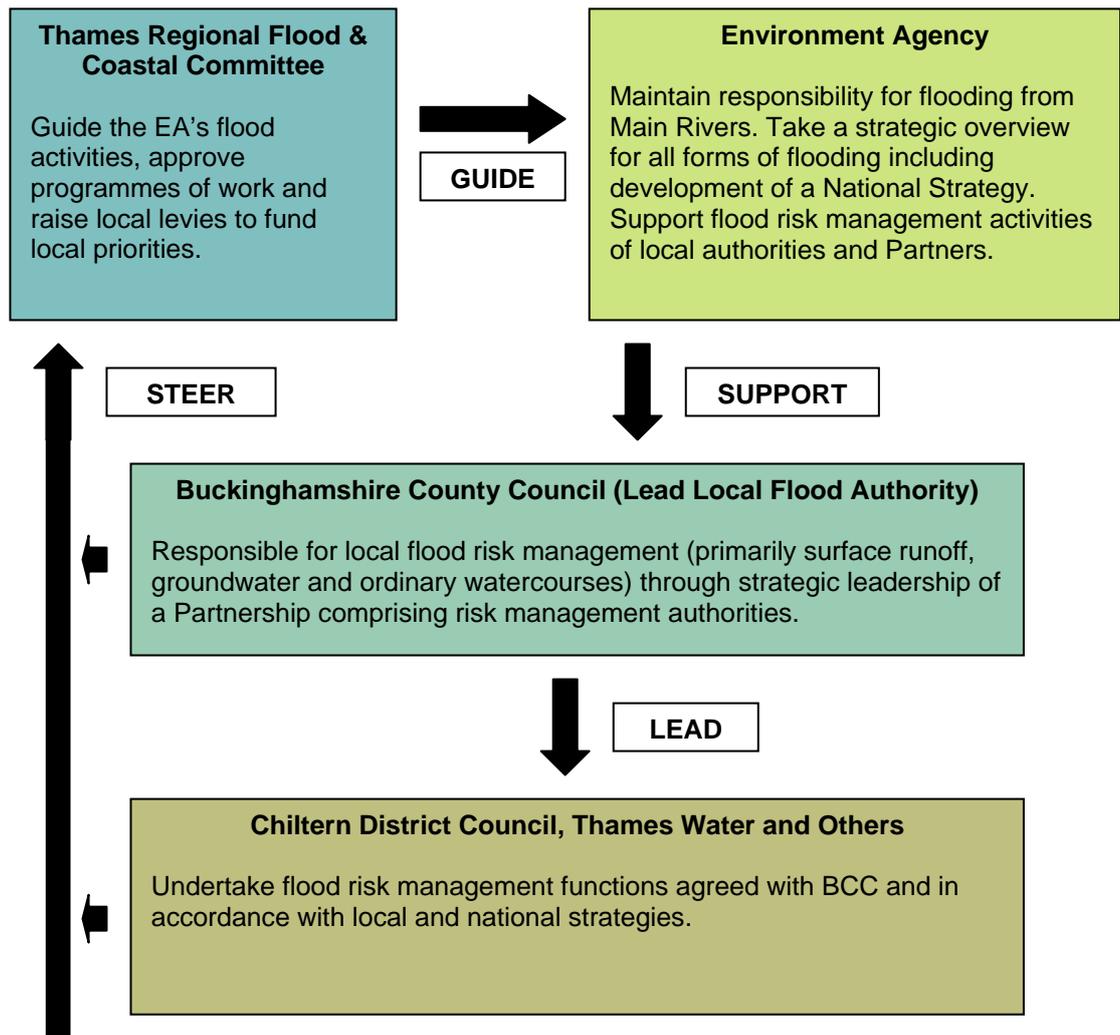
The primary purpose of the SFRA is to inform decision making as part of planning policy and development management processes, taking due consideration of the scale and nature of flood risk affecting the District. Responsibility for flood risk management resides with all tiers of government, and indeed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

5.2 Responsibility for Flood Risk Management

There is no statutory requirement for the Government to protect property against the risk of flooding. Nevertheless, the Government recognises the importance of safeguarding the wider community and, in doing so, the economic and social well-being of the nation. Following the Pitt Review into the flooding of summer 2007 and subsequent Flood Risk Regulations 2009 and Flood & Water Management Act 2010, new responsibilities for managing flood risk have been assigned to local authorities, the EA and others as outlined in the schematic overleaf. This Partnership working approach to better managing flood risk from all sources is being coordinated in Buckinghamshire by the Buckinghamshire Strategic Flood Management Group (BSFMG). This group is chaired by a County Council Member and includes the BCC Cabinet Member for Planning and Transport. The key responsibilities of the main Partners relevant to this SFRA are:

- **Environment Agency:** Provides a strategic overview of all sources of flooding. Under its permissive powers, it is responsible for flood risk management activities on Main Rivers, regulating reservoir safety, and working in partnership with the Met Office to provide flood forecasts and warnings. It assists the spatial planning and development management process through the provision of information and advice regarding flood risk and related issues.
- **Buckinghamshire County Council:** As Lead Local Flood Authority, BCC is responsible for coordination of local flood risk management across its administrative area. This includes development, maintenance, application and monitoring of a strategy for local flood risk management, a duty to maintain a register of structures or features which have a significant effect on flood risk and a duty to aim to contribute towards the achievement of sustainable development.

