



Chiltern and South Bucks SFRA

Chiltern and South Bucks District Councils

Strategic Flood Risk Assessment (Level 1)

B127F002-01 | 02

27 October 2016



Chiltern and South Bucks SFRA

Project No: B127F002
Document Title: Strategic Flood Risk Assessment (Level 1)
Document No.: B127F002-01
Revision: 02
Date: 27 October 2016
Client Name: Chiltern and South Bucks District Councils
Client No: -
Project Manager: Catrin Smith
Author: Matthew Aspin, Martin White
File Name: \\Cprofil01\projects\Chiltern and South Bucks SFRA\900 Deliverables\02 SFRA Report\v02\B127F002-CDC-SBDC-SFRA-02 v02.docx

Jacobs U.K. Limited

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

© Copyright 2016 Jacobs U.K. Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Limitation: This report has been prepared on behalf of, and for the exclusive use of Jacobs' Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Document history and status

Revision	Date	Description	By	Review	Approved
01	22/09/16	For client review	M Aspin & M White	M Symons	C Smith
02	27/10/16	Final issue to client	M Aspin & M White	M Symons	C Smith

Contents

Glossary	vi
Executive Summary	1
List of Supporting Figures	2
1. Introduction	4
1.1 Overview	4
1.2 Consultation and Co-operation.....	7
2. Planning Policy Framework and Other Guidance	9
2.1 Introduction.....	9
2.2 National Planning Policy.....	9
2.3 Adopted Development Plan Policy	10
2.4 Other Guidance	13
2.5 Signpost Summary for the SFRA from the Policy and Guidance Review.....	16
3. Approach to this Strategic Flood Risk Assessment	17
3.1 Role of the SFRA.....	17
3.2 Methodology for the Level 1 SFRA	18
4. Consultation Undertaken as Part of the SFRA	20
4.1 Consultation Letters and Responses	20
4.2 Signposting Summary	36
5. Data Collection and Flood Zone Delineation	37
5.1 Overview.....	37
5.2 Information on Historic Flooding.....	37
5.3 Delineation of the Fluvial Flood Zones	38
5.4 Delineation of Areas of Critical Drainage	42
5.5 Delineation of Reservoir Failure	43
5.6 Flood Management Structures and Features.....	43
5.7 Topography & Geology.....	44
5.8 Chesham Surface Water Management Plan.....	44
6. Flood Risk in Chiltern and South Bucks	46
6.1 Overview	46
6.2 Summary of Past Flooding	46
6.3 Predicted Flood Risk	47
6.4 Potential Impact of Climate Change.....	51
6.5 Cross-Border Flows.....	54
6.6 Residual Risk of Flooding.....	55
7. Potential Urban Extension Options (Housing) and Employment Areas of Search	56
7.1 Introduction.....	56
7.2 Preliminary Assessment.....	56
7.3 Preliminary Assessment Summary	56
8. Sustainable Flood Risk Management	58
8.1 Overview.....	58
8.2 Responsibility for Flood Risk Management.....	58

8.3	Local Plans	60
8.4	Development Management Advice	63
8.5	Local Community Action to Reduce Flood Damage	68
8.6	Emergency Planning	68
8.7	Flood Risk Mitigation	70
9.	Level 2 SFRA and Updating this SFRA	73
9.1	Level 2 SFRA	73
9.2	Updating this SFRA	73

Appendix A – Supporting Figures

Appendix B – Consultation Letters

Appendix C – Summary of Past Flooding by Settlement

Appendix D – Preliminary Flood Risk Assessment – Issues and Options Sites

Appendix E – Environment Agency Consultation Response

List of Figures

Figure 7-1 : Sequential and Exception Test Flow Diagram (NPPG)	57
--	----

List of Tables

Table 0-1 : List of Supporting Figures for Reference	3
Table 1-1 : Key Considerations to Inform this SFRA.....	6
Table 3-1 : NPPG Table 3 - Flood Risk Vulnerability and Flood Zone Compatibility	18
Table 4-1 : Consultees and Responses	36
Table 5-1 : Flood Zone 3b Delineation Data.....	41
Table 6-1 : Peak River flow Allowances for Climate Change for Thames River Basin District	54
Table 6-2 : Peak Rainfall Intensity Climate Change Allowances.....	54
Table 8-1 : Development Management Advice	67
Table 8-2 : Potential Flood Risk Mitigation Measures	72
Table 9-1 : Summary of Past Flooding by Settlement.....	8
Table 9-2 : Preliminary Flood Risk Assessment Issues and Options Sites (Assuming 'More Vulnerable' Development)	14
Table 9-3 : Preliminary Flood Risk Assessment of Issues and Options Sites (Assuming 'Less Vulnerable' Development)	16

Supporting Information

An 'Aquaprint' for Chesham (July 2014). Available from:

<http://www.buckscc.gov.uk/environment/flooding/community-action/floodsmart-in-chesham/>

BCC Flood Investigations. Available from:

<http://www.buckscc.gov.uk/environment/flooding/strategic-flood-management/flood-investigations/>

BCC Local Flood Risk Management Strategy (May 2016). Available from:

<http://www.buckscc.gov.uk/environment/flooding/strategic-flood-management/flood-management-strategy/>

BCC PFRA Mapping Appendices (May 2011). Available from:

http://www.buckscc.gov.uk/media/2275636/pfra_appendices.pdf

BCC Riparian Owners Guidance. Available from:

<http://www.buckscc.gov.uk/media/2700591/Guidance-for-Riparian-Owners.pdf>

BCC Website – Flooding. Available from: www.buckscc.gov.uk/flooding

Buckinghamshire County Council PFRA (May 2011). Available from:

https://www.buckscc.gov.uk/media/2275631/pfra_prelim_assessment_report_final.pdf

CDC Supplementary Planning Documents. Available from: <http://www.chiltern.gov.uk/spds>

Chalfont St. Peter Neighbourhood Plan (September 2016). Available from:

<http://www.chiltern.gov.uk/ChalfontStPeter>

Civil Contingencies Act (2004). Available from:

http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga_20040036_en.pdf

DEFRA Groundwater Flooding Scoping Study (Jacobs, May 2004). Available from:

http://www.persona.uk.com/a21Ton/Core_dox/H/H14.pdf

DEFRA Guidance Document “Flood Risks to People”. Available from: www.defra.gov.uk/

Environment Agency ‘Learn more about this area’s flood risk mapping’. Available from:

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater>

Environment Agency Local Flood Risk Mapping. Available from:

Environment Agency Open Data (2004). Available from: <https://data.gov.uk/data/search>

Environment Agency website. Available from: www.environment-agency.gov.uk

Flood and Water Management Act (2010). Available from:

http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

Flood Risk Assessment NPPG. Available from: <https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

Hydrology in Burnham Beeches (February 2014). Available from:

<http://www.southbucks.gov.uk/CHttpHandler.ashx?id=4887&p=0>

NPPF (March 2012). Available from:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

NPPG. Available from: planningguidance.communities.gov.uk

NPPG Climate Change Allowances. Available from: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

NPPG Flood Risk Assessment in Flood Zone 1 and Critical Drainage Areas. Available from:
<https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>

NPPG for Flood Risk and Coastal Change. Available from:
<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

NPPG Flood Zone Definitions. Available from:
<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-1-flood-zones/>

South Bucks Green Belt. Available from: <http://www.southbucks.gov.uk/article/3889/Green-Belt>

SuDS Manual (November 2015). Available from:
http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

Table 3 of NPPG: Flood Risk and Coastal Change. Available from:
<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-3-flood-risk-vulnerability-and-flood-zone-compatibility/>

Thames Valley Community Risk Register (2014). Available from:
www.thamesvalleylrf.org.uk/useful-links/publications/risk-register.ashx

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 and South Bucks 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.
DCLG	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	The development plan provides the relevant local planning policy for a given geographical area. It includes adopted Local Plans and neighbourhood plans, and is defined in Section 38 of the Planning and Compulsory Purchase Act 2004.
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
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 <i>has</i> 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.

Term	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, adopted by the local planning authority in consultation with the community and other stakeholders. The Local Plan forms part of the development plan. As Buckinghamshire is a two tier authority the Minerals and Waste Local Plan is relevant as well as the Districts' Local Plan (Chiltern and South Bucks are working on an emerging joint Local Plan).
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.
National Planning Policy Guidance (NPPG)	Planning practice guidance for a range of areas and disciplines published by the Government and updated regularly with latest guidance ¹ .
Neighbourhood Plans	A plan prepared by a Parish Council or Neighbourhood Forum for a particular neighbourhood area (Planning and Compulsory Purchase Act (2004) was amended by the Localism Act (2011) to include provisions for neighbourhood plan making) and amendments were also made in the Housing and Planning Act (2016).
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.
Permitted Development (PD)	Permitted Development rights allow for some minor development, such as certain sizes of building extension, without planning permission.
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
South Bucks District Council	South Bucks District Council
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>)

¹ NPPG. Available from: planningguidance.communities.gov.uk

Term	Definition
Supplementary Planning Document (SPD)	Documents which add further detail to the policies in the Local Plan. They can be used to provide further guidance for development on specific sites, or on particular issues, such as design. Supplementary planning documents are capable of being a material consideration in planning decisions but are not part of the development plan. <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 less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Zone 2 Medium Probability	NPPF Flood Zone which comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year.
Zone 3a High Probability	NPPF Flood Zone which comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year.

Executive Summary

This document presents a combined Level 1 Strategic Flood Risk Assessment (SFRA) for Chiltern District Council and South Bucks District Council. It provides part of the evidence base for the joint Chiltern and South Bucks Local Plan (2014-2036) as well as more strategic guidance on considering flood risk when determining planning applications.

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 a requirement of the National Planning Policy Framework (NPPF) 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 flooding problems. This SFRA is an important step in informing choices on where future development should be located and is an important part of the evidence base for the emerging joint Local Plan.

This Level 1 SFRA provides information relating to flood risk, which includes the following:

- A summary of past recorded flooding across the Districts 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 systems (SuDS) should be a priority;
- Development management and spatial planning recommendations within each Flood Zone and Areas of Critical Drainage, including high level recommendations to aid decision making in the emerging joint Local Plan; and
- General advice on managing flood risk, including property protection, emergency planning (including maps showing key evacuation routes) and site specific Flood Risk Assessments.

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 planning policy and other guidance is provided.

In terms of the potential fluvial flooding, the Rivers Chess and Misbourne flow north-west to south-east through Chiltern District, with the Vale Brook flowing into the River Chess in Chesham. The Rivers Alderbourne, Colne and Misbourne flow north-east to south-east through South Bucks District; with the River Thames flowing through the south-westerly section. A number of brooks and ditches feed into these main rivers. In general, the river valleys are well defined, and river flooding is not a significant issue for much of the local community. Environment Agency flood mapping indicates flooding from the River Thames is likely to cover a substantial area south of Taplow. Flooding from the Vale Brook through Chesham is also an issue since it is predominantly culverted and receives a significant volume of urban runoff. Flooding of roads and properties from other localised sources of flooding occurs across Chiltern and South Bucks including surface water, groundwater, sewers and blocked flood relief assets.

A preliminary assessment of the flood risk to potential Local Plan options sites for housing and employment is provided in Appendix D. This is based on the sites referred to in the Regulation 18 consultation (incorporating Issues and Options) Jan – March 2016.

List of Supporting Figures

Figure Number	District Covered	Figure Contents
1	CDC	Fluvial Flood Risk (Great Missenden and Little Missenden)
2	CDC	Fluvial Flood Risk (Amersham and Coleshill)
3	CDC	Fluvial Flood Risk (Chalfont St. Giles)
4	CDC	Fluvial Flood Risk (Chalfont St. Peter)
5	CDC	Fluvial Flood Risk (Chesham and Chesham Bois)
6	CDC	Fluvial Flood Risk (Latimer and Chenies)
7	SBDC	Fluvial Flood Risk (Gerrards Cross, Denham and Tatling End)
8	SBDC	Fluvial Flood Risk (Denham, Iver Heath and Uxbridge)
9	SBDC	Fluvial Flood Risk (Iver and Shreding Green)
10	SBDC	Fluvial Flood Risk (Stoke Poges and Wexham)
11	SBDC	Fluvial Flood Risk (Fulmer)
12	SBDC	Fluvial Flood Risk (Burnham and Taplow)
13	SBDC	Fluvial Flood Risk (Dorney and Taplow)
14	SBDC	Fluvial Flood Risk (Dorney)
15	CDC	Local Flood Risk
16	SBDC	Local Flood Risk
17	CDC	Areas of Critical Drainage
18	SBDC	Areas of Critical Drainage
19	CDC	Sewer Flooding
20	SBDC	Sewer Flooding
21	CDC	Structures
22	SBDC	Structures
23	CDC	Flood Warning & Alert Areas
24	SBDC	Flood Warning & Alert Areas
25	CDC	Geology
26	SBDC	Geology
27	CDC	Evacuation Routes (Great Missenden and Little Missenden)
28	CDC	Evacuation Routes (Amersham and Coleshill)
29	CDC	Evacuation Routes (Chalfont St. Giles)
30	CDC	Evacuation Routes (Chalfont St. Peter)
31	CDC	Evacuation Routes (Chesham and Chesham Bois)
32	CDC	Evacuation Routes (Latimer and Chenies)
33	SBDC	Evacuation Routes (Gerrards Cross, Denham and Tatling End)
34	SBDC	Evacuation Routes (Denham, Iver Heath and Uxbridge)
35	SBDC	Evacuation Routes (Iver and Shreding Green)
36	SBDC	Evacuation Routes (Stokes Poges and Wexham)
37	SBDC	Evacuation Routes (Fulmer)
38	SBDC	Evacuation Routes (Burnham and Taplow)
39	SBDC	Evacuation Routes (Dorney and Taplow)

Figure Number	District Covered	Figure Contents
40	SBDC	Evacuation Routes (Dorney)
41	CDC	Issues and Options Sites
42	SBDC	Issues and Options Sites
43	CDC	River Misbourne Environment Agency Modelled Flood Zones
44	CDC	River Misbourne Environment Agency Modelled Flood Zones
45	CDC	River Misbourne Environment Agency Modelled Flood Zones
46	CDC	River Misbourne Environment Agency Modelled Flood Zones
47	SBDC	River Misbourne Environment Agency Modelled Flood Zones

Table 0-1 : List of Supporting Figures for Reference

1. Introduction

1.1 Overview

Chiltern District Council (CDC) and South Bucks District Council (SBDC) are producing an emerging joint Local Plan covering the period 2014-2036. Once adopted, this will replace existing adopted plans for both Districts.

- Chiltern District is situated to the north west of London in the county of Buckinghamshire. The District covers an area of approximately 196 square kilometres (source: sustainable community strategy) and has a population of approximately 92,600 (2011 Census). Approximately 72% of land is in the Chiltern AONB and 80% in the Green Belt (sustainable community strategy).
- South Bucks District is situated to the west of London and is the smallest District, in terms of area, in Buckinghamshire. The District covers an area of approximately 141 square kilometres (source sustainable community strategy) and has a population of approximately 66,900 people (2011 Census). Approximately 87% of the District lies within the Green Belt².

As part of the evidence to support the emerging joint Local Plan, information is required on the probability and likelihood of flooding. This information will be used to inform the policies of the emerging joint Local Plan in particular the choice and location of development sites. It is also importance to note that the Chiltern and South Bucks Sustainable Community Strategy has been incorporated into the joint Business Plan³.

A relatively small proportion of Chiltern and South Bucks are at risk of flooding from rivers. Notwithstanding this, flooding caused by groundwater, surface water runoff, ordinary watercourses and/or flood relief asset blockages may result in localised flooding, 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. The impacts on property and businesses can be devastating and the fear of the repeated risk of flooding can affect well-being. Organisational responsibilities for managing flood risk have changed substantially in the last few years with Local Authorities now taking a greater lead on managing flood risk through the introduction of the Flood and Water Management Act (2010)⁴.

The following provides definitions of the principal local sources of flooding as defined by Jacobs and referred to throughout this SFRA.

² South Bucks Green Belt. Available from: <http://www.southbucks.gov.uk/article/3889/Green-Belt>

³ Chiltern and South Bucks Aims and Objectives. Available from: <http://www.chiltern.gov.uk/Aims-and-Objectives>

⁴ Flood and Water Management Act (2010). Available from: http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

Local Flood Risk

Buckinghamshire County Council, Chiltern District Council, South Bucks District Council and their partners have responsibilities for managing local flood risk, i.e. flood risk from sources other than Main Rivers, 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

The NPPF requires that local planning authorities prepare a SFRA in consultation with the Environment Agency and others. The primary purpose of the SFRA is to determine the likelihood of flood risk across Chiltern and South Bucks, based upon data from a variety of sources. Robust information on flood risk is essential to inform and support the Councils' revised flooding policies in their emerging joint Local Plan as well as to help inform decisions when determining planning applications. This report and the supporting mapping represent the Level 1 SFRA⁵. It will be used by the Councils to inform the future application of the Sequential Test in the emerging joint Local Plan which is where preference is given to developing sites which have the lowest risk of flooding (see Sections 2 and 3).

