## REVISION SCHEDULE

West Northamptonshire Level 1 Strategic Flood Risk Assessment.

<table>
<thead>
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<th>Revision</th>
<th>Date</th>
<th>Details</th>
<th>Prepared by</th>
<th>Reviewed by</th>
<th>Approved by</th>
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<tr>
<td>01</td>
<td>31st July 2017</td>
<td>Draft SFRA Level 1</td>
<td>Josie Bateman</td>
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<tr>
<td>02</td>
<td>5th October 2017</td>
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<td>03</td>
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<td>5th December 2017</td>
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<td>05</td>
<td>19th March 2019</td>
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<td>Alison Parry</td>
</tr>
</tbody>
</table>
# CONTENTS

## EXECUTIVE SUMMARY ........................................................................................................... 7

- Study Area ............................................................................................................................... 7
- Outcomes of the Level 1 Strategic Flood Risk Assessment ....................................................... 7

## INTRODUCTION ....................................................................................................................... 10

- Applying the Sequential Test for Plan Making Purposes .......................................................... 10
- Applying the Exception Test for Plan Making Purposes .............................................................. 11
- Study Area ................................................................................................................................. 12
- Flood Risk Objectives ............................................................................................................... 12
- The Strategic Flood Risk Assessment Structure ........................................................................ 13

## METHODOLOGY ...................................................................................................................... 14

- Overview .................................................................................................................................. 14
- Tasks .......................................................................................................................................... 14
- Stakeholders ............................................................................................................................... 14

## DATA COLLECTION AND REVIEW ..................................................................................... 15

- Overview .................................................................................................................................. 15
- Topography and Geology ............................................................................................................ 15
- GIS Layers ................................................................................................................................. 16
- Data Gaps and Assumptions ....................................................................................................... 17

## RELEVANT FLOOD RISK MANAGEMENT PLANS, STRATEGIES AND STUDIES ........... 18

- National Flood and Coastal Erosion Management Strategy for England .................................... 18
- Preliminary Flood Risk Assessments ........................................................................................... 18
- Flood Risk Management Plans and River Basin Management Plans ........................................... 19
- Anglian Flood Risk Management Plan ....................................................................................... 19
- Thames Flood Risk Management Plan ....................................................................................... 20
- Severn Flood Risk Management Plan ....................................................................................... 21
- County-wide Local Flood Risk Management Strategy ................................................................. 22
- Flood and Water Related Work ................................................................................................... 23
- West Northamptonshire Strategic Flood Risk Assessment. Final Level 1 Report – Volume 1 (February 2009) ......................................................................................................................... 23
- West Northamptonshire (Daventry and South Northamptonshire) Level 2 Strategic Flood Risk Assessment. “Living Document” (June 2009) ......................................................................................... 23
- Northampton Level 2 Strategic Flood Risk Assessment. Living Document (February 2010). 23
- West Northamptonshire Development Corporation Water Cycle Strategy, Phase 1. Outline Study (May 2009) ............................................................................................................................. 23
- Northampton Central Area Action Plan Drainage Assessment (August 2012) ......................... 24
- Surface Water Management Plan ............................................................................................... 25

## LOCAL PLANS .......................................................................................................................... 26

- West Northamptonshire Joint Core Strategy (Local Plan Part 1) ............................................. 26
- Objective 1 - Climate Change ..................................................................................................... 26
- Policy BN1 - Green Infrastructure Connections ....................................................................... 27
- Policy BN7A - Water Supply, Quality and Wastewater Infrastructure .................................... 27
- Policy BN7 - Flood Risk ............................................................................................................ 27
6. FLOOD HISTORY .............................................................................................................. 30
   MAIN RIVERS .................................................................................................................. 32
   RIVER NENE AND TRIBUTARIES .................................................................................... 32
   RIVER GREAT OUSE AND TRIBUTARIES ...................................................................... 33
   RIVER CHERWELL AND TRIBUTARIES ........................................................................... 33
   RIVER LEAM .................................................................................................................... 33
   RIVER AVON .................................................................................................................... 33
   FLOOD DEFENCE INFRASTRUCTURE ............................................................................. 34
   CANALS ........................................................................................................................... 34
   LOCAL SOURCES OF FLOOD RISK ................................................................................ 34
   ORDINARY WATERCOURSES ......................................................................................... 34
   SURFACE WATER FLOOD RISK ..................................................................................... 34
   WATER AND SEWERAGE SYSTEMS ............................................................................... 34
   GROUNDWATER FLOODING ............................................................................................ 35
   RESERVOIR RISK ............................................................................................................ 36