- Chiltern District Council:** The Local Planning Authority is responsible for carrying out a Strategic Flood Risk Assessment which should consider the risk of flooding throughout the district and inform the allocation of land for future development, development management policies and sustainability appraisals. CDC is responsible for determining local planning applications and must consult with the EA when making planning decisions. (BCC is responsible for assessing County planning applications relating to Waste and Minerals, Highways and Educational facilities) Chiltern District Council has a duty to act consistently with the BCC Local Flood Risk Management Strategy and the EA National Strategy.



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

The EA has updated its “Living on the Edge” guide in 2012 that provides specific advice regarding the rights and responsibilities of property owners, the EA and other bodies. The guide is targeted at owners of land situated alongside rivers or other watercourses, and is a useful reference point outlining who is responsible for flood defence, and what this means in practical terms. It also discusses how stakeholders

can work collaboratively to protect and enhance the natural environment of our rivers and streams. This guide can be found on the EA's website¹⁶.

This SFRA has been updated to be consistent with the draft BCC Strategy and implementation of the SFRA should ensure it remains consistent with the Strategy. Some of the key policies developed by the Strategy which link to this SFRA are:

- **Adapting to Climate Change:** BCC is committed to the sustainable management of local flood risk which includes necessary adaptation to the wide-ranging impacts of a changing climate.
- **Integrated Flood Risk Management:** BCC will work with relevant teams within the councils, with other Risk Management Authorities and with delivery Partners in BCC's area and across administrative boundaries towards truly integrated management of flood risk.
- **Improving Communication and Involvement:** The Buckinghamshire Strategic Flood Management Group will work with all Partners towards providing clear and up to date information on the risk of flooding and what can and is being done to manage the risk. Partners, stakeholders and the public will be involved as far as is practicable in actions to improve flood risk management to seek locally acceptable solutions which provide other benefits in addition to a reduction in flood risk.
- **Sustainable Management of Local Flood Risk:** BCC will seek to reduce the risk of flooding now, but in a way which does not compromise the interconnected needs of the economy, society and environment in the future.
- **Improve Recording of Flood Events:** BCC will centrally collate records of flooding which have been reported by the public, its Partners or through its own investigations as evidence to support future improvements in local flood risk management. Information will be managed according to our existing data protection policy.
- **Promoting Sustainable Drainage Systems (SuDS):** The use of Sustainable Drainage Systems (SuDS) will be promoted by the Buckinghamshire Strategic Flood Management Group as a method to reduce the rate and volume of surface water runoff. Where practical, the design of SuDS will be encouraged to provide some natural removal of pollutants and sediments, promote aquifer recharge, enhance biodiversity and add aesthetic value to local communities.
- **Reducing Urban Creep:** Property owners will be encouraged to use permeable surfacing, or to direct surface water runoff to a lawn or border to drain naturally when considering a new or replacement driveway. These options may not require planning permission.
- **Promoting Sustainable Land Management:** The Buckinghamshire Strategic Flood Management Group will act to strengthen the partnership approach to sustainable land management which seeks reduced rates and volumes of runoff and erosion and sediment transport alongside meeting the objectives of the Rural Strategy and Biodiversity Action Plan.

¹⁶ www.environment-agency.gov.uk

5.3 Spatial Planning – Chiltern District Council

5.3.1 New Local Flood Risk Management Policy

The saved policies of the 1997 Local Plan, including Policy GC10 on flooding, will be replaced by new policies contained in the emerging DPD. The saved policy pre-dates this SFRA and national policy contained in the NPPF.

RECOMMENDATION: Chiltern District Council should prepare a strategic policy for local flood risk management which is consistent with the BCC Strategy for Local Flood Risk Management. The policy should build upon Core Strategy Policy CS4 on sustainable development to reflect the findings and recommendations of the SFRA including requiring applicants to consider the SFRA and its mapping as a starting point for the assessment of flood risk in relation to development proposals.

5.3.2 Site Allocations

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

All allocated sites within the Core Strategy are within Flood Zone 1 and therefore have a low probability of flooding from rivers (Figure 30). The Flood Zones within Chiltern District are set out in the maps that support this SFRA. Two of the sites in Chalfont St Peter are near to Areas of Critical Drainage (as redefined in 2013) where surface water flooding of roads has previously been reported. Sustainable drainage solutions will need to be carefully implemented.

The sequential approach, referred to as the Sequential Test in the NPPF, is set out in the NPPF, with further detail provided in the accompanying Technical Guide. Tables 1 to 3 in the Technical Guide stipulate ‘appropriate’ land uses for each Flood Zone.

Table 3 identifies types of development that should not be permitted in particular Flood Zones; it also identifies types of development which may be permitted in zones of high flood risk where, following the application of the Sequential Test, it is not possible to locate the development within zones with a lower probability of flooding and wider sustainability objectives exist.

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

- *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
- *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.’*

The latter point includes a requirement for account to be taken to the future risk from climate change over the lifetime of the development.

Paragraph 8 of the Technical Guidance to the NPPF states that *“it will be necessary to increase the scope of the Strategic Flood Risk Assessment to provide the information necessary for application of the Exception Test”*.

RECOMMENDATION: Any future site allocations must be determined via the application of the Sequential Test, and the Exception Test if required. The evaluation of potential sites should be guided by the mapping and the findings presented within this SFRA, including with regard to Areas of Critical Drainage and, if necessary, supplemented by a more detailed SFRA which covers all potential sources of flooding. Full account should be taken of all sources of flooding including from rivers, groundwater, sewerage and surface water, together with the potential effects of climate change on flood risk and impacts on and from existing flood management infrastructure (see Sections 3 and 4).