Following the application of the Sequential Test, it may be necessary to develop a further document referred to as a Level 2 SFRA⁶. This would only be necessary if proposed land use allocations are required to pass the Exception Test in accordance with the NPPF based on their vulnerability classification and the Flood Zone they are situated within. Essentially, the two parts to the Exception Test require proposed development to demonstrate that it will provide wider sustainability benefits to the community that outweigh flood risk and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

The SFRA has a broader purpose in terms of:

- informally assisting the determination of planning applications by providing a more informed response to development proposals which may be affected by flooding;
- helping to identify and implement strategic solutions to flood risk, providing the flood risk basis for possible future flood attenuation works, for example additional infrastructure or land management techniques, by a range of agencies with responsibility for flood risk management; and
- support and inform both Councils' emergency planning response to flooding.

⁵ Refer to the National Planning Policy Guidance for Flood Risk and Coastal Change (<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>)

⁶ Refer to the National Planning Policy Guidance for Flood Risk and Coastal Change (<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>)

The SFRA has been developed working collaboratively with Chiltern District Council, South Bucks District Council, Buckinghamshire County Council (BCC) and the Environment Agency. In addition, further stakeholder engagement has also been carried out to inform this process and this is outlined in more detail within Section 4.

Knowledge exists with respect to flood risk within Chiltern and South Bucks, provided largely in the form of records of observed flooding and provided from a variety of sources. The SFRA has gathered and built upon this existing knowledge, underpinning the delineation of Chiltern and South Bucks into zones of ‘high’, ‘medium’ and ‘low’ probability of fluvial flooding, in accordance with the NPPF, and together with Areas of Critical Drainage (ACDs). These zones have been used to provide robust and transparent evidence to help inform the emerging joint Local Plan.

This SFRA replaces previous SFRA's for both Chiltern and South Bucks. Table 1-1 highlights a number of considerations which have informed this new document.

Prompt Question	Response Leading to This Update
Has any flooding been observed within Chiltern and South Bucks since the previous SFRA's were completed?	A number of flood events, from multiple sources, have occurred (predominantly through Winter 2013/2014)
Have any amendments to planning policy and guidance been released since the previous SFRA's?	The NPPF was introduced in 2012 and is supported by National Planning Practice Guidance.
Have Areas of Critical Drainage for Chiltern and South Bucks changed since the previous SFRA's?	Areas of Critical Drainage delineated using Environment Agency Flood Zone 2 and updated Flood Map for Surface Water; therefore these areas will have changed and will supersede the Critical Drainage Area shown in the 2008 SFRA for Chiltern and the Areas of Critical Drainage shown in the 2013 SFRA for Chiltern.
Has the Environment Agency issued any amendments to their flood risk mapping and/or standing guidance?	Updated flood extents are available for the River Misbourne. The Environment Agency has revised its guidance to the consideration of the predicted impacts of climate change since the last CDC and SBDC SFRA's were published.
Has the implementation of the previous SFRA's within the spatial planning and/or development control functions of each Council raised any particular issues or concerns that need to be reviewed as part of this SFRA process?	None have been raised to date but Development Management will be consulted on the Draft SFRA.

Table 1-1 : Key Considerations to Inform this SFRA

It is known that the Environment Agency shall be updating their hydraulic model of the River Thames in late 2016 to early 2017, this could change the predicted flood extent and consequently the flood risk zones in South Bucks. There will be an update of UK climate change predictions (currently UKCP09) in 2018 (see Section 6.4) which could lead to revised guidance on how planning authorities should account for the predicted impacts of climate change in SFRA's. The update of the UK climate change predictions could prompt an update of the associated guidance for its incorporation into SFRA's currently provided by the Environment Agency. A review of the revised predictions and associated guidance should be completed to assess the impact on the content of this SFRA, which may need updating.

The Environment Agency is also currently completing detailed modelling along the River Misbourne. The final version of this modelling is anticipated to be completed at the end of 2016 and to be incorporated into the next update of the Environment Agency Flood Zones, early in 2017. Figures 43 to 47 show the draft extents of the River Misbourne detailed modelling.

1.2 Consultation and Co-operation

Consultation and co-operation is particularly important in light of the 'Duty to Cooperate' required 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*".

Engagement and consultation with key stakeholders has been carried out through the following processes:

- An inception meeting was held between Jacobs, Chiltern, South Bucks, Buckinghamshire County Council and the Environment Agency on 6 July 2016;
- Letters were sent to a range of consultees asking for any comments to inform the SFRA (see Appendix B);
- Responses from Bucks CC Flood Team and the Environment Agency which were received in relation to the Issues and Options on the emerging joint Local Plan were reviewed with respect to specific comments received on flood risk;
- Pertinent matters have been discussed via the regular lead flood authority Flood Liaison Group; and
- An internal consultation process with Chiltern District Council, South Bucks District Council, Buckinghamshire County Council and the Environment Agency in relation to the draft of this updated SFRA, which took place throughout Summer and Autumn 2016 to seek feedback from various stakeholders on the document.

The River Misbourne and River Chess catchments encompass a number of Districts within the region, and future development could influence the risk of flooding posed to neighbouring areas if not carefully managed. Responses regarding cross-border flows were obtained from the Royal Borough of Windsor and Maidenhead (RBWM) Highways team and Aylesbury Vale District Council. The response from RBWM focusses on the River Thames as the natural border between South Bucks and RBWM. It was stated that

"the main sources of cross-border flooding are fluvial flood risk from the River Thames as well as the subsequent impacts on groundwater levels and local watercourses. Significant flooding was reported to be experienced because of this in January and February 2014. 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".

As there are no watercourses between Aylesbury Vale and Chiltern, there are no specific cross boundary issues related to fluvial flooding. However due to the topography, surface and groundwater flows could occur (see Section 6.5 for more detail).

The Environment Agency has a six year programme of flood mitigation works which includes three specific projects that might affect flood risk in the Chiltern and South Bucks Districts:

- Chesham Flood Alleviation Scheme – the Environment Agency are currently identifying potential options to alleviate flood risk from the Vale Brook in Chesham;
- Colne Brook Flood Alleviation Scheme – although the project is focussing on protecting properties from flooding in Colnbrook Village, there could be scope to incorporate improvement for Willow Bank and New Denham; and

- Misbourne Flood Alleviation Scheme – The Environment Agency are investigating fluvial flood risk along the River Misbourne; this could identify options to alleviate flood risk in Old Amersham, Chalfont St. Giles and Chalfont St. Peter.

Details of the consultation process and a full list of consultees are provided in Section 4.

2. Planning Policy Framework and Other Guidance

2.1 Introduction

Chiltern District Council and South Bucks District Council are preparing an emerging joint Local Plan.

This SFRA will form part of the evidence base for the land use policies and allocations within the emerging joint Local Plan.

Chiltern and South Bucks Councils are now preparing for the next public consultation stage which will consult on Green Belt Preferred Options to help address future development needs.

This Section provides a brief overview of the national and local planning policy context relevant to flood risk including a review of other relevant guidance.

2.2 National Planning Policy

The NPPF provides guidance and direction to local planning authorities. It is the responsibility of local planning authorities to produce Local Plans to establish 'sound' planning policies which are in accordance with the requirements of the NPPF. To ensure this is the case, Local Plans must follow the Town and Country Planning (Local Planning) (England) Regulations. These Regulations include provision for an independent examination on the submitted version of the Local Plan on behalf of the Secretary of State.

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

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

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

The NPPF also 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.

National Planning Policy Guidance (NPPG) provides specific guidance relating to the implementation of policies contained in the NPPF, including guidance on flood risk and the

production of site specific flood risk assessments (FRA) and SFRA's. It sets out how these should be applied when considering the Sequential Test and Exception Test in preparing development plans and in determining planning applications. The NPPG is considered in more detail in Section 3 of this report.

2.3 Adopted Development Plan Policy

This section includes a number of key policies regarding development within Chiltern and South Bucks that have been adopted⁷.

2.3.1 Adopted Chiltern Core Strategy

The Core Strategy for CDC, which covers the period to 2026, was adopted in November 2011. It therefore pre-dates the NPPF and associated NPPG.

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.

The key policy with regard to flood risk is CS4 (ensuring that development is sustainable). Points j and k cover development and flood risk:

- *“(j) 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;*
- *(k) Reduced risk of flooding in appropriate circumstances as a result of the new development.”*

Policy CS31 (Infrastructure) recognises that new infrastructure will be required and states:

“New development proposals 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. 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 (Green Infrastructure) seeks the identification, protection and enhancement of strategic green infrastructure assets in the District, which can include SuDS schemes.

⁷ The Delivery Development Plan Document would have formed part of the Local Plan but it was withdrawn by the Council in 2015.

2.3.2 Chiltern District Council Sustainable Construction and Renewable Energy Supplementary Planning Document

This was adopted in February 2015 and it provides additional guidance on how Policy CS4 is interpreted and applied. Section 5 refers to Water Quality and Consumption and Section 6 refers to Flood Risk and Sustainable Drainage. Some key principles are:

- Provides up to date guidance on flood risk in accordance with the NPPF and the NPPG;
- Highlights the national requirement to include SuDS in development proposals that are above a certain threshold;
- Outlines areas where surface water management is a local issue and what action is in place to seek to address this, such as the Aquaprint project in Chesham⁸;
- Outlines the need for developers to consult flood risk zone maps produced by the Environment Agency and the SFRA prior to considering development proposals. Appropriate Flood Risk Assessments will be required to support development;
- Areas of Critical Drainage are areas, identified in the SFRA 2013 maps, which are likely to be the most at risk from flooding from surface water, groundwater and ordinary watercourses and where SuDS would be a priority. The 2013 SFRA ACD extents are now superseded by those delineated within this SFRA, a further explanation can be found in Section 5.4. In these areas (or areas identified in subsequent updates), developers should submit a checklist with their applications in order to show that development proposals will not exacerbate flood risk;
- Provides sign posts to best practice design techniques to make properties more resilient to flooding; and
- Provides detailed guidance on different SuDS techniques.

2.3.3 Saved Policies from the 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 until 2006. Whilst some of the policies remain saved until such time they are replaced by the emerging joint Local Plan, they are not considered relevant to this SFRA.

2.3.4 South Bucks Core Strategy (2011)

The Core Strategy is the key document in the South Bucks Local Development Framework. It presents the 'big picture', setting a long-term vision, objectives and broad strategy for accommodating future development in the District in the period to 2026.

Core Policy 13: Environmental and Resource Management encompasses various material considerations covering the environment, including air quality and sustainable design and construction. Core Policy 13 covers drainage issues and states:

“All new development must be water efficient and incorporate Sustainable Drainage Systems (SuDS) where feasible. All new residential development should achieve a minimum water efficiency target of 105 litres per person per day”.

⁸ An 'Aquaprint' for Chesham (July 2014). Available from: <http://www.buckscc.gov.uk/environment/flooding/community-action/floodsmart-in-chesham/>

Core Policy 13 also addresses flood risk and states, “vulnerable development will be steered away from areas at risk of flooding wherever possible in accordance with PPS 25”.

2.3.5 Saved Policies from the South Bucks Local Plan

The South Bucks Local Plan was originally adopted in 1999. As the Local Plan was published before the introduction of the NPPF, it has been agreed with the planning authority that there are no saved policies which need to be considered in this SFRA.

2.3.6 Development Management Guidance Note - Burnham Beeches

South Bucks District Council has a number of Development Management Guidance Notes, which are similar to Supplementary Planning Documents. Whilst they are not a statutory part of the adopted Local Plan framework, they offer detailed and considered guidance on material consideration pertinent to South Bucks. One of the guidance notes for Burnham Beeches contains guidance on drainage and water quality. The development management guidance for Burnham Beeches consists of two parts:

- Hydrology in Burnham Beeches Guidance Note (February 2014)⁹; and
- Burnham Beeches Hydrology Study (October 2013).

The hydrology guidance note contains advice on constructing near watercourses and SuDS and states:

“construction activities in or near water have the potential to cause pollution, impact upon the bed and banks of watercourses and impact upon the quality and quantity of the water. The reduction of these potential impacts should form an inherent part of the layout design of any new development. The layout constraints should include a 10m built exclusion zone in the vicinity of any watercourse. In accordance with Environment Agency guidance on pollution prevention, additional site specific mitigation measures are also required. Refuelling and cleaning of plant machinery and equipment should take place off site. Any fuels, lubricants or chemicals should not be stored within 10 m of the watercourse”.

SuDS

The advice also states that “developers are required to adopt the principles of SuDS when submitting development proposals within the planning catchments identified in the catchment area map. This is a versatile design approach which seeks to replicate natural drainage patterns and to reduce pollution from runoff and improve ecology”.

The document also contains four key principles on SuDS:

1. *“Prevention – good maintenance & site design to reduce & manage runoff & pollution e.g. land-use planning, reduction of paved surfaces.*
2. *Source Control – runoff managed as close to the source as possible e.g. green roofs, rainwater harvesting, permeable paving, filter strips.*
3. *Site Control – runoff managed in a network across a site or local areas e.g. using swales, (shallow vegetated channels designed to store and/or convey runoff) detention basins, public realm SuDS components for attenuation & treatment. Also, flow should be slowed using overland conveyance routes.*

⁹Hydrology in Burnham Beeches (February 2014). Available from: <http://www.southbucks.gov.uk/CHttpHandler.ashx?id=4887&p=0>

4. *Regional Control – downstream management of runoff for a whole site/catchment e.g. retention ponds, wetlands”.*

The Burnham Beeches Hydrology Study relates more to the ecological importance of the Burnham Beeches site as a designated National Nature Reserve and a Special Area of Conservation and the need to keep watercourses that feed into the reserve clean.

2.3.7 Neighbourhood Plans in Chiltern and South Bucks

Neighbourhood planning was introduced through the Localism Act 2011. The regulations which underpin it came into force in April 2012. There are seven Parish Councils within Chiltern and South Bucks that have been declared neighbourhood areas since the introduction of the regulations, these are:

- Chalfont St. Peter;
- Chalfont St. Giles;
- Farnham Royal;
- Gerrards Cross;
- Iver;
- Seer Green; and
- Taplow.

This means the associated Parish Councils can now produce Neighbourhood Plans. Of these seven declared neighbourhood areas, only Chalfont St. Peter have produced a neighbourhood plan to date¹⁰. The Chalfont St. Peter neighbourhood plan has now been included in the Chiltern District Development Plan for the Chalfont St. Peter neighbourhood area, since the decision to do so was made by referendum in September 2016.

If adopted, the neighbourhood plans for the remaining neighbourhood areas would provide bespoke planning guidance for these areas and along with the emerging joint Local Plan would be part of the overall Development Plan.

2.4 Other Guidance

2.4.1 Climate Change Commitments in Chiltern

This commitment is a strategic objective following a climate change declaration in 2007. Since this declaration, Chiltern District has produced a comprehensive Climate Change Strategy and implemented a number of other local initiatives relating to energy efficiency, green energy production and sustainable travel policies.

The Climate Change Strategy provides a commitment to meeting national indicators on climate change through monitoring progress and ensuring the statutory functions of the Council and other authorities employ practices that are both environmentally sensitive but also increase resilience to climate change.

2.4.2 Sustainable Community Strategy for Chiltern and South Bucks 2016-2026

This draws together strategies previously produced for each District. It sets out objectives and local actions around five core themes which are:

¹⁰ Chalfont St. Peter Neighbourhood Plan (September 2016). Available from: <http://www.chiltern.gov.uk/ChalfontStPeter>

- *‘Thriving Economy;*
- *Sustainable Environment;*
- *Safe Communities;*
- *Health and Wellbeing; and*
- *Cohesive and Strong Communities.’*

2.4.3 Chiltern and South Bucks Corporate Objectives

In addition to the sustainable community strategy, both Councils have developed corporate policies to drive future change:

- The objective for Chiltern District is to *‘enhance Chiltern as a desirable place to live, work, visit and enjoy’*; and
- For South Bucks the objective is to *‘deliver great value, customer focused sustainable services’*.

In addition both districts have three corporate objectives to support their visions:

- *‘Deliver cost effective customer focused services;*
- *Work towards safer and healthier local communities; and*
- *Conserve the Environment and promote sustainability’*.