7. PREDICTED FLOOD RISK .............................................................................................. 39
   SURFACE WATER FLOODING ....................................................................................... 39
   GENERAL DRAINAGE ISSUES ........................................................................................ 40
   FLUVIAL FLOODING ....................................................................................................... 40
   RESIDUAL FLOOD RISK .................................................................................................. 41
   GROUNDWATER FLOODING ........................................................................................... 42

8. SITE-SPECIFIC INFORMATION ....................................................................................... 44
   TOWCESTER RACECOURSE, TOWCESTER ................................................................. 58
   SITE DESCRIPTION ........................................................................................................... 58
   EXISTING WATERCOURSES AND BODIES OF WATER ................................................. 59
   GEOLOGY AND HYDROLOGY ........................................................................................... 59
   FLUVIAL FLOOD RISK ..................................................................................................... 59
   COMPARISON OF GROUND LEVELS .............................................................................. 60
   HYDROLOGY AND FLOW CALCULATIONS .................................................................. 62
   FINDINGS .......................................................................................................................... 62
   LAND AT FORMER FURTHO PIT, COSGROVE ROAD, COSGROVE .................................. 62
   SITE DESCRIPTION ......................................................................................................... 62
   EXISTING WATERCOURSES AND BODIES OF WATER ................................................. 63
   GEOLOGY AND HYDROLOGY ........................................................................................... 63
   HISTORICAL FLOODING ................................................................................................. 64
   FLUVIAL FLOOD RISK ..................................................................................................... 64
   SURFACE WATER FLOOD RISK ..................................................................................... 64
   GROUND LEVELS ............................................................................................................. 64
   TOPOGRAPHY .................................................................................................................. 65
   HYDROLOGY AND FLOW CALCULATIONS .................................................................. 66
   FINDINGS .......................................................................................................................... 67
   FURTHER SITE SPECIFIC REQUIREMENTS .................................................................... 67

9. FLOOD RISK MANAGEMENT, RESILIENCE AND RESISTANCE ..................................... 68
   FLOOD DEFENCES AND ASSETS ..................................................................................... 68
   FLOOD WARNING AND HYDROMETRIC STATIONS ....................................................... 68
   EMERGENCY PLANNING AND NEW DEVELOPMENT ..................................................... 69
   FLOOD RESILIENCE ........................................................................................................ 70
EXECUTIVE SUMMARY

A Level 1 Strategic Flood Risk Assessment (SFRA) was produced in February 2009 by Scott Wilson for Northampton Borough Council (NBC), South Northamptonshire Council (SNC) and Daventry District Council (DDC) to ensure compliance with Planning Policy Statement (PPS) 25: Development and Flood Risk.

PPS25 has since been replaced by the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance. There have also been a number of legislative and procedural changes, alongside updates to a number of flood and water data sets, modelling and mapping layers, and the production of Part 2 Local Plans currently being prepared by DDC, SNC and NBC. These changes need to be reflected within the SFRA, to ensure that a sound flood and water management evidence base is available to support the development plan-making process. In light of these changes, in May 2017 the West Northamptonshire Joint Planning Unit commissioned Northamptonshire County Council (NCC) to prepare an updated Level 1 SFRA to satisfy the requirements of the NPPF.

The NPPF was revised in March 2012 and states that an SFRA is required to assess the risk to an area from flooding from all sources, now and in the future, taking account of the impacts of climate change, and to assess the impact that land use changes and development in the area will have on flood risk.