5.3.3 Relocation of Unsuitable Existing Development

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

RECOMMENDATION: Chiltern District Council, working in partnership with the Environment Agency, Buckinghamshire County Council, and others, should seek to identify both existing development which is potentially at risk from future impacts of climate change and, if necessary, potential sites for relocating that development. The information contained in the SFRA can be used to assist this process.

5.3.4 Safeguarding

Paragraph 100 of the NPPF states that local authorities should safeguard land from development that is required for current and future flood management.

RECOMMENDATION: In partnership with the Environment Agency, Buckinghamshire County Council and others, Chiltern District Council should seek to identify land required for current and future flood management and, if justified, safeguard it through planning policy. The information contained in the SFRA can be used to assist this process.

5.3.5 Areas of Critical Drainage

The NPPF requires a site-specific flood risk assessment for all development proposals *“in an area within Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency)”*. The EA has not specified any Critical Drainage Areas in Chiltern District. However, areas which are likely to be most at risk of flooding from local sources have been identified as part of this SFRA. They have been termed ‘Areas of Critical Drainage’ to differentiate them from those areas which could potentially be notified by the EA. However, the wording of the NPPF is such that it is not clear that an FRA would be required in an Area of Critical Drainage because they were not ‘notified to the local planning authority by the Environment Agency’.

RECOMMENDATION: Chiltern District Council should seek to adopt a local policy requiring a site-specific flood risk assessment for all development in Areas of Critical Drainage to address this anomaly. FRAs are particularly important in such areas as they have known localised flooding problems which can cause significant damage.

5.3.6 Adoption of Best Practice

Buckinghamshire County Council, in their role as Lead Local Flood Authority for managing flooding from local sources and SuDS, are in the process of producing best practice guidance with regard to sustainable drainage solutions across the county. The BCC flood management website also contains links to various other best practice guidance published by the EA, National Flood Forum and others.

RECOMMENDATION: Chiltern District Council should be involved in the development of BCC's proposed SuDS guidance and, when developed, adopt it as a Supplementary Planning Document to assist with the production and evaluation of flood risk assessments accompanying planning applications. This would avoid the need for CDC to produce its own guidance, which would repeat work already being undertaken by BCC and consume resources. An SPD should be linked to existing Core Strategy policy CS4 which should be re-examined and updated if necessary.

5.3.7 Opportunities to Reduce Flooding

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

The NPPF requires local authorities to work with other local authorities and providers to assess infrastructure needs in their area, including with regard to flood risk (Paragraph 162); Chiltern District Council is already working to assess infrastructure needs within the District. After identifying infrastructure needs, the NPPF states that strategic policies should then be included within the Local Plan to deliver the infrastructure required (Paragraph 156); Policy CS31 of the Core Strategy already seeks to secure the provision of needed infrastructure through working with statutory undertakers and infrastructure providers and, if required, seeking financial contributions from new development. Policy is to be further developed in the forthcoming Delivery DPD in this respect.

Section 106 agreements and Community Infrastructure Levy charges provide potential mechanisms for securing new flood risk reduction infrastructure or contributions towards it. However, account should be taken of the potential impact on the financial viability of development proposals, particularly in light of the current challenging economic climate.

RECOMMENDATION: Chiltern District Council should:

- Continue to work with other authorities and bodies, as appropriate, to identify specific flood risk infrastructure required within the District (e.g. with the Environment Agency regarding the Vale Brook culvert as per Section 4.3.3). The information contained in the SFRA can be used to assist this process, although more detailed studies may be required.
- In identifying potential development sites in DPDs, seek reasonable opportunities for flood risk reduction measures, where required, and develop site specific guidance for such sites in the form of Supplementary Planning Documents where appropriate. This could potentially include statements seeking Section 106 agreements to secure that planning benefit. The information contained in the SFRA can be used to assist this process, although more

detailed studies may be required. Chiltern District Council should also ensure that suitable enabling policy is contained within DPDs linking to such SPDs.

- Give consideration to a suitable generic policy to be contained within a DPD in respect of non-allocated sites where flood risk reduction measures should be sought.
- Consider Community Infrastructure Levy charges as a potential additional tool for securing contributions towards the delivery of flood risk reduction measures where a need has been identified.

This section is also relevant to any neighbourhood plans proposed in the District.

5.4 Planning Applications – Chiltern District Council and Applicants

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

The NPPF¹⁷ stipulates that a site-specific flood risk assessment is required for:

- Development proposals on sites of 1 hectare or greater in Flood Zone 1;
- all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3;
- all proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and
- where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding (groundwater or surface water flooding).

The table overleaf is an extract from the summary table in Section 5.7 and summarises CDC's requirements for site-specific flood risk assessments (FRAs). It is noted that the EA has not notified Chiltern District Council of any areas within Flood Zone 1 with critical drainage problems at present. However, areas which are likely to be most at risk of flooding from local sources, and where sustainable drainage solutions should be a priority, have been identified in this SFRA and have been delineated as Areas of Critical Drainage. This is different from the CDA delineation used by the EA. Importantly, flooding from local sources has occurred outside the mapped Areas of Critical Drainage. Therefore, a FRA is also required for sites greater than 1ha in area within Zone 1, but outside a CDA. The FRAs in Zone 1 should be proportionate to the level of risk and focus on records of past flooding and sustainable drainage solutions.