2.4.4 Buckinghamshire County Council Local Flood Risk Management Strategy

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

BCC published its most recent edition of the Local Flood Risk Management Strategy (FRMS) in May 2016¹¹. 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. The strategy was produced for a number of reasons, these are stated as:

- *‘In a review of natural hazards across Europe in the decade to 2009, floods, along with storms, were the most damaging form of disaster in terms of economic losses. The UK is registered as having the highest economic losses from flooding within Europe. A major contribution to these losses results from flooding from watercourses other than main rivers or the sea.*
- *In England, in 2009, around 5.2 million, or 1 in 6 residential and commercial properties were identified as being in areas at risk of flooding from rivers, the sea or surface water. Furthermore, 1.7 million properties have been identified as being at risk of flooding from groundwater.*

¹¹ BCC Local Flood Risk Management Strategy (May 2016). Available from: <http://www.buckscc.gov.uk/environment/flooding/strategic-flood-management/flood-management-strategy/>

- *Buckinghamshire has suffered the consequences of flooding in recent years. Flooding of homes, businesses, agricultural land as well as roads, public services and the wider environment has occurred from rivers, smaller watercourses, intense rainfall, groundwater and sewers.*
- *Flooding from the Main Rivers in Buckinghamshire continues to be managed by the Environment Agency using their permissive powers. However, to provide better and more comprehensive management of flood risk, the Flood & Water Management Act 2010 has assigned new responsibilities to local authorities.*
- *There is a need to update flood and coastal erosion risk management to reflect current approaches and organisational structures.*
- *Consideration of how to adapt to climate change is an important strategic issue. Climate change is predicted to increase flood risk through changing patterns of rainfall and flood flows in rivers, and increased risks from surface runoff.”*

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 all flood incidents, regardless of significance; and
- 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.

2.4.5 Buckinghamshire County Council Preliminary Flood Risk Assessment

As required for by the Flood and Water Management Act, BCC, as Lead Local Flood Authority for Buckinghamshire, completed their latest update to the Preliminary Flood Risk Assessment (PFRA) in May 2011¹².

The scope of the report covers a review of historical local sources of flood risk (primarily surface runoff, groundwater and ordinary watercourses as well as potential risks of future flooding. This information is then used to identify Flood Risk Areas. Four objectives of the report as set out in the BCC PFRA are:

- *“Compile, map and assess records of historic flooding¹³ from surface runoff, groundwater and*
- *Ordinary watercourses (referred to as ‘past flooding’);*
- *Identify and map¹⁴ areas at risk of flooding;*
- *Produce a PFRA report which satisfies the requirements of the Regulations; and*
- *Inform development of a strategy to manage local flood risk.”*

¹² Buckinghamshire County Council PFRA (May 2011). Available from: https://www.buckscc.gov.uk/media/2275631/pfra_prelim_assessment_report_final.pdf

¹³ The data used to produce the PFRA Flood History mapping has also been used to identify historical flood events in Figures 15 and 16 of this SFRA.

¹⁴ BCC PFRA Mapping Appendices (May 2011). Available from: http://www.buckscc.gov.uk/media/2275636/pfra_appendices.pdf

2.4.6 Groundwater Flooding Scoping Study

A groundwater flooding scoping study was commissioned by the Department of Environment, Food and Rural Affairs (DEFRA) to provide information on the scale, distribution and nature of groundwater flooding in England. The supporting maps¹⁵ indicate the locations of historical groundwater flood incidents and identify areas vulnerable to groundwater emergence.

2.5 Signpost Summary for the SFRA from the Policy and Guidance Review

A brief summary is included below highlighting some of the key pieces of information from the policies and guidance documents discussed throughout Section 2. Some over-arching conclusions relevant to this SFRA are:

- The Core Strategies for Chiltern and South Bucks both pre-date guidance on flood risk contained in the NPPF and supporting NPPG;
- For Chiltern, Supplementary Planning Guidance to the Core Strategy means Policy CS4 which includes flood risk is consistent with the latest guidance in the NPPF and NPPG, through providing additional information with respect to the application of Policy CS4. In particular, it provides additional guidance on how developments should manage flooding in Areas of Critical Drainage;
- The SPD would no longer be valid once the emerging joint Local Plan is adopted and a new SPD would need to be adopted. However, as many aspects of the SPD remain relevant, then this could be an update rather than starting again from scratch. This update would also need to cover South Bucks;
- South Bucks does not have an SPD but has additional non statutory guidance relating to the sensitive natural area of Burnham Beeches. This guidance could also be incorporated into a replacement SPD once the emerging joint Local Plan is adopted;
- Both Chiltern and South Bucks have other related objectives, guidance and strategies which whilst not directly linked to Local Planning Policy, set the context for how future development in both districts would be shaped and implemented. This includes objectives on tackling climate change, managing water consumption and protecting water resources, reducing flood risk and improving resilience to the impacts of climate change including flooding; and
- In addition, health and wellbeing is promoted which is important as people who live in areas impacted by flooding often suffer psychological trauma and fear that their properties or livelihood are not safe whilst flooding poses a serious risk. Flooding can be a danger to life as referred to in Section 6.3.2.

¹⁵ DEFRA Groundwater Flooding Scoping Study (Jacobs, May 2004). Available from: http://www.persona.uk.com/a21Ton/Core_dox/H/H14.pdf

3. Approach to this Strategic Flood Risk Assessment

3.1 Role of the SFRA

The important role of SFRA in the local plan process is set out in the National Planning Practice Guidance (2014). It states that local planning authorities should use the SFRA to:

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

The NPPG promotes effective and sustainable flood risk management through the planning system by steering development away from areas that are susceptible to flooding and where this is not possible ensure flood risk is managed as effectively as possible. The NPPG stipulates the application of a sequential approach to site allocation, the Sequential Test – seeking development sites within areas of lowest flood risk in the first instance (Flood Zone 1 – low probability of flooding).

The Sequential Test, which is set out in the NPPG¹⁶ with further detail provided in the NPPG, must be utilised in both allocating sites and determining applications. Tables 1 to 3 in the NPPG stipulate ‘appropriate’ land uses for each Flood Zone. Land uses are divided into five ‘vulnerability classifications’, detailed in Table 2 of the NPPG. Table 3 of the NPPG (see Table 3-1) can be used to determine the appropriateness of a potential development in a specific location.

¹⁶ NPPG (March 2012). Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
2	Appropriate	Exception Test required	Appropriate	Appropriate	Appropriate
3a	Exception Test required*	Not Appropriate	Exception Test required	Appropriate	Appropriate
3b	Exception Test required*	Not Appropriate	Not Appropriate	Not Appropriate	Appropriate*

* Conditions may be applicable (refer to NPPG)

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

Paragraph 102 of the NPPF states that:

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

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

This Level 1 SFRA provides the information required for the Sequential Test to be applied when considering different site options in the emerging joint Local Plan (at the time of this report the plan has concluded Issues and Options Stage and the next stage is Preferred Options). Depending on the outcome of the further stages of the emerging joint Local Plan, the Exception Test may be necessary. The Planning Practice Guidance (SFRA guidance, paragraph 012) states that the purpose of the Exception Test is:

“where a Level 1 Assessment shows that land outside flood risk areas cannot appropriately accommodate all the necessary development, it may be necessary to increase the scope of the Assessment to a Level 2 to provide the information necessary for application of the Exception Test where appropriate”.

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

3.2 Methodology for the Level 1 SFRA

In accordance with the NPPF a Level 1 SFRA should collect and refine data in order to define the Flood Zones. The adopted methodology for this Stage 1 SFRA is summarised in the subsequent Sections.

3.2.1 Data Collection

This involves the collection and review of data pertaining to known and perceived flood risk and current planning policy within the two districts. This has been collected via a number of sources which includes BCC, Environment Agency and Thames Water. In addition, a specific consultation exercise has been completed for this SFRA (see Section 4).

3.2.2 Assessment of Flood Risk

The extent and probability of flood risk within Chiltern and South Bucks has been categorised and assessed for the SFRA (see Figures 1 - 22) through:

- The identification of flood risk zones 1, 2, 3a and 3b (functional floodplain);
- Identification of locations of flood risk from other sources (ordinary watercourses, groundwater, sewers, reservoirs and canals);
- Identification of locations at risk of surface water flooding (termed Areas of Critical Drainage), particularly those outside fluvial risk areas;
- Existing flood defences and the areas protected by them that could be at risk should they fail.

3.2.3 Climate Change

Climate change has the potential to significantly increase the consequences of flooding. The assessment of flood risk has taken into account the estimated impact of climate change over the next 100 years (up to the year 2116). This has been assessed for changes in rainfall leading to an increase in fluvial flood risk due to higher river levels. This has the potential to increase the current risk of flooding through an increase in rainfall frequency and intensity. The frequency of high water levels on the River Thames is also expected to increase.

3.2.4 Outputs

In addition to the figures detailing flood risk within Chiltern and South Bucks (see Section 6.3.1) the following outputs have been produced as part of this SFRA:

- SFRA Report;
- Suggested policies and guidance for the local planning authorities on the management of flood risk in Chiltern and South Bucks;
- Figures detailing areas covered by Environment Agency Flood Alerts/Warnings;
- Figures depicting superficial and solid geology;
- Figures indicating possible maximum depths on key access roads and potential evacuation routes;
- Figures depicting the locations of the Local Plan Issues and Options sites; and
- Updating previous guidance to assist developers and Chiltern and South Bucks planning officers in considering flood risk when determining planning applications.

4. Consultation Undertaken as Part of the SFRA

Consultation and co-operation has been undertaken to produce this SFRA to meet the 'Duty to Cooperate' as required by the Localism Act 2011 (Section 110) and encompassed in paragraph 157 of the NPPF which states that Local Plans should *"be based on co-operation with neighbouring authorities, public, voluntary and private sector organisations"*.

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

- Letters were sent to a range of key stakeholders and consultees in August 2016 specifically seeking their comments on the more recent 2013 Chiltern SFRA (particularly with regards to its implementation), whether its approach was also relevant to South Bucks and any data that may be of use in updating the SFRA for Chiltern and South Bucks; and
- An internal consultation process in relation to the draft of this updated SFRA to seek feedback from various stakeholders on the document.

In addition, Chiltern District Council, South Bucks 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 by email within the Chiltern and South Bucks District Councils to ensure the document is workable for all those utilising it:

- **Planning:** Consulted to identify linkages to emerging work on the Local Plan (policies and potential options sites). Also with respect to updating development management guidance which formed part of the previous Chiltern SFRA.
- **Estates, Environmental Protection and Environmental Health:** Consulted to secure information about areas potentially at risk from flooding and linkages to Council actions under the above remit, especially to so as to link with the Council's work to promote sustainable development.
- **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

4.1 Consultation Letters and Responses

Copies of the letters as sent out as part of the initial consultation process are included in Appendix B. The responses received from consultees and any actions taken are summarised in Table 4-1. The majority of the responses detail locations of flooding within the respective Council jurisdictions. All relevant key points of information have been incorporated into the main body of this SFRA.

Consultee	Response	Action(s) Taken
Affinity Water	[No response]	None
Amersham Town Council	"Unfortunately we do not hold any records detailing information on flooding in Amersham."	None
Ashley Green Parish Council	[No response]	None
Aylesbury Vale District Council	<p>"The main point we have to say (even just updating a previous study) is the importance of working closely with the Environment Agency, Bucks CC, relevant water companies and drainage board(s) in a steering group as the study progresses plus involving other district planning authorities if there are any development sites you are looking at near the boundary in your emerging Local Plan.</p> <p>We don't have any specific cross boundary issues as there aren't any watercourses between Aylesbury Vale and Chiltern. The remains of the Grand Union Canal at Wendover and feeding reservoirs join the main Grand Union Canal at Marsworth and goes into Dacorum or Milton Keynes Council area.</p> <p>We also don't have any growth options in our emerging Local Plan in proximity to the district boundary.</p> <p>There should be (through the Environment Agency) consistency in the assumptions that are used on the study itself for example what allowance is made for climate change. Our SFRA is at a Final Draft stage on the Level 1 report and commencement of Level 2 looking at the impact of our proposed site allocations in the emerging local plan."</p>	<p>Cross border flow information incorporated into report Section 6.5. Current change guidance followed as stated within the report.</p>

Consultee	Response	Action(s) Taken
Buckinghamshire County Council	<p>“We have been fully involved with the whole process of writing the brief for Jacobs and are happy that it will fulfil the needs for a level 1 SFRA. The process has been excellent so far and working closely as a partnership has been very effective.”</p> <p>AND</p> <p><u>“Flooding Reports:</u></p> <p>Amersham 16th June 2016 between 4:30 and 6pm 23 commercial and residential properties flooded internally as a result of surface water flooding caused by localised heavy rainfall in Old Amersham High Street and a few locations in Amersham a section 19 report will be published later in 2016.</p> <p>Chalfont St Giles March to April 2014 groundwater flooding of the BT telephone exchange water pumped out across high street and into the river Misbourne caused disruption to traffic, pedestrians and half closure of the council carpark.</p> <p>Chesham September 2015 29 commercial properties were flooded internal in the early hours of the morning as a result of surface water flooding caused by localised heavy rainfall.</p> <p><u>Current Projects:</u></p> <p>Pednormead End – Surface and Groundwater Flooding modelling gives two options which are being assessed to reduce flood risk to 100 residential and commercial properties through property level protection and culvert upgrades being investigated as part of the current 6 year FDGiA program.</p> <p>Chesham FAS - The overall strategy agreed between the partners is to provide a standard of protection of 1 in 30 years return period for the Vale Brook culvert from all sources of flooding. Additional reduction in flood risk and improvements to water quality can be achieved through a town-wide approach to reducing runoff into the watercourses, by diverting highway drainage, reducing runoff from impermeable driveways, and promoting the disconnection of roof drainage and creation of householder rain gardens and grey water harvesting for re-use.”</p>	Information included in figures and throughout SFRA.

Consultee	Response	Action(s) Taken
Buckinghamshire County Council – Archaeology	Summary of response: Detailed response covering important legislation required when planning developments with regards to archaeology (which receptors to keep an eye out for etc.)	None – it has been assumed that the impact of a development on heritage and archaeology will be assessed separately to flood risk during the planning application.
Chalfont St Giles Parish Council	<p>“The flooding started in February 2014 following the wettest winter on record. The River Misbourne burst its banks northwest of the village, it travelled across Upper Stone Meadow, then flooded Blizzards Yard car park. It continued out of the car park across the High Street and into Lower Stone Meadow. Please see attached map showing the course of the flood water. The flooding continued for several weeks.”</p> <p>Flood photographs and flooding flow path diagram were also included.</p>	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Chalfont St Peter Parish Council	Summary of response: summary and statement of sewer flooding and other flood incidents within the Parish were included.	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Chartridge Parish Council	[No response]	None
Chenies Parish Council	[No response]	None
Chesham Bois Parish Council	[No response]	None
Chesham Flood Action Group	Summary of response: Detailed response detailing existing drainage conditions, locations of surface water flooding/ponding.	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Chesham Town	“No we don’t hold any information like this, but Bucks County Council have specifically started	Included information in report (see Section

Consultee	Response	Action(s) Taken
Council	collating information on flooding for Chesham as part of their Local Flood Risk Management Strategy. They are collating all flooding events, not just the larger events that they have a statutory responsibility to investigate.”	2.4.4) and supporting figures.
Chilterns Conservation Board	[No response]	None
Chiltern District Council	[Provided data and input throughout the study]	Information included in figures and throughout SFRA
Chiltern Railways	<p>“I am aware that flooding problems have been experienced in the past at Beaconsfield station as well as to the South of Gerrards Cross including Denham station.</p> <p>Can I suggest that for further details it would be good to contact Julian Harms at Network Rail who will have more details on the vulnerability of the infrastructure to flooding.”</p>	<p>Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.</p> <p>Network Rail have been consulted in light of this response, the full response and actions taken can be found in this table.</p>
Cholesbury-cum-St Leonard’s Parish Council	<p>“In response to your request for information on flooding in our Parish, please find as follows:</p> <p>Location: bottom of Sandpit Hill, Cholesbury.</p> <p>Cause: bore hole that was not regularly cleaned over time and became blocked with silt.</p> <p>Effect: road totally flooded, causing a hazard to traffic, due to location on a bend, whenever there was sudden, heavy rainfall or sustained rainfall. The water would slowly drain away over the following days.</p> <p>Duration: for 1-2 years.</p> <p>Resolved: bore hole was re-bored (end 2014) and Super-sucker is meant to visit now on 6 monthly basis.</p> <p>Otherwise, there is a bore-hole opposite Dorriens Farm on Cholesbury Lane, Buckland Common, which has been visited by the Super-sucker and I</p>	<p>Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.</p>

Consultee	Response	Action(s) Taken
	<p>believe has cause the farm outbuildings to flood in the past, but there have been no incidents in the last couple of years.”</p> <p>And</p> <p>“Further to my previous email, I would like to bring to your attention the following incidents of flash flooding, which were brought to my attention by Cllrs at our meeting the other night:</p> <ul style="list-style-type: none"> - Bottom Road, Buckland Common, by 'The Old Britannia' house 1993 - By MT Loos & Thames Water pumping station, The Vale, Hawridge, about 8-10 years ago. Related to high rain fall and a problem with the pumping station.” 	
Coleshill Parish Council	<p>“Coleshill village has had no serious flooding other than due to blocked gullies during heavy rain.</p> <p>The A355 (Beaconsfield Road) by Red Barn Farm does regularly flood when there is heavy rain.”</p>	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Dacorum Borough Council	<p>“We have no comments to make at this stage. We would be grateful if you could keep us informed of the progression of the technical work for Chiltern and South Bucks District Councils.”</p>	None
Denham Parish Council	<p>“Further to your request for additional information on flooding (your email 10th August refers); we would like to bring the following areas of Denham to your attention.</p> <ol style="list-style-type: none"> 1. The Junction of Moorfield Road with the A412 North Orbital Road, Denham Green. This area is prone to surface water flooding after heavy rainfall. The surface water cannot drain due to either blocked drains or inadequate drains. 2. The same problem as above under the railway bridge over the A412 North Orbital Road, again in Denham Green. 3. Ashmead Lane, Denham Village. Heavy surface water flooding occurs after moderate to heavy rainfall. This is believed to be caused by inadequate drainage and blocked drains. Water can encroach on to property drives and gardens. 	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.