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

¹⁷ Footnote 20, page 24

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

The site-specific FRA must follow the Sequential Test, and if required the Exception Test, as noted above and detailed in the NPPF and its accompanying Technical Guidance. The NPPF¹⁸ stipulates that the FRA must demonstrate that:

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

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

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

The remaining requirements for an FRA continue to apply.

In its role as a statutory consultee for planning applications, the EA will provide comment on applications for sites at higher risk of flooding, although their role is set to decrease in future.

It should be noted that, once the provisions of the Floods and Water Management Act 2010 come into force, BCC, in its anticipated role as the Sustainable Drainage Approval Body, will need to approve drainage systems in new developments and re-developments over a certain threshold (to be determined) prior to the commencement of construction.

RECOMMENDATION: Applicants should utilise the information contained within this SFRA in their design proposals and as the starting point for any flood risk assessment to be submitted with their planning application. In this respect, as noted above, CDC should consider a policy in the Local Plan which would require developers to review the SFRA as a starting point in relation to flood risk guidance.

¹⁸ Paragraph 103

Equally, planning officers should use the information contained in this SFRA to inform their evaluation of planning applications and any accompanying flood risk assessments. It should be noted that, in line with the NPPF, ALL sources of flooding must be considered, including from surface water and groundwater. When granting planning permission, the use of planning conditions and Section 106 agreements should be considered where necessary to prevent any increase in flood risk and to assist in securing flood risk reduction measures.

The SFRA mapping will be of particular use in identifying key information for the FRA, including Flood Zones, Areas of Critical Drainage and flood management assets, but must be read in conjunction with the SFRA text. Sections 3 and 4 provide further information on flood risk in specific locations and highlight key issues to consider, including the potential effects of climate change on flood risk and location of flood management infrastructure. Further issues to take in to consideration in developing or evaluating an FRA are noted below.

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

Key contacts:

Environment Agency – www.environment-agency.gov.uk

Buckinghamshire County Council – www.buckscc.gov.uk/flooding

Know Your Flood Risk - <http://www.knowyourfloodrisk.co.uk>

5.5 Restriction of Permitted Development Rights – Chiltern District Council

Permitted Development (PD) rights allow for some minor development, such as certain sizes of building extension, without planning permission¹⁹. Paragraph 10 of the NPPF Technical Guidance states that minor developments, some of which are covered by PD rights such as small extensions, are *‘unlikely to raise significant flood risk issues unless they would:*

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

Minor developments subject to PD rights, such as some extensions, therefore have the ability to raise flood risk in such situations. Two tools enable the restriction of PD rights: planning conditions and Article 4 Directions.

Article 4 of the Town and Country Planning General Permitted Development Order provides a possible vehicle for the removal of PD rights in exceptional circumstances, which the NPPF (Paragraph 200) notes to be *‘limited to situations where this is necessary to protect local amenity or the wellbeing of the area’*. This could include situations where minor permitted development, such as extensions,

¹⁹ See EA guidance on PD at www.environment-agency.gov.uk

has the potential to add to localised flood risk as highlighted above, such as from the cumulative impact of extensions within an area.

The NPPF states that *'planning conditions should only be imposed where they are necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects'* (paragraph 206). In addition, paragraph 200 of the NPPF states that *'planning conditions should not be used to restrict national permitted development rights unless there is clear justification to do so'*. Again, this could include situations where minor permitted development, such as extensions, has the potential to add to localised flood risk, as the NPPF itself highlights.

RECOMMENDATION: Chiltern District Council should consider the potential for using planning conditions, and in exceptional circumstances Article 4 Directions, to minimise the flood risk associated with minor developments subject to permitted development rights.

5.6 General Recommendations – Minimising Flood Risk and Impacts of Flooding

When evaluating the flood risk of an existing or proposed development it is important to consider issues of flood resilience and flood resistance – minimising the likelihood of flooding, minimising impacts if the site does flood, and allowing a quick recovery after flooding. Such measures should also be included in the development of design proposals in planning applications, as relevant to the likely level of flood risk at a site. As noted above, the NPPF requires that planning applications demonstrate that the *'development is appropriately flood resilient and resistant'*, that *'any residual risk can be safely managed'* and *'it gives priority to the use of sustainable drainage systems'*. Potential considerations include:

- A change in land use to reduce the vulnerability of the proposed development
- Placing uses with greater vulnerability to flooding in higher areas within the site to limit the risk or extent of flood damage
- Minimising / reducing impermeable surfaces (building footprints and areas of hardstanding)
- Raising internal floor levels above the predicted flood level to reduce the likelihood of the property flooding, taking into account any increase in flood level likely in future as a result of climate change
- Raising electrical wiring and sockets to avoid damage to electrical systems in the event of flood, use of tiled or stone flooring etc
- Arranging buildings and solid walls on site to remove obstructions to the overland flow paths of flood waters
- Identifying potential sources of pollution in the event of flood and seeking to contain them
- Ensuring there is a safe means of access and escape in the event of a flood
- Developing a flood evacuation plan in the event of the threat of flood

Sustainable Drainage Systems (SuDS) is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings. CDC, the EA and BCC all strongly advocate the use of SuDS. A wide variety of SuDS techniques are available, potentially providing both water quality and water quantity improvement benefits on a site by site basis throughout Chiltern.