Consultee	Response	Action(s) Taken
	<p>4. Old Mill Road, Denham with the junction of the A40 main road. Again surface flooding due to inadequate or blocked drains.</p> <p>5. Hollybush Lane, Tatling End, Denham. In the layby section by the Toby Carvery on the A40 and also the A40 at the junction of Hollybush Lane and the A40. These two areas regularly flood after moderate to heavy rainfall due to inadequate sewer capacity.</p> <p>6. Footpath between Denham Station railway bridge on the A412 and the A40. Sections of this footpath are permanently flooded in winter time and mud washed on to the path and muddy spray from heavy lorry use, make this footpath unusable. (this footpath is subject to a feasibility study by BCC to see if it can be restored to include a safe cycleway).</p> <p>7. Old Rectory Lane, leading to Higher Denham. This lane floods regularly in the winter due mainly to water flowing off of fields that are higher than the road. Inadequate drainage, however landowners could improve the situation by digging gulleys.”</p>	
<p>Ellington & District Residents Association</p>	<p>“Please receive the flood information for the Taplow Riverside central zone area on the attached document.</p> <p>Unfortunately, I was unable to get information prior to 2011 and for the last couple of years (2015 and 2016) despite knowing its flooded here within those years the person that would have the detail of it is not available, so effectively the attached gives you an account over a 3 year period which is indicative of the flooding experiences here.”</p>	<p>Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.</p>
<p>Environment Agency</p>	<p>Summary of response: Email from the Environment Agency with an attached document providing detailed comments about issues within their remit that they would expect to see addressed in the Local Plan. See Appendix E for full response.</p> <p>AND</p> <p>“Please find below our comments to your recent query.</p> <p>Also in addition to these comments please note</p>	<p>Response added as appendix to this SFRA.</p> <p>Information included in figures and throughout SFRA. Flooding incidents cross-checked with flood history data and added if not already present. Figures</p>

Consultee	Response	Action(s) Taken
	<p>that we are developing a model for the River Misbourne. As you may be aware from the recent emails from my colleague, Paolo Meotti, the flood outlines are available this September, with the final check and update available at the end of December</p> <p>Within the scope of the Chesham Flood Alleviation Scheme, we will also update the Chesham Surface Water Management Plan model and as such there might be a better understanding of flood risk in Chesham but we won't be able to confirm this before summer 2017. We are not envisaging significant changes though.</p> <p><u>Flood History</u></p> <p>December 2013- February 2014: wide flood event in all the area.</p> <p><u>South Bucks:</u></p> <p>Willowbank&New Denham – River Colne</p> <p><u>Chiltern DC:</u></p> <p>Old Amersham, Chalfont St Giles, Chalfont St Peter – river Misbourne</p> <p>Pednormead End in Chesham –River Chess</p> <p>September 2014</p> <p><u>Chiltern DC and South Bucks</u></p> <p>Pednormead End in Chesham –River Chess</p> <p>Chesham High Street – Vale Brook</p> <p>All the above (included the South Bucks one) were a mixed of fluvial, surface water, groundwater and sometimes sewage flooding and as such Bucks CC (LLFA) have produced section 19 flood investigation reports.</p> <p><u>Ongoing Projects</u></p> <p>We have 3 projects in our 6 year programme that might affect the two District Councils:</p> <ol style="list-style-type: none"> 1. Chesham Flood Alleviation Scheme – we are identifying possible options to alleviate flood risk from the Vale Brook in Chesham. The councils are our partners in the project. Patrick McLoughlin is 	<p>updated accordingly</p>

Consultee	Response	Action(s) Taken
	<p>the point of contact in Chiltern DC.</p> <p>2. Misbourne Flood Alleviation Scheme: it's at an early stage. We are investigating risk of flooding along the Misbourne. It might identify possible options to alleviate flood risk especially in old Amersham, Chalfont St Giles, Chalfont St Peter</p> <p>3. Colnbrook Flood Alleviation Scheme. While the project is mainly focusing to protect properties from flooding in Colnbrook Village (Slough) we might be able to extend the scope and incorporate some improvement for Willow bank and new Denham."</p> <p>[Provided data used throughout the SFRA and supporting figures]</p>	
Farnham Royal Parish Council	" We are sorry but we don't keep this information but could ask for it in the parish magazine if you are prepared to wait. The next edition is at Christmas so it would be February before we collate any info to feedback on this."	None
Fulmer Parish Council	"I would advise that Fulmer has no apparent flood risks apart from the Hawkswood Lane Ford. However, we would like to be kept informed of all developments."	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Great Missenden Parish Council	<p>"Having sent your request onto our parish councillors, I only received one comment:</p> <p><i>I think there was some flooding in Feb 2007, when the river culvert under the Link Road in Great Missenden was blocked. It drained away quite quickly from the car parks, but the fields below and above had standing water for quite a few weeks."</i></p>	Flooding incident cross-checked with flood history data and added if not already present. Figures updated accordingly.
Hedgerley Parish Council	"Hedgerley has no problem areas at present. We did have one area but this has been alleviated with the help of BCC. Since then we have not suffered any further difficulties."	None
Hertfordshire County Council – Development Services	<p>"The Development Services team in Hertfordshire Property on behalf of Hertfordshire County Council services have no comments to make on this consultation.</p> <p>Please note that you will receive another response from the Environment Department of HCC. I only</p>	None

Consultee	Response	Action(s) Taken
	act for HCC services (education, libraries, health and community services etc.). "	
Hertfordshire County Council – Environment Department	[No Response]	None
Highways Agency / Department for Transport	[No response]	None
Iver Parish Council	Summary of response: information provided includes locations of regular surface water flooding.	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Latimer and Ley Hill Parish Council	[No response]	None
Little Chalfont Parish Council	<p>"I have managed to track down the original documentation about this. I have the following information about flooding in Little Chalfont.</p> <ul style="list-style-type: none"> - Underneath the railway bridge (A404) has flooded seriously many times in the past (although better over the past year). - Beel Close, close to the underpass, has had incidents of bad flooding but again less so in the past couple of years. - Station Approach has also had flooding problems recently. - Bell Lane, by Derwent Close, gets huge puddles due to blocked drains. - Nightingales Lane is also notorious for flooding but this mostly falls in the Chalfont St Giles parish. - Cokes Lane also experiences problems near the bend and junction with Nightingales Lane in very heavy rain." 	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Little Missenden	[No response]	None

Consultee	Response	Action(s) Taken
Parish Council		
London Borough of Hillingdon	[No response]	None
Penn Parish Council	[No response]	None
Network Rail	<p>“We undertake a large number of drainage interventions in the course of a year, but the majority are local and designed to alleviate specific problems of track flooding or deterioration in track and earthworks asset condition as a consequence of poor drainage function. The work therefore usually restores drainage function rather than capturing new volumes of surface water, albeit that we are frequently restoring systems that have not worked properly for decades.</p> <p>The two examples cited by Chiltern Railways are interesting because they are both in cutting. The flooding in both cases is most likely as a consequence of run-off from the adjacent road network during adverse or extreme weather, and the water ultimately ends up in the ground (Chalk Aquifer). The wider flood risk is therefore very low and may not be significant for your purposes.</p> <p>If you are able to provide a bit more definition in the types of schemes we should include that would help us in supplying you information most relevant to the Flood risk assessment.”</p>	A request for all information regarding Network Rail activities within Chiltern and South Bucks was submitted.
Royal Borough of Windsor and Maidenhead – Highways	<p>“The River Thames forms the majority of the border between South Bucks District Council and the Royal Borough of Windsor and Maidenhead (from Cliveden to Dorney Common). Fluvial flood risk from the Thames, and subsequent impacts on groundwater levels and local watercourses, is therefore obviously the main source of cross border flooding and significant flooding was experienced in January and February 2014.</p> <p>The Roundmoor Ditch and the Boveney Ditch form the border between South Bucks District Council and the Royal Borough of Windsor and Maidenhead over a relatively short distance in vicinity of Dorney Common / Eton Wick. Both of these watercourses are again “main river” and flooding was experienced in this area in January and February 2014.</p>	Included in the report (see Section 6.5)

Consultee	Response	Action(s) Taken
	I am unaware of any proposed major changes in the management of existing infrastructure, or proposed major infrastructure investment, that is likely to affect the management of flood risk in the vicinity of the South Bucks District Council and the Royal Borough of Windsor and Maidenhead border.”	
Seer Green Parish Council	<p>Summary of response: attached document includes 5 flooding hotspots within the Seer Green Parish, these are:</p> <ul style="list-style-type: none"> • On the bend on Newbarn Lane near Highclere Stables. • On Chalfont Road near Oldefield Stables. • On School Lane opposite Colliers. • At the junction of School Lane and Longbottom Lane. • At the junction of Longbottom Lane and Potkiln Lane. 	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Slough Borough Council	[No response]	None
South Bucks District Council	[Provided data and input throughout the study]	Information included in figures and throughout SFRA
South Bucks District Council (Iver Heath Ward)	<p>“Sending you this email which gives some info and the location on attached map. The field referred to is presently in the green belt assessment criteria for our SB/CDC local plan.</p> <p>There is major development construction imminent for 5 points roundabout, using s.106 monies from Pinewood Studios.</p> <p>(See attached email for CC officer involvement on this development.)</p> <p>This field has been unmanaged for some years and historic ditches and drainage, un serviced.</p> <p>Consequently the properties on the east side suffer regular flooding encroachment.</p> <p>Attached picture an example, a mild encroachment in this photo, the water does regularly reach to the property boundaries (other pictures available on</p>	<p>Information included throughout the SFRA.</p> <p>Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.</p>

Consultee	Response	Action(s) Taken
	<p>request, I can request permission to use more detailed and extensive photos from neighbouring residents)</p> <p>The flooding reaches the building and encroaches on the entire garden of no.2 Slough Road, and also encroaches into no.4 during wet weather.</p> <p>There are multiple flood ponds, around the 5 point roundabout junction arms and in front of properties, 2, 4, 6 and 8 Slough Road, during persistent rain and winter months.</p> <p>Junction arms along Pinewood Road, Church Road and Slough Road all have flood pond areas.</p> <p>One other specific persistent flood pond area is at the mini roundabout junction of Slough Road and Bangor Rd South; this also causes traffic delays and congestion, again during persistent wet weather.”</p>	
<p>Taplow Parish Council</p>	<p>“ The Parish Council has not itself kept records of flooding in the area but through recent consultations with its members, the local Hitcham and Taplow Society and a local Residents’ Association (EDRA) we are aware of the following incidents of flooding since 2008.</p> <p>We may have been able to research this further if we had had more time and it had not been the holiday season.</p> <p>Flooding in the vicinity of the River:</p> <p><u>Flooding of the Thames Path</u></p> <p>The Thames Path (footpath 23) and adjacent land has flooded regularly after heavy rain. The following incidents have been recorded by residents living in that area and have been forwarded to you under separate cover by EDRA:</p> <ul style="list-style-type: none"> - For two days in late December 2011 (30th and 31st) - For a day in mid May 2012 (12th) - For a day in November 2012 (24th) when the water came up to the Rowing Club building and Taplow Quay site had strong currents 	<p>Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.</p>

Consultee	Response	Action(s) Taken
	<ul style="list-style-type: none"> - For two days in December 2012 (17th and 24th) - For several days in the first week in January 2013 - For all of the last week in December 2013 - For a day in February 2014 (12th) when flooding went into the boatyard. - For two days in October 2014 (14th and 18th) - For a day in November 2014 (9th) <p><u>In addition there have been even more serious incidents:</u></p> <p>The Thames burst its banks flooding the Thames Path, adjacent land and on River Road in October 2012.</p> <p>On 11th February 2013 The Thames Path and adjacent land flooded - but this time the flooding extended along the Bath Road as well as Ellington Gardens. The Jubilee River burst its banks making footpath 12 inaccessible from Mill Lane to the Jubilee Bridge.</p> <p>River Road was flooded again on 30th December 2013</p> <p>In January 2014 the Thames path flooded badly along (submerging the bench which needed rebuilding) with adjacent land into the Taplow Quay site and Maidenhead Rowing Club building and car park. Mill Lane and Bath Road flooded for a prolonged period. The boathouse by the bridge reported flooding for 6 weeks. On 26th January the front gardens of Bridge Cottage and two other adjoining properties were also flooded along with the railway bridge near Approach Road/A4 junction. We understand that one of our residents has written to you with a number of photographs taken of the floods in January 2014.</p> <p>In October 2014 (on the 6th and 8th) water reached the Rowing Club building. The Bath Road flooded from the bridge to the Norfolk Hotel and Ellington Gardens flooded.</p> <p><u>For the future</u></p> <p>We share residents' concerns that the felling of</p>	

Consultee	Response	Action(s) Taken
	<p>approximately 150 trees since 2015 and the plans for the creation of over 200 new houses (owing to the redevelopment of the Mill Lane area) will worsen the flooding issues in the area.</p> <p><u>Flooding along the A4</u></p> <p>After heavy rain the A4 floods. Photos of A4 flooding are attached. Flooding has also been noted in the following areas:-</p> <ul style="list-style-type: none"> - The bottom of Berry Hill - Poplar Farm fields to the right of Boundary Road approaching the village - in the fields between the A4 railway bridge and Marsh Lane - there is often standing water in the front gardens at the north end of Marsh Lane. - under the railway bridge at Station Road - on Rectory Road by Wellbank - on the Flexello Field by Boundary Road.” 	
Thames Water	<p>Regarding the 2013 SFRA: “On page 14 under point 4.6 it states:</p> <p><i>Thames Water is responsible for the management of urban drainage (surface water) and sewerage within the District. Thames Water was consulted to discuss the risk of localised flooding associated with the existing drainage/sewer system. Unfortunately the feedback provided was very general in nature, providing simply a summary of the number of recorded incidents per post code. It is not possible therefore to pinpoint known capacity problems and/or infrastructure at risk of structural failure.</i></p> <p>Thames do not consider this statement to be very fair as it implies that Thames have not been prepared to work with the Council on the FRA, and contradicts paragraph 29 of the Executive Summary which correctly states that the detail has been provided to the Council, but for reasons of confidentiality we cannot divulge property specific information.</p>	Text amended (see Section 5.2) to reflect comment

Consultee	Response	Action(s) Taken
	<p>Thames Water was approached for information regarding flooding arising from the surcharging and blockage of surface 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 detail how many properties have been subject to DG5 flooding per postcode area (the first four digits of the postcode are provided only).</p> <p>As such we would request that this is amended.”</p> <p>[Provided data on sewer flooding for the SFRA mapping]</p>	
The Lee Parish Council	[No response]	None
Three Rivers District Council (Hertfordshire)	<p>“We don’t have any specific comments regarding the content that you outline below, which will form the basis of a joint Level 1 SFRA.</p> <p>Three Rivers originally produced a combined Level 1 SFRA with St Albans City & District Council, Dacorum Borough Council and Watford Borough Council in August 2007. This can be viewed on our website here: http://www.threerivers.gov.uk/egcl-page/strategic-flood-risk-assessment.</p> <p>We then produced another SFRA in November 2012, which assessed the proposed sites that were in the Draft version of the Site Allocations LDD, prior to its submission to the Secretary of State. This can be viewed on the Evidence Base page for the Local Plan on our website: http://www.threerivers.gov.uk/egcl-page/evidence-base.”</p>	None
Transport for London	<p>“Thank you for consulting Transport for London (TfL) under the Duty to Cooperate. Due to the nature of the enquiry TfL has no specific comments to make although it may be worth seeking advice from HS2 Ltd regarding preparatory works for the High Speed 2 rail project, as well as Network Rail and Crossrail Ltd regarding any ongoing works in connection with the Crossrail project which may impact on strategic flood risk management within the two districts.”</p>	Consultation with HS2 Ltd. has not been completed as this level of correspondence is not covered by the scope of this Level 1 SFRA and more detailed, individual FRAs for major infrastructure projects should have

Consultee	Response	Action(s) Taken
		been completed as part of those projects.
Wexham Parish Council	<p>"We have historic flooding in the following areas:</p> <p>A412 George Green</p> <p>George Green Road</p> <p>Middle Green</p> <p>Middle Green Road</p> <p>Trenches Lane</p> <p>Orchards Park</p> <p>Church lane</p> <p>Grangewood</p> <p>Wexham Park Lane</p> <p>Rowley Lane</p> <p>Most of these areas flood due to the Horton Drain, Wexham Springs and high rain fall, historic images are available property under threat in Grangewood, Church Lane, George Green Road, Middle Green, and Orchard Park. All areas are shown on DFE web site."</p>	Flooding incidents cross-checked with flood history data and added if not already present. Figures updated accordingly.
Wycombe District Council	<p>"We were aware of this update already and have shared what we are doing informally (my colleague Chris Schmidt-Reid has liaised with you on this) over the past few months.</p> <p>As I believe you are using Jacobs (Mike Symons?) who did our SFRA level 1 and are working on our SFRA level 2 I would recommend that you ask them to ensure that there is consistency across the areas and for ongoing liaison."</p>	Checked within Jacobs for any information originating from Wycombe that should be included within this SFRA.

Table 4-1 : Consultees and Responses

4.2 Signposting Summary

The consultation has identified a number of issues which have been taken into account in producing this SFRA. These are considered in detail in Section 6 of the report.

5. Data Collection and Flood Zone Delineation

5.1 Overview

This Section details the sources of data used to develop this SFRA which includes:

- 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 the updated Flood Map for Surface Water (uFMfSW) showing areas most susceptible to local flooding; and
- previous studies including the Chesham SWMP, PFRA, 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, ACDs and the formulation of planning and development management recommendations.

An overview of the core datasets, including their source and 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 hydraulic modelling is undertaken. Therefore, whilst the datasets used here are the best available at the time of publication, the SFRA should be reviewed periodically. Between updates CDC, SBDC, BCC or the Environment Agency should be contacted for the latest information as appropriate.

It is important to note that hydraulic modelling of the River Thames within Chiltern and South Bucks is currently being completed by the Environment Agency. The expected completion date is late 2016 to early 2017. The Environment Agency has recently updated the flood outlines for the River Misbourne. This has provided new flood extent equivalent to Flood Zones 3a, 3b and 2. It is anticipated that these will be used to update the Flood Zones on the Environment Agency's website in early 2017.

5.2 Information on Historic Flooding

In addition to records held by CDC and SBDC, information on historic flooding has been requested from the following bodies to identify those areas within Chiltern and South Bucks that are known to have flooded in recent years:

- Bodies operating within Chiltern and South Bucks Districts:
 - Affinity Water (Veolia Water);
 - Buckinghamshire County Council;
 - Chiltern Railways;
 - Chilterns Conservation Board;
 - Department for Transport;
 - Environment Agency ;
 - Highways England;
 - Thames Water;

- Town and Parish Councils in Chiltern and South Bucks Districts¹⁷; and
- Transport for London.
- Neighbouring Authorities
 - Aylesbury Vale District Council;
 - Dacorum Borough Council;
 - Hertfordshire County Council;
 - Royal Borough of Windsor and Maidenhead;
 - Three Rivers District Council;
 - Slough;
 - LB Hillingdon; and
 - Wycombe District Council.

Requests for information regarding cross-border flooding have been submitted to the neighbouring authorities. Cross-border flooding issues have been identified which are discussed in Section 6.5. The incidents mapped in Figures 15 and 16 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).

5.3 Delineation of the Fluvial Flood Zones

Fluvial Flood Zones have been defined in accordance with NPPF requirements. The delineation of Zones 1, 2 and 3a is based on the Environment Agency's Flood Map for Planning (from Rivers and the Sea) which defines the Flood Zones as follows:

- Flood Zone 3: Areas at risk of flooding from a 1% (1 in 100) annual chance fluvial event or a 0.5% (1 in 200) annual chance tidal event¹⁸;
- Flood Zone 2: Areas at risk of flooding from between 1% (1 in 100) and 0.1% (1 in 1,000) each year; and
- Flood Zone 1: Areas that are not considered at risk of flooding from a 0.1% (1 in 1,000) annual chance event.

The NPPG defines Flood Zone 3b - functional floodplain as 'land where water has to flow or be stored in times of flood'¹⁹. Flood Zone 3b is therefore identified by local planning authorities. Consequently Flood Zone 3b has been delineated as described in Section 5.3.4.

¹⁷ Town and Parish Councils listed alphabetically are: Amersham, Ashley Green, Beaconsfield, Burnham, Chalfont St Giles, Chalfont St Peter, Chartridge, Chenies, Chesham, Chesham Bois, Cholesbury, Coleshill, Denham, Dorney, Farnham Royal, Fulmer, Gerrards Cross, Great Missenden, Hedgerley, Iver, Latimer, Little Chalfont, Little Missenden, Penn, Seer Green, Stoke Poges, Taplow, The Lee and Wexham.

¹⁸ It should be noted that there is no tidal influence on flood risk within Chiltern and South Bucks Districts.

The Environment Agency'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 Environment Agency has an ongoing programme of improvement, and updates are made on a quarterly basis.

Designated Flood Zones have been checked for sensibility for this SFRA. Importantly, it is noted that whilst the Vale Brook in Chesham was designated by the Environment Agency as a Main River in 2008, the fluvial Flood Map shows the area along the course of the river, to the north of Red Lion Street, as Flood Zone 1. Instead of modifying the Environment Agency Flood Zones to include risk in this area, flood risk from the Vale Brook is considered in this SFRA as an ACD, given that the Brook receives a substantial volume of urban runoff.

5.3.1 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 Zones 2 and 3 (as defined below and shaded on Figures 1 - 14).

5.3.2 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 Environment Agency Flood Zone Map.

5.3.3 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 Environment Agency Flood Zone Map.

5.3.4 Delineation of Zone 3b (Functional Floodplain)

Zone 3b Functional Floodplain is defined in Table 1 of the NPPG as those areas in which “water *has* to flow or be stored in times of flood”. The definition of functional floodplain remains somewhat open to subjective interpretation, but through consultation with the Environment Agency the extent of FZ3b has been determined and agreed. 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”, (NPPG, Table 1).

Detailed modelled flood extents for the 5% (1 in 20) annual chance design event are not available for all Main Rivers within Chiltern or South Bucks. However high-level hydraulic modelling of a 5% (1 in 20) annual chance event was completed by Jacobs for Chiltern in 2008 and updated in 2013 and South Bucks in 2008.

For Chiltern, river (floodplain) cross-sections were used 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 to Flood Zone 3b were made during the 2013 SFRA update so that its

¹⁹ NPPG Flood Zone Definitions. Available from: <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-1-flood-zones/>

extent lies within the extent of the updated Zone 3a, at the time, and to include the privately owned Shardeloes Lake (flood storage area) on the River Misbourne.

For South Bucks, the Environment Agency's Flood Zone Maps (2007) have been adopted to underpin the SFRA process. At these locations, detailed topography has been used to carry out a 'sensitivity check' of the Flood Zone maps. This check has sought to ensure that the predicted floodplain extents are sensible in light of surrounding ground levels.

These models have been used where detailed modelling is not available. Table 5-1 includes an overview of the sources and information used to delineate Flood Zone 3b along Environment Agency designated 'Main Rivers'.

Watercourse	District	Source of Data	Scenario Used to Delineate Flood Zone 3b
Amerden Grove Ditch	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Bigley Ditch	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Boveney Ditch	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Colne Brook	South Bucks	Detailed modelling completed by the Environment Agency	5% (1 in 20) annual chance event extent
Cress Brook	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Datchey Common Brook	South Bucks	Detailed modelling completed by the Environment Agency	5% (1 in 20) annual chance event extent
Fray's River	South Bucks	Detailed modelling completed by the Environment Agency	5% (1 in 20) annual chance event extent
River Alderbourne	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
River Chess	Chiltern	High level modelling completed by Chiltern	5% (1 in 20) annual chance event extent

Watercourse	District	Source of Data	Scenario Used to Delineate Flood Zone 3b
		(2008, updated in 2013)	
River Colne	South Bucks	Detailed modelling completed by the Environment Agency	5% (1 in 20) annual chance event extent
River Misbourne	Chiltern and South Bucks	Detailed modelling completed by the Environment Agency (2016)	5% (1 in 20) annual chance event extent
River Thames	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Roundmoor Ditch	South Bucks	Detailed modelling completed by the Environment Agency	5% (1 in 20) annual chance event extent
Rusholt Brook	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Shire Ditch	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
The Cut	South Bucks	High level modelling completed by South Bucks (2008)	5% (1 in 20) annual chance event extent
Vale Brook	Chiltern	No modelled data available	N/A

Table 5-1 : Flood Zone 3b Delineation Data

Any development within Flood Zone 3b is likely to measurably impact upon the existing flooding regime, increasing the severity and frequency of flooding elsewhere. 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. Development in such areas would need to pass the Exception Test in conjunction with the relevant vulnerability of the proposed development (see Section 3.1 and Table 3-1).

5.3.5 Dry Islands

Areas that are delineated as ‘Dry Islands’ (see Figures 1 to 14) are locations that, whilst not flooded, 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) annual chance event floodplain, should be accompanied by an flood evacuation plan appropriate to Zone 3a High Probability. This helps 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 this approach seeks to ensure that those living and working on the dry island can safely escape in the event of flood.

5.3.6 Climate Change

There is clear scientific evidence that global climate change is happening now and cannot be ignored. As stated in the NPPG, 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. The appropriateness of the development site in this location will need to be assessed by re-checking Table 3 of the NPPG (see Table 3-1) with reference to the updated Flood Zones and the vulnerability of the proposed development.

5.4 Delineation of Areas of Critical Drainage

Based on national mapping provided by the Environment Agency, a number of residential and commercial properties or future development in Chiltern and South Bucks 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 existing drainage, ordinary watercourse and sewer systems are critical to determining the degree of flood risk.

Environment Agency guidance on the requirement for a flood risk assessment to support a planning application states that a FRA is required in Flood Zone 1 (in part) if the development is “*in an area with critical drainage problems as notified by the Environment Agency*”. However the Environment Agency has yet to identify any Critical Drainage Areas in Chiltern or South Bucks. Given the potential consequences of a flood event from ‘local sources’ proposed development in Flood Zone 1 this SFRA defines Areas of Critical Drainage (ACD) across Chiltern and South Bucks (refer to Figures 17 and 18). Chiltern and South Bucks consider that the planning requirements associated with ACD are the same as if they were a CDA defined by the Environment Agency particularly as a number of the Issues and Options sites encroach into land which is designated as an ACD. Planning applications either partly or wholly within ACD will need to be supported by a site-specific FRA demonstrating how the development will take local sources of flooding into account to ensure:

- The risk of flooding to the site can be demonstrated is understood;
- It is appropriate for the proposed location;
- The site’s flood risk is not too great for the development; and
- It does not increase flood risk elsewhere²⁰

Although ACDs and CDAs would both cover areas with critical drainage problems, the variation in name has been used to differentiate between those areas delineated by this SFRA and those

²⁰ Flood Risk Assessment NPPG. Available from: <https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

which may be notified by the Environment Agency. It is important to note that for Chiltern and South Bucks, the Environment Agency have not designated CDA.

Through the BCC Preliminary Flood Risk Assessment, the Environment Agency's uFMfSW 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.** The uFMfSW outline of a 1% (1 in 100) annual chance event is used in this SFRA as a basis to define ACDs in Chiltern and South Bucks. Because the ACDs 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 underlying Chalk can last a number of weeks and causes substantial damage and disruption because of the long duration.

The SFRA mapping of ACD 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 ACD may be sources of groundwater emergence and/or surface runoff, where water runs downhill to pond in an ACD. 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. SuDS should be designed in accordance with regulations included within the SuDS Manual (CIRIA C753)²¹.

It is important to note that the 2013 update to the Chiltern District Council SFRA used the Flood Map for Surface Water (FMfSW) mapping to delineate the ACD extents. Later in 2013, (after the Chiltern SFRA was published) the Environment Agency published the updated Flood Map for Surface Water. **Therefore the ACD extents delineated within this SFRA supersede the extents developed for the original Chiltern SFRA (2008) and its 2013 update. The South Bucks SFRA (2008) makes no reference to ACDs.**

5.5 Delineation of Reservoir Failure

The Environment Agency Risk of Flooding from Reservoirs map²² has been utilised to assess the risk of flooding from reservoir failure throughout Chiltern and South Bucks.

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

Following a recommendation in the Pitt Review, the Environment Agency 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.

5.6 Flood Management Structures and Features

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 Environment Agency, Local Authority or an individual.

²¹ SuDS Manual (November 2015). Available from: http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

²² Environment Agency 'Learn more about this area's flood risk mapping'. Available from: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater>

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 the hydraulic modelling used to generate the flood maps included 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.

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

Other flood management infrastructure (e.g. culverts and linear defences) has also been identified across Chiltern and South Bucks and is indicated in Figures 21 and 22. 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 features²³ (not already on the Environment Agency's Asset Information Management System (AIMS) database) 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. 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 standard of protection 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 may still be required. It is incumbent on both the Local Authorities 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.

5.7 Topography & Geology

Broad information on topographic levels and underlying superficial and solid geology is available for Chiltern and South Bucks, and is presented in Figures 25 and 26, 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.

5.8 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 (see surface water flood risk in Chesham on Figure 15) and a SWMP has been prepared using funding from Defra²⁴. 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, which have been used to update the uFMfSW;

²³ BCC Website – Flooding. Available from: www.buckscc.gov.uk/flooding

- A first appreciation of the cost of damage which could be caused by local flooding: for those residential properties experiencing flooding on average at least once in the next 100 years, the cost of the flooding is likely to be about £50k per property;
- An understanding that the Vale Brook culvert, which performs an important urban drainage function in Chesham, has the capacity to drain the volumes of runoff anticipated from a rainfall event that has between a 10% (1 in 10) and a 3.33% (1 in 30) chance of occurring annually;
- 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 attenuation north of the Chesham town centre (An 'Aquaprint' for Chesham²⁵) individual property protection, control of runoff close to source and design of urban environments to make space for water; and
- Key messages reinforcing the importance of considering flood risk when undertaking other council or stakeholder activities enabling:
 - Flood risk to be managed through cumulative benefit of numerous smaller schemes;
 - Opportunities to combine schemes to be identified; and
 - Awareness will be raised and maintained which will develop expertise.

²⁵ An 'Aquaprint' for Chesham (July 2014). Available from: <http://www.buckscc.gov.uk/environment/flooding/community-action/floodsmart-in-chesham/>

6. Flood Risk in Chiltern and South Bucks

6.1 Overview

This Section details the findings of the review of flood risk in Chiltern and South Bucks Districts, based on the information and data provided by a range of partners as described in Sections 4 and 5.

A relatively small number of properties are at risk of flooding from the Rivers Chess, Misbourne, Alderbourne and other watercourses designated as 'Main Rivers' within Chiltern and South Bucks. 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 in a number of locations in Chiltern and South Bucks from more localised sources including surface water, groundwater, sewers and blocked culverts.

6.2 Summary of Past Flooding

Flooding of homes, businesses, agricultural land and roads has occurred in Chiltern and South Bucks Districts 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 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.

Historic flood records have been collated along with consultee responses to ensure as many flood events have been included on Figures 15 and 16 as possible.

A brief summary of flood history in each Parish is included in Appendix C (see Figures 1 – 20).

6.3 Predicted Flood Risk

6.3.1 Flood Risk Mapping

The following plans identify flood risk:

- **Figures 1 to 14** focus on fluvial flooding and show the river centrelines, extent of Main Rivers, Flood Zones. The maps provide an initial indication of the potential severity of flooding at a proposed development site;
- **Figures 15 and 16** focus on local sources of flooding and show ACDs and recorded incidents of flooding (from all sources except sewer flooding) across Chiltern and South Bucks. The maps provide an initial indication of the potential susceptibility of a potential emerging joint Local Plan option site to flooding from surface water, groundwater or ordinary watercourses;
- **Figures 17 and 18** shows ACDs along with Flood Zones;
- **Figures 19 and 20** show those postcode districts within which properties have experienced sewer flooding (according to Thames Water DG5 data);
- **Figures 21 and 22** show the locations of recorded flood risk management structures and features, including flood storage areas and reservoir flood extent. Development should take the location of these assets into consideration;
- **Figures 23 and 24** show extent areas where flood alerts and warnings are available from the Environment Agency;
- **Figures 25 and 26** show the superficial and solid geology underlying Chiltern and South Bucks. This map could assist with determining whether infiltration or attenuation SuDS techniques may be suitable;
- **Figures 27 to 40** indicate the possible maximum depth of flooding on key access roads in areas at risk of fluvial flooding, and potential evacuation routes;
- **Figures 41 to 42** indicate the potential option sites along with ACDs and Flood Zones; and
- **Figures 43 to 47** indicate the Environment Agency's draft River Misbourne detailed modelling flood extents.

6.3.2 Fluvial Flood Risk Settlement Analysis

Following sensibility checks on the Environment Agency's fluvial Flood Map and some modifications, Chiltern and South Bucks have been delineated into the Flood Zones in line with the NPPF. The risk shown by the Flood Zones (Figures 1 - 14) is interpreted here for the main settlements along the Rivers Chess, Misbourne, Alderbourne and other Environment Agency designated 'Main Rivers'.