Wherever possible within brownfield areas, the developer should seek to reduce the rate of runoff from the site to the equivalent greenfield runoff rates (i.e. the rate of runoff generated from the site assuming it were an open grassed area). This is usually within the range of 5 to 9 litres per second per hectare (l/s/ha), depending on site slope and soil porosity. Collectively, the effective application of SuDS as part of all future development has the potential to reduce the risk of flooding within Chiltern.

Indeed reducing the rate of discharge from urban sites to greenfield runoff rates is one of the most effective ways of reducing and managing flood risk within the District. Although any reduction in the amount of water that originates from any given site is likely to be small, if applied to sites across the district in a consistent way, the cumulative effect could be significant. There are numerous different ways that SuDS can be incorporated into a development and the most commonly found components of a SuDS system are described in the following table. The appropriate application of a SuDS scheme to a specific development is heavily dependent upon the topography and geology of the site.

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

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

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

Key contacts:

- Environment Agency – www.environment-agency.gov.uk
- Buckinghamshire County Council – www.buckscc.gov.uk/flooding
- CIRIA²⁰ – www.susdrain.org
- Know Your Flood Risk - <http://www.knowyourfloodrisk.co.uk>

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

5.7 Summary – Development Management Recommendations

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

²⁰ Construction Industry Research and Information Association

Requirements	NPPF Flood Zone					
	Zone 3b Functional Floodplain		Zone 3a High Probability	Zone 2 Medium Probability	Areas of Critical Drainage	Zone 1 Low Probability
	Existing Development ²¹	New Development				
DEVELOPMENT MANAGEMENT RECOMMENDATIONS						
Important Considerations	Opportunities should be sought: to reduce overall level of flood risk in the area through layout and form of development and appropriate application of SuDS; and to relocate existing inappropriate development to land with lower probability of flooding. Sequential Test required (unless para.104 of NPPF applies)		Opportunities should be sought: to reduce overall level of flood risk in the area through layout and form of development and appropriate application of SuDS; to relocate existing inappropriate development to land with lower probability of flooding; and to create space for flooding to occur.	Opportunities should be sought to reduce overall level of flood risk in the area through layout and form of development and appropriate application of SuDS. Sequential Test required (unless para.104 of NPPF applies)	Important to check whether site is a 'dry island' (see Section 3.3.5). Areas of Critical Drainage have been identified which are likely to be most at risk of flooding from local sources. Local flooding must be considered as in integral part of the design process for all development. Opportunities should be sought to reduce overall level of flood risk in the local area through layout and form of development and appropriate application of SuDS. (See guidance provided by EA on Critical Drainage Areas - equally applicable here - and guidance on SuDS to be provided by BCC)	Important to check whether the site is a 'dry island' (see Section 3.3.5). It is important to recognise that sites within Zone 1 may be susceptible to flooding from other sources. Development may contribute to an increase in flood risk elsewhere if not carefully mitigated. Opportunities should be sought to reduce overall level of flood risk in the area and beyond through layout and form of development and appropriate application of SuDS.
	All existing 'solid buildings' that would otherwise be in Zone 3b, unless designed to allow the passage of water, together with any other land prevented from flooding in a 5% (1 in 20) AEP event by the presence of solid buildings and existing infrastructure, are considered to be within Zone 3a for planning purposes. Existing buildings and other land designed to flood will continue to be in Zone 3b.	Includes all new development on previously undeveloped land, or on surfaces that are currently permeable, or on surfaces that are currently impermeable but not designed to flood.		All existing 'solid buildings' are considered to be within Zone 3a for planning purposes, together with any other land prevented from flooding in a 5% (1 in 20) AEP event by the presence of solid buildings and existing infrastructure, unless designed to allow the passage of water (even if in Zone 3b on flood map). Sequential Test required (unless para.104 of NPPF applies)		
Appropriate Land Use (refer to Tables 1 to 3 of the NPPF Technical Guidance)	Proactively seek a reduction in risk by reducing the vulnerability of the existing land use.	Water Compatible uses Essential Infrastructure, if passes Exception Test.	Water Compatible or Less Vulnerable uses. More Vulnerable uses or Essential Infrastructure, if passes Exception Text.	Water Compatible, More Vulnerable or Less Vulnerable uses. Highly Vulnerable uses, if passes Exception Test.	No restrictions upon land use.	No restrictions upon land use.
SPECIFIC DEVELOPMENT MANAGEMENT RECOMMENDATIONS						
Flood Risk Assessment (FRA) (all sources of flooding)	Detailed FRA required		Detailed FRA required	Detailed FRA required	FRA required (proportionate to level of risk), should focus on records of past flooding and SuDS	FRA required (proportionate to level of risk) for all sites greater than 1ha in area, but should focus on records of past flooding and SuDS. Recommend that sites of 1ha or less carry out an assessment of localised flood risks
Extensions, Outbuildings, Permitted Development & Property Subdivision (see EA guidance on PD at www.environment-agency.gov.uk)	There should be a presumption against all building extensions (including out-buildings) to avoid raising flood levels elsewhere. Property sub-division may increase the population at risk, and should not be permitted. Restriction of PD rights should be considered.		Building extensions (inc. out-buildings) should be discouraged to avoid raising flood levels elsewhere. Property sub-division may increase intensity of development, and population at risk, and should be discouraged. Restriction of PD rights should be considered.		Building extensions and outbuildings may obstruct overland flow paths and should be designed carefully to avoid raising the potential risk of flooding to adjoining properties. Restriction of PD rights should be considered.	No restrictions.
Flood Resilience & Resistance, including Floor Levels	FRAs must include details of flood resilience and resistance measures included in designs. Generally, floor levels must be a minimum of 300mm above the 1% (1 in 100) AEP river flood level, including climate change, but varies according to flood zone and nature of development – see EA & BCC guidance)				FRAs must include details of any flood resilience and resistance measures included in designs (see EA & BCC guidance). No minimum floor level	
Site Access & Escape, including Flood Evacuation	For residential property, dry access is to be provided in the 1% (1 in 100) AEP event. For commercial property, access must be 'safe' in accordance with Defra "Flood Risk to People" (FD2320 & FD2321). A Flood Evacuation Plan must be in place, suitable to the type of development, where there is no safe dry access to/from the site (i.e. access through Zone 1) – officers should consult the CDC Emergency Planning team as appropriate.				FRA should consider the vulnerability of the proposed development, and a safe route of escape should be provided if necessary ²² .	
Basements	Seeking to reduce vulnerability of use	Not permitted	Basement dwellings not permitted (see NPPF). For other development, no sleeping accommodation permitted at basement level. All basements must have an access point that is above the 1% (1 in 100) AEP river flood level, including climate change	Exception test required for basement dwellings (see NPPF). Generally, basements to have unimpeded access internally to upper levels – see EA guidance.	No sleeping accommodation permitted at basement level. All basements must have an access point that is above the anticipated localised flood level.	No restrictions.
SuDS & Permeable Paving	Priority must be given to use of SuDS. Implement SuDS to seek runoff from the site (post development) that does not exceed greenfield runoff rates, where feasible. Any SuDS design must take account of groundwater and geological conditions. NB New role for BCC to approve SuDS. Hardstanding which exceeds 5sqm in front garden of residential properties must be permeable (result of amendment to General Permitted Development Order (GPDO) in 2008)					
Buffer Zones and EA Consent	Minimum 8m buffer zone must be provided to 'top of bank' within sites immediately adjoining a Main River corridor (both open waterways and culverted waterway corridors). Any structures within 8m of 'top of bank' require EA consent. Reference should be made to EA's "Living on the Edge" guide (www.environment-agency.gov.uk) that discusses development situated in, over, under or adjacent to rivers and/or streams and the responsibilities of the riparian landowner.					
Other	Ensure that the proposed development does not result in increase in flood levels elsewhere – e.g. by ensuring that existing impermeable area is not increased, that overland flow routes are not truncated by buildings and/or infrastructure, or hydraulically linked to compensatory flood storage is provided within the site (or upstream) – measures should be appropriate to potential impact.					
	As an integral part of the government's "Making Space for Water" agenda, the EA is actively seeking the denaturalisation of culverted watercourses as part of any future development, and this is acknowledged by CDC. Realistic opportunities to reinstate the natural open waterway within existing culverted reaches of the river(s) should be promoted.					
	Ensure ALL sources of flooding are covered by the FRA and that surface water is adequately managed in line with EA and BCC guidance, especially in known ACD.					
	In addition to a Flood Risk Assessment, applications within all fluvial flood zones (including within Areas of Critical Drainage) for developments of greater than 1ha must be accompanied by proposals for the management of surface water, as per EA standing advice. Similar surface water management proposals should also be prepared for developments of less than 1ha within any flood zone even if an FRA is not required.					