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 0.6m²⁶.

²⁶ Further information is contained in the Defra guidance document "Flood Risks to People" available at www.defra.gov.uk/

Amersham (CDC) (see Figure 2)

The River Misbourne flows from west to east through Amersham Old Town. Many properties in the town are situated within Flood Zone 3a including properties on Broadway, Market Square, Church Street and High Street. Multiple properties at the junction between London Road and Station Road 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) annual chance event flood depths²⁷ 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. It is important to note that there could be an increase to flood risk in Old Amersham if a blockage were to occur in the critical flood relief culvert within the area.

Chalfont St Giles (CDC) (see Figure 3)

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 as well as a number of farm buildings close to the town. 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) annual chance event 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. It is important to note that there could be an increase to flood risk in Chalfont St. Giles if a blockage were to occur in the critical flood relief culvert within the area.

Chalfont St Peter (CDC) (see Figure 4)

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 and sporting pavilions at Chalfont Park are also in Flood Zone 3a.

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) annual chance event 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. It is important to note that there could be an increase to flood risk in Chalfont St. Peter if a blockage were to occur in critical flood relief culvert within the area.

Chesham (CDC) (see Figure 5)

The River Chess flows from west to east through the town of Chesham. Many 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. 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 for the 1% (1 in 100) annual chance 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 it does not include areas of Flood Zone 2 or 3.

²⁷ Environment Agency Open Data (2004). Available from: <https://data.gov.uk/data/search>

Denham (SBDC) (see Figure 8)

Several properties including farm buildings and gardens close to Tom William's Wood are located within Flood Zone 3a extent in Higher Denham. Several properties on Village Road and Cheapside Lane, in Denham, are also situated within Flood Zone 3a.

The River Colne splits in two just north of Uxbridge, creating an area of localised flood risk between the two branches of the river. Properties on Willow Avenue, Willow Crescent and Hawthorn Drive are indicated within Flood Zone 3a here.

The River Alderbourne flows south along the western edge of Uxbridge. Rusholt Brook joins with the River Colne, marking the District boundary. The area between the Colne and the Alderbourne is predominantly Flood Zone 3a. Several properties, farms and an electrical substation are located within this floodplain.

Dorney (SBDC) (see Figure 13)

The River Thames to the south signifies the District boundary. Just north of Bray, Amerden Grove Ditch discharges into the Thames as it meanders and starts flowing east towards Dorney. The River Thames (Lower) is located further north, with Flood Zone 3a between the two branches of the Thames. There are several isolated properties and farm buildings, as well as a caravan park located within Flood Zone 3a. Several properties on Dorney Reach Road are also located within Flood Zone 3a. Downstream of Dorney, a wide area of Flood Zone 3a is indicated on the River Thames which includes isolated properties.

Fulmer (SBDC) (see Figure 11)

The River Alderbourne emerges in Fulmer and several properties on Fulmer Road and Alderbourne Lane are located within Flood Zone 3a. A number of isolated properties between Fulmer and Uxbridge are also located within the Flood Zone 3a.

Gerrards Cross (SBDC) (see Figure 11)

The River Misbourne flows along the eastern boundary of Gerrards Cross. Several properties and land are located within Flood Zone 3a. Downstream of Gerrards Cross, the Flood Zone 3a extent indicates a risk of flooding to a Sewage Works and Gas Holder Station.

Great Missenden (CDC) (see Figure 1)

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. During a flood event the River Misbourne may overtop causing flooding to several properties in the floodplain. Peak flood depths through Great Missenden are approximately 0.5 metres, for the 1% (1 in 100) annual chance event, which may pose a risk to pedestrians and vehicles, particularly if velocities are high, as noted above.

Little Missenden (CDC) (see Figure 1)

The River Misbourne flows from west to east through Little Missenden. One property on Taylors Lane is situated within Flood Zone 3b. The River Misbourne is predicted to flood in Little Missenden affecting agricultural areas and some buildings. Properties in the Manor Farm area may flood to a depth of less than 0.5 metres, for the 1% (1 in 100) annual chance event. 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.

Wexham Court (SBDC) (see Figure 10)

Several properties along Church Lane, to the east of Wexham Court, are located within Flood Zone 3a.

6.3.3 Local Flood Risk Settlement Analysis

Based on national mapping provided by the Environment Agency, a number of residential and commercial properties in Chiltern and South Bucks 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 Environment Agency uFMfSW has been used to identify ACDs which may be most susceptible to local flooding. These areas are shown on Figures 15 and 16. A broad summary of the larger ACDs lying outside fluvial Flood Zones 2 and 3 is provided here. However please note that flood risk in other areas may be significant in certain circumstances. The supporting figures should be consulted to ensure the level of flood risk is acknowledged in the early design stages of emerging development proposals.

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 flow paths 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 flow paths 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; and
- The valley system through Seer Green.

Chesham (Vale Brook)

A significant ACD 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 ACDs.

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 prior to the initial major construction work, understood to be in the 19th Century, and maintenance since has led to a reduction in the conveyance capacity of the channel. At places the culvert has collapsed or is restricted with new pipe work. The Vale Brook was designated Main River in April 2008. In addition

to base flows 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 as sufficient for the 10% (1 in 10) and 3.33% (1 in 30) annual chance rainfall events. This capacity is reduced when groundwater levels are high and has led to flooding problems in the past.

As recommended in the SWMP, 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 highlighting how the potential impacts upon flooding elsewhere will be mitigated.

Prestwood (CDC)

An ACD is defined along Blacksmith Lane in Prestwood. The flow path follows Blacksmith Lane south until it reaches Sixty Acres Road where the flow path diverts south-east towards Peterley Wood. From Peterley Wood the flow path changes direction slightly and flows south to the A4128 and the Chiltern District border.

Amersham on the Hill (CDC)

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

Little Chalfont (CDC)

ACDs are evident adjacent to the railway line in Little Chalfont arriving from the north-west and Amersham; the ACDs appear finish in the centre of Little Chalfont.

Seer Green (CDC)

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

6.3.4 Flood Risk from Reservoirs

The extent of the risk of flooding from reservoir failure includes the area adjacent to the River Misbourne from south of Amersham to the County border, to the east, and small areas to the east of Farnham Common and south-east of Farnham Royal. Apart from these locations the flood risk from reservoir defence failure is considered 'low' throughout Chiltern and South Bucks.

6.4 Potential Impact of Climate Change

By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 20% (1 in 5) annual chance or less) could increase locally by 40%. If emissions follow a medium future scenario, UKCP09 projected changes for the Chiltern and South Bucks Districts by the 2050s relative to the recent past are:

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

It is important to note that there will be a new set of UK Climate Projections available from 2018 (UKCP18), and due for completion in 2022. These new projections are likely to differ from those in the UKCP09 as the effects of climate change are continually changing.

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability; however we can expect to see:

- Wetter winters and more of this rain falling in wet spells may increase river flooding in both rural and urbanised catchments;
- More intense rainfall causing 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; and
- There is also a risk of flooding from groundwater-bearing chalk aquifers across Chiltern and South Bucks. Recharge may increase in wetter winters, or decrease in drier summers.

The NPPG provides further sensitivity ranges to enable the potential effect of climate change on flood risk to be taken into account. The Environment Agency updated their climate change allowance guidance for SFRA's and Flood Risk Assessments in February 2016. A more detailed overview of the new guidance, and what impacts this has on future developments is included in Section 6.4.1.

As stated in the NPPG, 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.

The anticipated extent of Zone 3a (the 1% annual chance flood) at the end of the century may be approximated by the current Zone 2 (the 0.1% annual chance flood). In terms of existing property flood risk in Zone 3a, this could lead to an increase in Flood Zone 2 extent; equating to approximately 25% increase in the number of properties at risk of flooding. In the same way, the ACDs 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 Environment Agency assumes 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 and South Bucks District Councils consider their response to the potential impacts of climate change. 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 Chiltern and South Bucks) carefully mitigates against the potential impact that climate change may have upon the risk of flooding.

For this reason, all of the development management recommendations set out in Section 8 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 ACDs in Zone 1. This provides a robust and sustainable approach to the potential impacts that climate change may have upon Chiltern and South Bucks 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, Zone 3a High Probability is defined on the basis of existing (i.e. 2016) flood level predictions.

6.4.1 Updated FRA Climate Change Allowance Guidance

Updated guidance for climate change allowances for FRAs was published by the Environment Agency in February 2016²⁸. The superseded guidance included a single uplift factor to allow for climate change effects for river flows, rainfall intensities and sea levels. The updated guidance includes uplift factors to be used for climate change allowances relative to the study location in the UK. Climate Change allowances have been predicted for the following parameters:

- Peak river flow by river basin district;
- Peak rainfall intensity;
- Sea level rise: and
- Offshore wind speed and extreme wave height.

The guidance states: *“the allowances are based on climate change projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere. There are different allowances for different epochs or periods of time over the next century”*. As both districts are far enough upstream on the River Thames to not be influenced by tidal effects, only the allowance guidance for peak river flows and rainfall intensities are considered in this SFRA.

6.4.1.1 Impact of Climate Change upon Peak River Flow

The decision to use a particular climate change allowance depends on the location (River Basin District), development design life, development vulnerability classification²⁹ and the Flood Zone it is situated in. Recommendations for which allowance should be used for vulnerabilities within each Flood Zone can be found on the guidance website³⁰. Chiltern and South Bucks Districts are located within the Thames River Basin District; therefore the climate change allowances to be applied are included in Table 6-1.

²⁸ NPPG Climate Change Allowances. Available from: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

²⁹ Table 3 of NPPG: Flood Risk and Coastal Change (Available from: <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-3-flood-risk-vulnerability-and-flood-zone-compatibility/>)

³⁰ Flood Risk and Coastal Change NPPG. Available from: <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	25%	35%	70%
Higher central	15%	25%	35%
Central	10%	15%	25%

Table 6-1 : Peak River flow Allowances for Climate Change for Thames River Basin District

6.4.1.2 Impact of Climate Change upon Peak Rainfall Intensity

The updated guidance for rainfall intensities includes Central and Upper End uplift factors for a range of appraisal periods. The updated Environment Agency guidance for FRA climate change allowances are summarised in Table 6-2.

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 6-2 : Peak Rainfall Intensity Climate Change Allowances

Both the Central and Upper End uplift factors should be used for the relevant appraisal period and assessed to understand the range of possible impact. This allows a greater understanding of the potential result of climate change throughout the appraisal period. A more thorough understanding can then be achieved compared to the previous method of implementing a single uplift factor. Further guidance can be found online in the NPPG Flood Risk Assessments: Climate Change Allowances³¹.

6.5 Cross-Border Flows

Chiltern District lies towards the head 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 and South Bucks regarding flows in the Main Rivers have the potential to impact downstream upon these neighbouring districts.

There is the potential due to the existing topography, 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. If these cross-border flows were to happen frequently, there could

³¹ NPPG Climate Change Allowances. Available from: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

be localised increase in flood risk to the aforementioned receptors. Particularly during periods of exceptionally high groundwater, as experienced in the winter of 2001, management decisions taken upstream of Chiltern could impact on both Districts.

Cross-border flows have been identified between South Bucks and the Royal Borough of Windsor and Maidenhead (RBWM). The main sources of cross-border flooding are fluvial flood risk from the River Thames as well as the subsequent impacts on groundwater levels and local watercourses. Significant flooding was reported to be experienced because of this in January and February 2014.

6.6 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 standard of protection for which the flood risk management measures have been designed;
- failure of flood risk management infrastructure due to poor maintenance or neglect; and
- general uncertainties inherent in the prediction of flooding.

The SFRA process has carried out a review of flood risk within Chiltern and South Bucks 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.

7. Potential Urban Extension Options (Housing) and Employment Areas of Search

7.1 Introduction

The Issues and Options stage of the emerging joint Local Plan has identified a number of alternative site options where new housing and employment development is being considered. Further assessment and consultation of these options will take place as part of the Preferred Option stage of the emerging joint Local Plan.

7.2 Preliminary Assessment

A preliminary assessment of flood risk of the Issues and Options sites has been completed; please see Appendix D. The assessment indicates:

- The proposed land use (housing or employment);
- Approximate site area;
- Flood risk vulnerability in terms of the NPPG guidance;
- The highest flood risk zone that any part of the site falls within;
- A preliminary assessment of the suitability for development based on flood risk vulnerability;
- An approximate breakdown of the site by flood risk zone; and
- Whether the site encroaches into land which is identified by this SFRA as an area of Critical Drainage.

7.3 Preliminary Assessment Summary

Four Urban Extension Options (Housing) include areas of land that include Flood Zone 3b where development within this Flood Zone would be inappropriate. The four extension options are:

- Amersham Copas Farm;
- Chalfont St Giles;
- Chalfont St Peter – Mill Meadow; and
- Taplow.

Depending on the size of the future development, there could be sufficient area to relocate them, within their Issues and Option site boundary, using the Sequential Test to move it to a location at lower risk of flooding.

The following Urban Extension Options (Housing) include land within Flood Zone 3a where the Exception Test would need to be passed if development is proposed within this part of the site:

- Amersham London Road East;

- Iver Heath – North of Pinewood;
- Middle Green North;
- Middle Green South; and
- Stoke Poges.

For Employment Areas of Search, Chalfont St Peter – East of the Golf Course contains land within Flood Zone 3b, where development would be deemed inappropriate by the NPPF.

A number of sites also include land which falls within Flood Risk Zone 2. Figure 7-1 summarises how the Sequential Test and Exception Test will need to be applied to decisions relating to the allocation of development sites in the emerging joint Local Plan based on the information supplied in this SFRA.

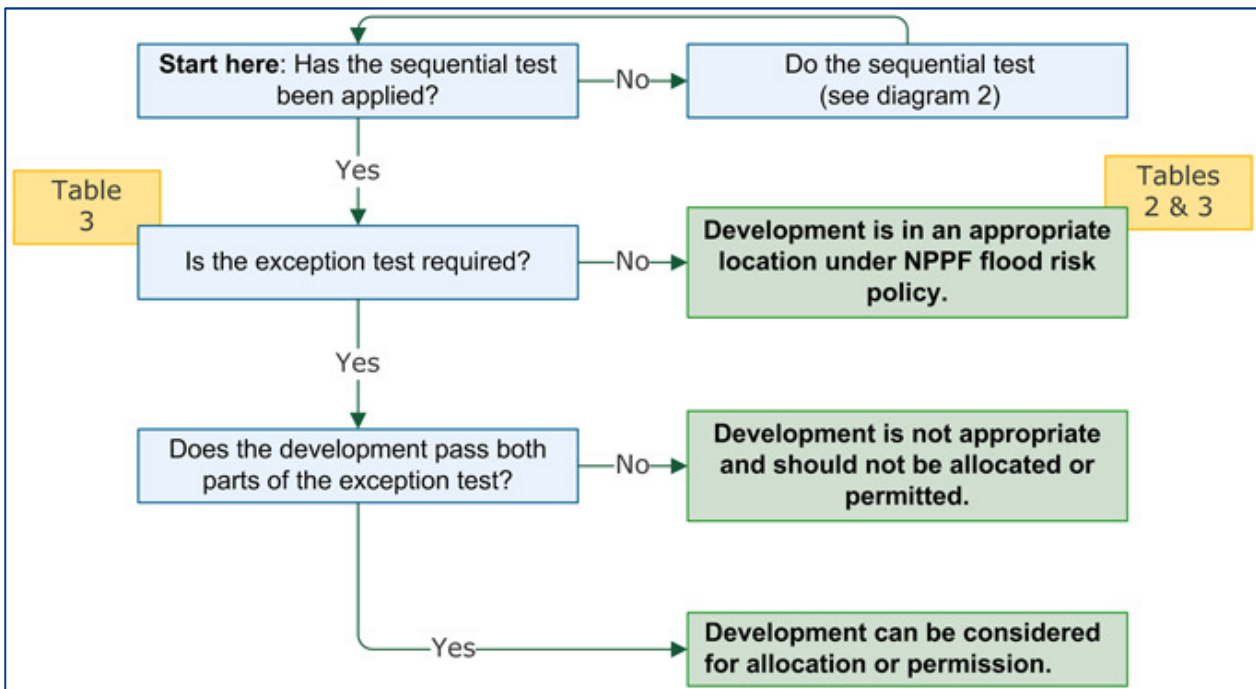


Figure 7-1 : Sequential and Exception Test Flow Diagram (NPPG)

Many of the Issues and Options site encroach into land which is identified as an ACD to a varying extent (some encroachments are very minor).

8. Sustainable Flood Risk Management

8.1 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 Environment Agency'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 Chiltern and South Bucks. Responsibility for flood risk management resides with all tiers of government, and indeed individual landowners and applicants, as outlined in Section 8.2.