²¹ Existing development specifically designed to allow the passage of flood water, such as buildings on stilts or car parks designed to flood

²² Local knowledge may suggest that the rapid onset of flooding (from surface water), its long duration (e.g. groundwater flooding) or its large depth could pose a risk to life which should be taken into consideration

5.8 Local Community Action to Reduce Flood Damage

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

Key contacts:

- Environment Agency – www.environment-agency.gov.uk
- Buckinghamshire County Council – www.buckscc.gov.uk/flooding
- Thames Valley Local Resilience Forum – www.thamesvalleylrf.org.uk

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

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

Information on all of the above can be found on the EA's website.

It is also important for property owners to ensure that they have sufficient insurance to cover their property if damaged by flood.

5.9 Emergency Planning – Chiltern District Council

The Council is designated as a Category 1 Responder under the Civil Contingencies Act 2004. As such, the Council has defined responsibilities to assess risk, and respond appropriately in case of an emergency, including (for example) a major flooding event. The Council's primary responsibilities are²³:

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

The EA monitors river levels within the main watercourses affecting Chiltern, including the River Chess (upstream to Chesham) and the River Misbourne (upstream to Little Missenden)²⁴. Based upon a sophisticated in-house forecasting computer model, the EA makes an assessment of the maximum water level that is likely to be reached during an anticipated flood event, which can extend from a few hours to several days. Where these predicted water levels are expected to result in

²³ Civil Contingencies Act 2004

²⁴ Refer to the EA website (www.environment-agency.gov.uk) for further details regarding flood warning services within Chiltern District

the inundation of populated areas²⁵, the EA will issue a series of flood warnings within defined flood warning areas, encouraging residents to take action to avoid damage to property in the first instance.

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

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

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

Dry access (i.e. above flood level) should be sought wherever possible to ensure that all residents can be safely evacuated in times of flood. A Flood Evacuation Plan must be in place, suitable to the type of development, where there is no safe dry access to/from the site (i.e. access through Zone 1). To inform the assessment of public 'safety', Figures 23 to 29 provide an indication of the depth of flooding anticipated along key local roads during the 1% (1 in 100) AEP design event and suggestions as to evacuation routes, although these may vary depending upon the circumstances of individual events.

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

Areas suffering from localised flooding issues may be at greater risk due to the difficulty of forecasting intense rainfall which may lead to surface water flooding and the response of aquifers to above average long-term rainfall which may lead to groundwater flooding. Localised flooding caused by intense rainfall can occur rapidly and pose a risk to life, particularly in confined spaces e.g. basement properties. Furthermore, the blockage of gullies and culverts as a result of litter and/or leaves is commonplace, and this will inevitably lead to localised problems that can only realistically be addressed by reactive maintenance. It is noted, however, that the EA has recently introduced a Groundwater Flood Warning Service as an extension to its

²⁵ Restricted to those urban areas situated within EA flood warning zones

existing Floodline Warnings Direct service. This new service is available to areas which have previously been affected and already receive local information about groundwater flooding. This includes Chesham. The service will issue Flood Alerts when there is the possibility of flooding from groundwater, Flood Warnings in some areas when flooding of property is expected and support the dissemination of information through the website, flood wardens, flood action groups etc.

It is recommended that the Council advises the Thames Valley Local Resilience Forum of the risks raised in light of the updated Chiltern SFRA, ensuring that the planning for future emergency response can be reviewed accordingly. This will inform the Thames Valley Local Resilience Forum Community Risk Register²⁶.

²⁶ www.thamesvalleylrf.org.uk/useful-links/publications/risk-register.ashx

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

The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the district; with data continually changing as new flooding events occur and further modelling is undertaken, this knowledge is continually evolving. In addition, Government policy on flood risk continues to change, with significant changes to national and local policy evident between the publication of the original SFRA in 2008 and the production of this update in 2013. Given that this is the case, a periodic review of the Chiltern District SFRA is imperative and it must be treated as a living document.

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

Question 1

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

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

Question 2

Have any amendments to the NPPF or the accompanying Technical Guidance been released since the previous review? If so, the following key questions should be tested:

- Does the revision to the policy guidance alter the definition of the NPPF Flood Zones presented within the SFRA?
- Does the revision to the policy guidance alter the decision making process required to satisfy the Sequential Test?
- Does the revision to the policy guidance alter the application of the Exception Test?
- Does the revision to the policy guidance alter the categorisation of land use vulnerability, presented within Table 2 of the NPPF Technical Guidance (March 2012)?

If the answer to any of these core questions is 'yes' then a review of the SFRA recommendations in light of the identified policy change should be carried out.

Question 3

Has the EA or BCC issued any amendments to their flood risk mapping and/or guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within the District, resulting in a change to the 5% (1 in 20) AEP, 1% (1 in 100) AEP or 0.1% (1 in

1000) AEP flood outline? If yes, then the Zone 3b and Zone 3a flood outlines should be updated accordingly.

- Has any further detailed or revised mapping been produced for the District resulting in a change to the Areas of Critical Drainage? If so, then relevant maps should be altered accordingly.
- Has the assessment of the impacts that climate change may have upon rainfall and/or river flows over time altered? If yes, then a review of the impacts that climate change may have upon the District is required.
- Do the development management recommendations provided in the SFRA in any way contradict emerging EA advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques? If yes, then a discussion with the EA is required to ensure an agreed suite of development control requirements are in place.

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

Question 4

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

Appendix A Consultation Process

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

Two phases of consultation were carried out in the production of this SFRA:

- Letters were sent to a range of consultees in October 2012 specifically seeking their comments on the original 2008 SFRA (particularly with regards to its implementation) and any data that may be of use in updating the SFRA.
- An internal consultation process in relation to the draft of this updated SFRA, which took place throughout December 2012 and early January 2013 to seek feedback from various stakeholders on the document.

In addition, Chiltern District Council, Buckinghamshire County Council and the Environment Agency were regularly consulted to seek their feedback on specific issues throughout the development of the SFRA and have co-operated fully in the process.

The following teams were consulted within Chiltern District Council to ensure the document is workable for all those utilising it:

- **Planning:** Consulted to identify areas under pressure from development and/or regeneration
- **Engineering and Contract Management:** Consulted to identify areas potentially at risk from river flooding, urban drainage and groundwater
- **Emergency Planning:** Consulted to identify areas potentially at risk from river flooding, urban drainage and groundwater, and to discuss possible implications from an emergency response perspective
- **The Council's Principal Environmental Protection Officer** was also included in the consultation process so as to link with the Council's work to promote sustainable development.

Letters

The following letters were sent to consultees in October 2012 to both request flooding data and to elicit their views on the current 2008 SFRA. The responses received are summarised in the table following the letters.