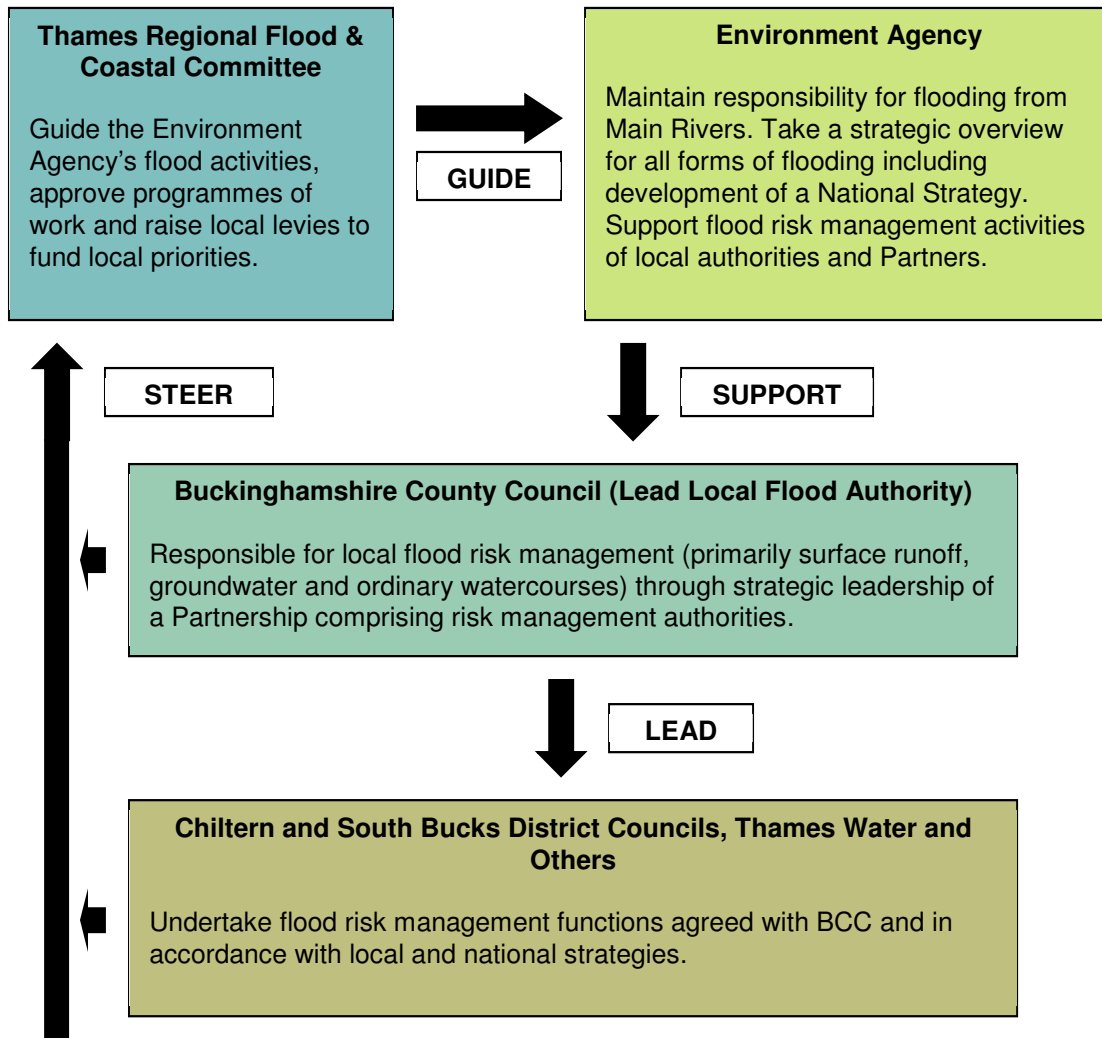
8.2 Responsibility for Flood Risk Management

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, increased responsibilities for managing flood risk have been assigned to local authorities, the Environment Agency 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. BCC have guidance available for riparian owners of ordinary watercourses on their website³².
- **Chiltern and South Bucks District Councils:** The Local Planning Authorities are responsible for carrying out a Strategic Flood Risk Assessment which should consider the risk of flooding throughout the districts and inform the allocation of land for future

³² BCC Riparian Owners Guidance. Available from: <http://www.bucksc.gov.uk/media/2700591/Guidance-for-Riparian-Owners.pdf>

development, development management policies and sustainability appraisals. CDC and SBDC are responsible for determining local planning applications and must consult with the Environment Agency when making planning decisions. (BCC is responsible for assessing County planning applications relating to Waste and Minerals, Highways and Educational facilities) Chiltern and South Bucks District Councils have a duty to act consistently with the BCC Local Flood Risk Management Strategy and the Environment Agency National Strategy. CDC + SBDC consult BCC for advice on local flood issues.



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 Environment Agency has updated its "Living on the Edge" guide in 2012 that provides specific advice regarding the rights and responsibilities of property owners, the Environment Agency 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 Environment Agency's website³³.

³³ Environment Agency website. Available from: www.environment-agency.gov.uk

This SFRA is consistent with the 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:** The use of 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.

8.3 Local Plans

8.3.1 New Local Flood Risk Management Policy

Once adopted, the emerging joint Local Plan will replace existing policies and the supporting guidance contained in SPDs. The table below contains a number of recommendations and suggestions to help guide the production of the new Local Plan policies:

Recommendation	Description
New Flood Risk Policy	<p>The emerging joint Local Plan should include a policy on local flood risk management. This should be consistent with the BCC Strategy for Local Flood Risk Management. The policy should build upon the Chiltern District 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.</p> <p>The existing Chiltern Policy CS4 is supported by Supplementary Planning Guidance. This provides additional information on how this policy will be implemented and also assists developers when submitting planning applications, for example through providing guidance on SUDS. It is recommended that a new policy is also supported by a similar SPG.</p> <p>Paragraph 100 of the NPPF states that local authorities should safeguard land from development that is required for current and future flood management.</p> <p>In partnership with the Environment Agency, Buckinghamshire County Council and others, Chiltern and South Bucks District Councils should seek to identify land required for current and future flood management and, if justified, safeguard it through planning policy. This would be particularly relevant if new flood risk infrastructure is required to support the development of new sites.</p>
Areas of Critical Drainage	<p>A particular issue to consider is the policy approach to the Areas of Critical Drainage identified within this SFRA. These areas have been identified as having a particular risk associated with surface water and other flooding problems rather than fluvial flood risk. Whilst a policy mechanism exists for the Environment Agency to formally notify such areas as Critical Drainage Areas, in practice this is happening very rarely.</p> <p>This SRFA provides the evidence to show that certain areas of both Districts contain areas of critical drainage and that the Issues and Options sites include land which encroaches into these areas.</p> <p>The use of Flood Risk Assessments and more detailed guidance on the design of development, including appropriate flood risk mitigation, should be considered for development within CDA's identified in this SFRA. The policy should state that although CDA are not formally designated as flood risk zone 2 or 3, the mitigation of flood risk, not increasing flood risk elsewhere, ensuring the development is safe for users and maintaining safe evacuation and access routes during times of flood are essential considerations when determining planning applications. The onus will be on developers to demonstrate these criteria have been met.</p>

	<p>The policy should not be overly restrictive and therefore the use of the Sequential Test and the Exception Test is not considered appropriate. The onus should be on developers to take a pro-active and innovative approach to designing out flood risk. For example, recreational space can be designed to act as additional flood storage.</p> <p>Additional requirements to mitigate flood risk in the ACD needs to be balanced against that many developments will be small scale and an FRA and flood risk mitigation would need to be proportionate to what is proposed.</p>
<p>Applying the Sequential Test and the Exception Test.</p>	<p>Any future site allocations must be determined via the application of the Sequential Test, and the Exception Test if required.</p> <p>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. A number of potential sites contain land that is within Flood Risk Zones 2, 3a or 3b. Land within 3b should not be developed and therefore it might be necessary to undertake a site specific sequential test to determine appropriate siting.</p> <p>For sites outside zone 3b, 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.</p> <p>Significant technical evidence and extensive consultation with key stakeholders will be required to support the promotion of sites which require the Exception Test.</p>
<p>Working with Buckinghamshire County Council as the Lead Flood Authority</p>	<p>Buckinghamshire County Council, in their role as Lead Local Flood Authority for managing flooding has produced a Flood Management Strategy which is currently in the process of being revised. This contains a significant amount of relevant information including data relating to the areas most affected by flooding, the impact of recent flood events, guidance on SUDs and reference to key case studies such as the Chesham Aquaprint Project.</p> <p>The BCC flood management website also contains links to various other best practice guidance published by the Environment Agency, National Flood Forum and others.</p> <p>A replacement SPD for Chiltern and South Bucks would need to reflect any best practice, standards or protocols that are being developed at the County level.</p>
<p>Securing New Infrastructure</p>	<p>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); 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);</p>

	<p>Section 106 agreements and Community Infrastructure Levy charges provide potential mechanisms for securing new flood risk reduction infrastructure or contributions towards it.</p> <p>The Aquaprint Project includes case studies of CIL and its use for flood risk projects.</p>
Chesham Mitigation Measures	<p>As recommended in the SWMP, 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 reduction in flood risk. Future developments that may change the current flow regime must provide a site-specific Flood Risk Assessment detailing how the potential impacts upon flooding elsewhere will be mitigated.</p>
Areas of Critical Drainage	<p>NPPG guidance³⁵ states a FRA should be completed for a development within Flood Zone 1 and within an area with critical drainage problems as notified by the Environment Agency. The Environment Agency has not defined Critical Drainage Areas for the Chiltern and South Bucks Districts as the introduction of the Flood and Water Management Act (2010) means the responsibility for managing local flood risk now lies with the relevant LLFA (BCC).</p> <p>Chiltern and South Bucks consider that the planning requirements associated with ACD are the same as if they were CDA defined by the Environment Agency. In the absence of Environment Agency defined CDAs, the ACDs delineated as part of this SFRA (see Section 5.4) should be used. This SFRA should therefore be updated in light of any new information that might alter the extent of the ACDs (see Section 9.2).</p> <p>Using these assumptions, planning applications either partly or wholly within ACD will need to be supported by a site-specific FRA, in accordance with the NPPG, demonstrating how the development will take local sources of flooding into account.</p>

8.4 Development Management Advice

Table 8-1 is considered to offer relevant advice in terms of Flood Zones and development management. 'Overland flows' refers to estimated flow paths that can be seen in Figures 15 and 16.

³⁵ NPPG Flood Risk Assessment in Flood Zone 1 and Critical Drainage Areas. Available from: <https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>

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 ³⁶	New Development				
DEVELOPMENT MANAGEMENT RECOMMENDATIONS						
Important Considerations	<p>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)</p>		<p>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.</p> <p>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) annual chance 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)</p>	<p>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)</p>	<p>ACDs 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.</p> <p>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.</p> <p>(See guidance provided by Environment Agency on Critical Drainage Areas - equally applicable here - and guidance on SuDS to be provided by BCC)</p>	<p>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.</p>
	<p>All existing 'solid buildings' that would otherwise be in Zone 3b, unless designed to allow the passage of water, together with any other land prevented from flooding in a 5% (1 in 20) annual chance event by the presence of solid buildings and existing infrastructure, are considered to be within Zone 3a for planning purposes.</p> <p>Existing buildings and other land designed to flood will continue to be in Zone 3b.</p>	<p>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.</p>				

³⁶ Existing development specifically designed to allow the passage of flood water, such as buildings on stilts or car parks designed to flood

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 ³⁶	New Development				
Appropriate Land Use (refer to Tables 1 to 3 of the NPPG)	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 (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 all sites carry out assessment of localised flood risks
Extensions, Outbuildings, Permitted Development & Property Subdivision (see Environment Agency 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.

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 ³⁶	New Development				
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) annual chance event river flood level, including climate change, but varies according to Flood Zone and nature of development – see Environment Agency & BCC guidance).			FRAs must include details of any flood resilience and resistance measures included in designs (see Environment Agency & 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) annual chance 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 deemed necessary ³⁷ .		No minimum level.
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) annual chance event 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 Environment Agency 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.

³⁷ A safe route of escape could be deemed necessary if anecdotal evidence suggests that flooding in the area can have a rapid onset (from surface water), last a long time (e.g. groundwater flooding) or be of depths that could pose a risk to life.

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 ³⁶	New Development				
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 Environment Agency 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 Environment Agency consent. Reference should be made to Environment Agency'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 Environment Agency 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 Environment Agency and BCC guidance, especially in known ACD.					
	In addition to a Flood Risk Assessment, applications within all fluvial Flood Zones (including within ACDs) for developments of greater than 1ha must be accompanied by proposals for the management of surface water, as per Environment Agency 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.					
This table is designed as a summary of issued covered elsewhere in the SFRA, NPPF and other guidance documents – it should not be relied upon in isolation when writing or evaluating a FRA.						

Table 8-1 : Development Management Advice

8.5 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 Environment Agency 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 Environment Agency 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 Environment Agency 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 Environment Agency's website.

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

8.6 Emergency Planning

Both Chiltern and South Bucks Districts are designated as a Category 1 Responders under the Civil Contingencies Act 2004. As such, the Councils have defined responsibilities to assess risk, and respond appropriately in case of an emergency, including (for example) a major flooding event. The Councils' primary responsibilities are³⁸:

- 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.

³⁸ Civil Contingencies Act (2004). Available from:
http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga_20040036_en.pdf

The Environment Agency monitors river levels within the main watercourses affecting Chiltern and South Bucks. Based upon a sophisticated in-house forecasting computer model, the Environment Agency 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 the inundation of populated areas³⁹, the Environment Agency 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 Environment Agency fluvial flood warning service, the Flood Forecasting Centre is a partnership between the Environment Agency 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 ACDs 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 Councils. 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 27 to 40 provide an indication of the depth of flooding anticipated along key local roads during the 1% (1 in 100) annual chance design event and suggestions as to evacuation routes, although these may vary depending upon the circumstances of individual events. It is important to note that in some locations, key infrastructure may be located within the Environment Agency designated Flood Zones and therefore at risk of flooding (see Section 6.3.2 for examples).

Coordination with the emergency services and the Environment Agency is imperative to ensure the safety of residents in time of flood. Relatively few areas within Chiltern and South Bucks 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

³⁹ Restricted to those urban areas situated within Environment Agency flood warning zones

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 Environment Agency has recently introduced a Groundwater Flood Warning Service as an extension to its existing Floodline Warnings Direct service. This new service is available to areas which have previously been affected and already receive local information about groundwater flooding. 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 Councils advise the Thames Valley Local Resilience Forum of the risks raised in light of this SFRA, ensuring that the planning for future emergency response can be reviewed accordingly. This will inform the Thames Valley Local Resilience Forum Community Risk Register⁴⁰.

8.7 Flood Risk Mitigation

There are a number of communities within the Districts that are currently predicted to be at risk of flooding. Table 8-2 provides a summary of the communities at risk and an initial indication of the type of mitigation measures that could be considered to ameliorate fluvial and surface water flood risk. This could be referred to in the Councils' Infrastructure Delivery Schedule.

Location	Description and Potential Mitigation Measures
Chesham	<p>Significant surface water flow paths are predicted through Chesham (see Figure 15). However flood risk in Chesham has been reviewed and measures identified through the SWMP (see Section 5.8). As well as these ongoing projects, the potential for the implementation of SuDS should be investigated as a preference over flood defences during the design of all future developments and redevelopments within the Chesham area.</p> <p>Mitigation measures are currently being assessed as part of the Pednormead End and Chesham Flood Alleviation Scheme projects. The Pednormead End project is currently assessing a couple of options to reduce flood risk from surface water and groundwater flooding to up to 100 properties; the options being considered are upgrades to existing culverts and property level protection in the area.</p> <p>The aim of the Chesham Flood Alleviation Scheme is to provide protection from flooding from the Vale Brook culvert in Chesham. The goal is to provide a standard of protection of up to the 3.33% (1 in 30) annual chance event to properties from all sources of flooding. A town-wide approach of reducing runoff into the watercourses by diverting highway drainage, promoting grey water harvesting and reducing runoff from impermeable driveways has been identified.</p>

⁴⁰ Thames Valley Community Risk Register (2014). Available from: www.thamesvalleylrf.org.uk/useful-links/publications/risk-register.ashx

Location	Description and Potential Mitigation Measures
Great Missenden	<p>There are a number of properties within Flood Zone 3a of the River Misbourne around Church Street. There is limited available space for flood attenuation immediately upstream (north) of Church Street, therefore residents should be encouraged to sign up for flood alerts and warnings from the Environment Agency (see Figure 23 and Section 8.6).</p>
Little Missenden	<p>Properties are predicted to be at risk of flooding (Flood Zone 3a and 3b) in Little Missenden. There is limited available space for flood attenuation immediately upstream (north) of Church Street, therefore residents should be encouraged to sign up for flood alerts and warnings from the Environment Agency (see Figure 23 and Section 8.6).</p>
Amersham	<p>There are extensive extents of Flood Zone 3 affecting Amersham Old Town with a number of properties predicted to be at risk.</p> <p>In terms of mitigation there may be opportunities for upstream attenuation in the open areas to the west of Amersham. Alternatively properties at risk should be encouraged to sign up for flood alerts and warnings from the Environment Agency (see Figure 23 and Section 8.6).</p>
Chalfont St. Giles	<p>Properties are predicted to be at risk along the High Street, there are extents of Flood Zone 3b from the River Misbourne.</p> <p>Given the availability of land upstream (north) there may be scope for attenuation of flood flows however the extent is quite broad at this point suggesting a significant flow to be attenuated. Alternatives could include encouraging residents to sign up for flood alerts and warnings from the Environment Agency (see Figure 23 and Section 8.6). A further approach could be to undertake works to make these buildings flood resilient to reduce the cost and impact of flooding.</p>
Chalfont St. Peter	<p>There are extensive areas of Flood Zone 3 in the town with a number of properties predicted to be at risk.</p> <p>Given the availability of open land upstream of the football ground upstream attenuation may be a possibility as a mitigation measure. Alternatives could include encouraging residents and businesses to sign up for flood alerts and warnings from the Environment Agency (see Figure 23 and Section 8.6). A further approach could be to undertake works to make these buildings flood resilient to reduce the cost and impact of flooding.</p>

Location	Description and Potential Mitigation Measures
Fulmer	<p>Fulmer is predicted to be at risk of fluvial flooding. The Alderbourne passes through the village which has an extent of Flood Zone 3a. There is open space upstream which may suggest upstream attenuation of flows is a potential mitigation measure. However given the small number of houses at risk a scheme is unlikely to be viable therefore it may be prudent to encourage residents to sign up for flood alerts and warnings from the Environment Agency (see Figure 24 and Section 8.6).</p>

Table 8-2 : Potential Flood Risk Mitigation Measures

9. Level 2 SFRA and Updating this SFRA

9.1 Level 2 SFRA

A Level 2 SFRA assesses the flood risk at potential development sites in more detail than that covered at Level 1. This SFRA update only covers Level 1 as Chiltern and South Bucks are still considering potential housing, employment and mixed used allocations. as part of preparing the emerging joint Local Plan.

This report (and the supporting mapping) therefore represents the Level 1 SFRA⁴¹, and should be used by the Councils to inform the application of the Sequential Test (see Section 3.1). Following the application of the Sequential Test, it may be necessary to develop a more detailed SFRA⁴² should it be shown that any further proposed allocations fall within flood affected areas. 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 as part of the wider application of the Exception Test.

9.2 Updating this SFRA

This SFRA provides a strategic overview of the spatial variation of flood risk throughout Chiltern and South Bucks 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 Chiltern and South Bucks; with data continually changing as new flooding events occur and further modelling is undertaken, this knowledge is continually evolving. In addition, Government policy on flood risk continues to change, with significant changes to national and local policy evident between the publication of the previous SFRA's in 2008 and 2013 respectively and the production of this update in 2016. Given that this is the case, a periodic review of this SFRA is imperative and it must be treated as a living document.

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

Question 1

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

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

41 NPPG for Flood Risk and Coastal Change. Available from: <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

42 NPPG for Flood Risk and Coastal Change. Available from: <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

Question 2

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

Question 3

Has the Environment Agency, CDC or SBDC (as Flood Risk Management Authorities) or BCC (as LLFA) issued any amendments to their flood risk mapping and/or guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within Chiltern and South Bucks, 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 Chiltern and South Bucks resulting in a change to the ACDs? 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 Chiltern and South Bucks is required;
- Do the development management recommendations provided in the SFRA in any way contradict emerging Environment Agency 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 Environment Agency is required to ensure an agreed suite of development control requirements are in place.

It is highlighted that the Environment Agency updates the Flood Map for Planning (Rivers and Sea) on a quarterly basis⁴³. If this has been revised within Chiltern and South Bucks, the updated Flood Zones will be automatically forwarded to the Councils for their reference. *It is recommended that only those areas that have been amended by the Environment Agency since the previous SFRA review are reflected in Zone 3 and Zone 2 of the SFRA flood maps.* This ensures that the more rigorous analyses carried out as part of the SFRA process are not inadvertently lost by a simple global replacement of the SFRA flood maps with the Flood Map for Planning (Rivers and Sea).

It is important to note that the Environment Agency has recently updated the flood outlines for the River Misbourne. This has revised the predicted flood extents equivalent to Flood Zones 3a, 3b and 2. It is anticipated that these will be used to update the Flood Zones on the Environment Agency's website in early 2017. This update to the SFRA has been produced using the published Environment Agency Flood Zones; however the draft model extent has been included to provide an indication of the likely change (see Figures 43 - 47) as a result of the updated hydraulic modelling. This draft SFRA will be published alongside the Preferred Option sites and will be finalised once the final model extents (and hence Flood Zones) are confirmed..

⁴³ Environment Agency 'Learn more about this area's flood risk mapping'. Available from: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater>

Question 4

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

Appendix A – Supporting Figures

Appendix B – Consultation Letters

The following letters were sent to consultees in August 2016 to both request flooding data and to elicit their views on the updated 2013 Chiltern SFRA and any local information they might have with regards to flooding for both Districts.

Appendix C – Summary of Past Flooding by Settlement

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
Amersham	Chiltern		Rising groundwater levels have directly caused, or exacerbated, flooding to several basement properties in Old Amersham.	<p>BCC records indicate High Street and Broadway in Amersham Old Town suffer from surface water flooding during heavy rainfall. In June 2016 23 instances of internal flooding to properties on Old Amersham High Street and a few locations in Amersham occurred. A flood investigation report (in accordance with Section 19 of the Flood and Water Management Act, 2010) will be published by BCC in late 2016.</p> <p>Some roads, and possibly properties, have flooded from surface water in Amersham on the Hill.</p>	
Ashley Green	Chiltern			Surface water flooding has occurred on some roads (e.g. Hog Lane) to the north of Ashley Green, with field runoff contributing.	
Beaconsfield	South Bucks			BCC records indicate flooding has occurred on several roads in Beaconsfield over Winter 2013/2014, including: Penn Road, Howe Drive, Warwick Road, Station Road, Reynolds Road and Shepherd's Lane.	
Burnham	South Bucks			BCC reports indicate a flood event on Britwell Road in January 2014.	

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
Chalfont St. Giles	Chiltern	The River Misbourne caused flooding in Chalfont St Giles High Street in 2001.	BCC reports indicate in March and April 2014, groundwater flooding occurred in the area near the BT telephone exchange causing disruption to traffic, pedestrians and the nearby council car park.	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.	BCC reports indicate a flood event occurred on London Road near Turners Wood Drive in January 2014.
Chalfont St. Peter	Chiltern	The River Misbourne caused flooding in Chalfont St Peter High Street in 2001.	Rising groundwater levels have directly caused, or exacerbated, flooding at the foot of Gravel Hill in Chalfont St Peter.	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. BCC flood records indicate flooding in several locations along the A413.	

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
Chartridge	Chiltern			Isolated incidents of surface water flooding of roads have been recorded in Chartridge e.g. Pednor Road and Westdean Lane.	
Chenies	Chiltern			Surface water flooding on Holloway Lane in 2007	
Chesham	Chiltern	<p>The River Chess has contributed to flooding in Pednormead End and Lower Bois.</p> <p>The ordinary watercourse adjacent to Missenden Road has caused flooding of properties in Pednormead End.</p>	<p>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 over spilled and flooded properties in the Pednormead End area, Chesham.</p>	<p>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. The likelihood of flooding increases during periods of high groundwater level.</p> <p>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.</p> <p>BCC flood data indicate reports occurring from Winter 2013/2014 in several locations in Chesham, including: Hiving's Hill, Clifton Road, Frances Street, Vale Road,</p>	

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
				<p>Bellingdon Road and Station Road. BCC reports also include information on the internal flooding of 29 commercial properties in September 2015 caused by heavy localised rainfall. A flood investigation report (in accordance with Section 19 of the Flood and Water Management Act, 2010) is available on the BCC website⁴⁴.</p> <p>The fishing lakes off Cresswell Road overflowed and flooded during a 2007 event.</p>	
Chesham Bois	Chiltern			Isolated incidents of surface water flooding have been recorded in the Parish.	
Cholesbury-cum-St. Leonards	Chiltern			<p>Oak Lane to the south of Buckland Common has flooded from surface water at times of heavy rainfall.</p> <p>BCC reports indicate flooding to Chiltern Cottages and Oak Lane were observed in January 2014.</p>	
Coleshill	Chiltern			One record of surface water flooding in 2007 exists for Coleshill.	
Denham	South Bucks			BCC data indicates a report of flooding on Old Rectory Lane between Higher Denham and Denham occurred	

⁴⁴ BCC Flood Investigations. Available from: <http://www.buckscc.gov.uk/environment/flooding/strategic-flood-management/flood-investigations/>

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
				<p>in January 2014.</p> <p>Reports of flooding from BCC data include an event at Moat Place in January 2014.</p>	
Farnham Common	South Bucks			<p>Reports of flooding from BCC data include events north of School Wood on Collum Green Road and south of School Wood on One Pin Lane.</p>	
Farnham Royal	South Bucks			<p>A report of flooding from BCC data includes an event on Bishops Orchard in January 2014.</p>	
Gerrards Cross	South Bucks			<p>A report of flooding from BCC data includes an event on the A40 to the north west of Gerrards Cross in January 2014.</p>	
Great Missenden	Chiltern	<p>The River Misbourne has caused flooding in Great Missenden.</p>	<p>Rising groundwater levels have exacerbated the impact of blocked drains and surface water flooding of several properties at Church Street in Great Missenden.</p>	<p>Surface water flooding has also occurred in Great Missenden and South Heath.</p> <p>Reports of flooding, in January 2014, on Mapridge Green Lane and Aylesbury Road are indicated in BCC flooding data. Two reports on London Road are recorded for the same dates.</p>	

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
			Flooding has also occurred at the junction of London Road and the A413, and in the fields south of Innisfree Farm.		
Iver	South Bucks			Reports of flooding from BCC data include events on Love Lane in January 2014.	
Iver Heath	South Bucks			Reports of flooding from BCC data includes events near the roundabout just west of Iver Heath on the A4007 and south of the town on Bangors Road South in January 2014.	
Latimer	Chiltern	The River Chess has contributed to flooding in Latimer Park.		Reports of flooding in January 2014 on Latimer Road near Lane Wood are included in BCC flood data. 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	Chiltern			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.	

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
				BCC data indicates flooding occurred at the junction between Lodge Lane and New Road in December 2013.	
Little Missenden	Chiltern	The River Misbourne has caused flooding in Little Missenden.		Surface water flooding has occurred in some locations in the Parish, mostly around Little Kingshill.	
Penn	Chiltern			Surface water flooding has occurred in some locations in the Parish, predominantly in the vicinity of Knotty Green. BCC data indicates flooding on Penn Street occurred in January 2014.	
Seer Green	Chiltern			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.	
Stokes Poges	South Bucks			A report of flooding from BCC data includes an event on Hollybush Hill in January 2014.	

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
Taplow				Reports of flooding from BCC data include several events at the railway station and where the railway line crosses Bath Road in January 2014.	
The Lee				Isolated incidents of surface water flooding have been recorded in the Parish.	<p>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;</p> <p>Postcode region HP6 5, Old Amersham, Chesham Bois and Hyde Heath have had 6 incidents of external sewer flooding in the past 10 years; and</p> <p>Postcode region SL9 0, Chalfont Common has had 7 incidents of either internal or external sewer</p>

Settlement Name	District	Fluvial	Groundwater	Surface Water	Other
					flooding in the past 20 years.

Table 9-1 : Summary of Past Flooding by Settlement

Appendix D – Preliminary Flood Risk Assessment – Issues and Options Sites

Assuming "More Vulnerable" Development (Housing)

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
Amersham - Copas Farm Area	135,927	Chiltern	Built Area Extension Option	Yes (minor)	More Vulnerable	Flood Zone 3b	Development should not be permitted within Flood Zone 3b and should be relocated where possible	Approximately 25% FZ3b, 35% FZ3a, 5% FZ2, 35% FZ1
Amersham - Crown Farm	48,876	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Amersham - London Road East	86,953	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 3a	Yes	Approximately 25% FZ3a, 75% FZ1
Amersham - Quill Hall Farm	314,911	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Beaconsfield	1,674,409	South	Urban Extension	Yes	More	Flood Zone	No	100% FZ1

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
		Bucks	Option (Housing)		Vulnerable	1		
Chalfont St Giles	220,064	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 3b	Development should not be permitted within Flood Zone 3b and should be relocated where possible	Approximately 15% FZ3b, 15% FZ3a, 3% FZ2, 66% FZ1
Chalfont St Peter - East	137,934	Chiltern	Urban Extension Option (Housing)		More Vulnerable	Flood Zone 1	No	100% FZ1
Chalfont St Peter - Mill Meadow	115,078	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 3b	Development should not be permitted within Flood Zone 3b and should be relocated where possible	Approximately 5% FZ3b, 35% FZ3a, 20% FZ2, 40% FZ1
Chalfont St Peter - National Centre for	1,404,147	Chiltern	Urban Extension	Yes (minor)	More	Flood Zone	No	100% FZ1

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
Epilepsy			Option (Housing)		Vulnerable	1		
Chesham - Lycrome Road Area	663,140	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Denham - Tatling End	215,875	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Farnham	688,569	South Bucks	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 1	No	100% FZ1
Gerrards Cross - North	396,906	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Gerrards Cross - South	422,445	South Bucks	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 1	No	100% FZ1
Holmer Green - South	173,040	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Iver Heath - East	234,645	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
Iver Heath - North of Pinewood	143,080	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 3a	Yes	Approximately 3% FZ3a, 97% FZ1
Iver Heath - South East of Pinewood	192,276	South Bucks	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 1	No	100% FZ1
Iver Heath - West	660,039	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Iver Village	674,123	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Little Chalfont - Land South of Little Chalfont	90,542	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Little Chalfont - Stony Lane	113,418	Chiltern	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Little Chalfont - West of Lodge Lane	512,291	Chiltern	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 1	No	100% FZ1

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
Middle Green - North	914,361	South Bucks	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 3a	Yes	Approximately 10% FZ3a, 5% FZ2, 85% FZ1
Middle Green - South	2,072,760	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 3a	Yes	Approximately 10% FZ3a, 20% FZ2, 70% FZ1
Prestwood - East of Wycombe Road	107,354	Chiltern	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 1	No	100% FZ1
Richings Park	246,552	South Bucks	Urban Extension Option (Housing)	Yes (minor)	More Vulnerable	Flood Zone 1	No	100% FZ1
Stoke Poges	437,039	South Bucks	Urban Extension Option (Housing)	Yes	More Vulnerable	Flood Zone 3a	Yes	Approximately 5% FZ3a, 95% FZ1
Taplow	427,521	South Bucks	Urban Extension Option (Housing)	No	More Vulnerable	Flood Zone 3b	Development should not be permitted within Flood Zone 3b and should be	Approximately 40% FZ3b, 5% FZ3a, 55% FZ2

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
							relocated where possible	
<p>'Minor' encroachments of the Areas of Critical Drainage within option sites have been designated where localised ponding or flow paths along highways are observed.</p>								

Table 9-2 : Preliminary Flood Risk Assessment Issues and Options Sites (Assuming 'More Vulnerable' Development)

Assuming "Less Vulnerable" Development (Offices/Light Industry or Warehousing)

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
Beaconsfield - Burtley Wood	405,631	South Bucks	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 1	No	100% FZ1
Chalfont St Peter - Chalfont Grove	81,569	Chiltern	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 1	No	100% FZ1
Chalfont St Peter - East of Golf Course	628,119	Chiltern	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 3b	Development should not be permitted within Flood Zone 3b and should be relocated where possible	Approximately 15% FZ3b, 43% FZ3a, 2% FZ2, 40% FZ1
Chesham - A146 Area	1,724,717	Chiltern	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 1	No	100% FZ1
Denham - Employment Area	967,449	South Bucks	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 2	No	Approximately 2% FZ2, 98% FZ1

Name	Area (m ²)	District	Type	Area of Critical Drainage within Site?	Vulnerability	Worst Case Flood Zone	Exception Test Required?	Flood Zone Proportions
Little Chalfont - East of Lodge Lane	406,302	Chiltern	Employment Area of Search	Yes	Less Vulnerable	Flood Zone 1	No	100% FZ1
Little Chalfont - Land East of GE Healthcare	86,971	Chiltern	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 1	No	100% FZ1
Taplow - Employment Area	614,836	South Bucks	Employment Area of Search	Yes (minor)	Less Vulnerable	Flood Zone 2	No	Approximately 40% FZ2, 60% FZ1
<p>'Minor' encroachments of the Areas of Critical Drainage within option sites have been designated where localised ponding or flow paths along highways are observed.</p>								

Table 9-3 : Preliminary Flood Risk Assessment of Issues and Options Sites (Assuming 'Less Vulnerable' Development)

Appendix E – Environment Agency Consultation Response