Consultee	Response
Affinity Water	[No response]
Amersham Town Council	<p>Email response received. In summary:</p> <ul style="list-style-type: none"> • Locations: Woodside Road, Junction of Shortway and Grimdsells Lane, Sycamore Road, London Road West, High Street, Old Amersham, Station Road, Rectory Hill, Farm Lane • Date: During heavy rainfall • Source: Surface water • Pathway: Roads • Receptors: Roads
Ashley Green Parish Council	[No response]
Aylesbury Vale District Council	[There is] potential surface water flooding on the A413 and between Wendover and Great Missenden from heavy rainfall
Buckinghamshire County Council	[Provided data and input throughout the study]
Chalfont St Giles Parish Council	<p>Email response received. In summary:</p> <ul style="list-style-type: none"> • Locations: London Road, High Street/The Green, Narcot Lane, Jordans Lane, Nightingales Lane • Date: All dates of heavy rainfall • Source: Surface water runoff • Pathway: Roads • Receptors: Roads and properties
Chalfont St Peter Parish Council	<p>As a PC we do not hold formal records of all flooding incidents in the village and in many cases there is confusion among residents who is responsible for what, when they occur. This is a matter which the PC is addressing and will be considered in the Neighbourhood Plan which we are currently drafting. Consideration has been given to undertaking property questionnaires being sent to properties we believe to be at risk.</p> <p>The extent of the flood zones highlighted in the plans on your web site are generally indicative of our understanding of the extent of the flooding from the River Misbourne from your critical date of 01.01.2007. As you indicated Zone 1 is a 1 in 1000 year event, zone 2 is a 1 in 100 -1000 year event, zone 3a is a 1 in 100 years and greater event and zone 3b is the functional flood area which is the most frequent. Clearly this has been indicated from your hydraulic modelling in conjunction with the Environment Agency in view of the projected extended frequency of events.</p> <p>The most serious events were in 2000 – 2001 which sticks in the memory though this falls outside your current review period.</p> <p>We would like to take the opportunity of highlighting the consequence of when these flood events have occurred and which will happen again in the future. Thames Water have a main sewer which follows along the line of the Misbourne valley and will be subject to inundation and infiltration when the water table rises in the gravels and fluvial flooding results in further flooding in the village from the foul sewers within and outside the area of your flood zones, for which we are in discussion with Thames.</p> <p>Also when these rises in the water table occur this also results in flooding of the centre of the village and Lower Road from the</p>

Consultee	Response
	<p>highway drainage which is principally soakaways and results in flooding of property and open spaces. We should however point out that we believe this is exacerbated by the lack of maintenance and inadequacy in number of Bucks CC gully pots and soakaway chambers though in more infrequent storm events you are considering the consequences would be far more serious to property.</p> <p>We are aware some structural maintenance was carried out on the Misbourne culvert which passes under Market Street adjacent to the Greyhound Public House / Restaurant and we have assumed that you have taken into account this restriction in your modelling.</p>
Chartridge Parish Council	<p>Email response received. In summary:</p> <ul style="list-style-type: none"> • Locations: Ramscote Lane and Bank Green, Bellingdon, and the junction of Buslins Lane with Asheridge Hill, Asheridge Vale. • Date: Unspecified • Source: Unspecified • Pathway: Unspecified • Receptors: Unspecified
Chenies Parish Council	[No response]
Chesham Bois Parish Council	[No response]
Chesham Town Council	[Up to date map of recorded flooding in Chesham sent to CTC for any further additions to be made – awaiting response]
Chilterns Conservation Board	In your letter you state that you are particularly seeking information on cross-border flooding issues and would welcome any information we have that we believe would be of use. I am not aware that the Board has such information and we cannot therefore provide it.
Chiltern District Council	[Provided data and input throughout the study]
Chiltern Railways	[No response]
Cholesbury Parish Council	[No response]
Coleshill Parish Council	[No response]
Dacorum Borough Council	[No response]
Environment Agency	[Provided data and input throughout the study]
Great Missenden Parish Council	[No response]
Hertfordshire County Council	[No response]
Highways Agency /	I write to inform you that the Secretary of State has no comment to

Consultee	Response
Department for Transport	make on the 2008 SFRA and the proposals set out in your letter.
Latimer Parish Council	[No response]
Little Chalfont Parish Council	Letter response received. In summary: <ul style="list-style-type: none"> • Locations: Burtons Lane, Cokes Lane, Nightingales Lane, Beel Close, Elizabeth Avenue and Lodge Lane • Date: Several times a year • Source: Surface water • Pathway: Roads • Receptors: Roads, pavements and verges
Little Missenden Parish Council	[No response]
Penn Parish Council	Not a problem in Penn Parish other than when Highway drains or gullies get blocked.
Seer Green Parish Council	Letter response received (including map and photos). In summary: <ul style="list-style-type: none"> • Locations: Chalfont Road, School Lane, Newbarn Lane, Longbottom Lane • Date: Frequently, with heavy rain • Source: surface water runoff, particularly from adjacent fields • Pathway: water ponds due to blocked drains – field runoff contains substantial amount of material and drains require regular clearance • Receptors: roads and footpaths
South Bucks District Council	[No response]
Thames Water	[Provided data]
The Lee Parish Council	[No response]
Three Rivers District Council (Hertfordshire)	[The updated SFRA] is now available on our website at http://www.threerivers.gov.uk/Default.aspx/Web/EvidenceBase (under EB14) and I would suggest that Jacobs may wish to review this information in preparing the SFRA. We have no other comments to make on the 2008 SFRA or on your proposals.
Transport for London	[No response]
Wycombe District Council	At this stage we do not have any comments to make. However we wish to be kept updated as the SFRA develops and would welcome the opportunity to comment on any draft version as it develops.

Appendix B Chesham SWMP Options Map

Further information on the Chesham Surface Water Management Plan can be found on the BCC website at: www.buckscc.gov.uk/flooding.