It is essential that future development is planned carefully, steering it away from areas that are most at risk from flooding and ensuring that it does not increase flooding elsewhere.

The NPPF requires local planning authorities to review the variation in flood risk across their area, and to steer vulnerable development (e.g. housing) towards areas of lowest flood risk. Where this cannot be achieved and development is to be permitted in areas that may be subject to some degree of flood risk, the NPPF requires the Local Planning Authority (LPA) to demonstrate that there are sustainable mitigation solutions available that will ensure that the risk to property and life is minimised (throughout the lifetime of the development) should flooding occur.

Study Area

West Northamptonshire is located within the southern part of central England. It covers a large geographical area and encompasses the administrative areas of NBC, DDC and SNC in the County of Northamptonshire. The area includes four towns: Northampton, Daventry, Towcester and Brackley, and over 190 villages located in the extensive rural areas within South Northamptonshire and Daventry.

West Northamptonshire has an overall population of 396,7491. Whilst the land area is predominately rural, 55% of this population lives within the urban area of Northampton. The majority of residents from South Northamptonshire and Daventry districts live in the rural areas outside the market towns of Brackley, Daventry and Towcester.

Outcomes of the Level 1 Strategic Flood Risk Assessment

This Level 1 SFRA update has considered all sources of flood risk including pluvial, fluvial, groundwater and reservoir. A great deal of information has been gained from the Northamptonshire Local Flood Risk Management Strategy (LFRMS) produced by NCC.

A total of 1,515 flooding incidents have been recorded within West Northamptonshire since November 2010, when NCC became the Lead Local Flood Authority (LLFA), and date back to 1947.

1 Office of National Statistics 2016 mid-year estimate
Historically, the dominant source of flood risk in West Northamptonshire has been from fluvial flooding, with the most significant flooding event occurring in Easter 1998.

Flood risk zones along the main river corridors have been mapped, including the high probability areas and the functional floodplain (Flood Zone 3a and Flood Zone 3b where available). In total, there are 2,870 properties located within Flood Zone 3 in West Northamptonshire, and 5,423 located within Flood Zone 2.

In recent years surface water flood risk has affected the area. In total, there are 40,758 properties deemed to be at risk of surface water flooding in West Northamptonshire. Surface water flood risk has also been identified as a key consideration for all new development. Since April 2015, all major development proposals are now required to address surface water drainage matters to ensure that runoff from new development is mitigated to greenfield runoff rates. This can be achieved through careful design of the site layout and drainage system, as well as incorporating Sustainable Drainage Systems (SuDS).

The risk of groundwater flooding has been deemed as low in the past, however recent detailed assessments (undertaken by NCC as the LLFA) have identified areas throughout West Northamptonshire that are considered to be at high and very high risk of groundwater flooding. These areas are found in the localities of Deanshanger and Roade in South Northamptonshire, Brixworth and Moulton in Daventry District, and St. James, Kingsthorpe, Phippsville, Nene Valley and Boothville in Northampton Borough. In total 4,567 properties in the study area are located in areas at very high risk of groundwater flooding, with 3,508 properties at high risk, 5,620 at moderate risk, 12,129 at low risk, 29,172 at very low risk and 127,503 at negligible risk.

Within West Northamptonshire, 30 reservoirs fall within the Reservoirs Act 1975 (as amended by the Flood and Water Management Act 2010) and may pose a residual flood risk to local communities. There are other smaller reservoirs which have been highlighted that may also pose a risk. Outside of West Northamptonshire there are 14 reservoirs, which may pose a further residual risk to local communities.

There are 17 potential development sites that have been identified by SNC and DDC and each site has been individually assessed through the Sequential Testing process in relation to all sources of flood risk. The call for sites had not taken place by NBC at the time of writing and therefore no sites have been assessed in the Borough of Northampton. Where considered necessary, bespoke advice and guidance has been provided for each site, which should be incorporated into site-specific polices along with a requirement for a more detailed assessment to be undertaken through a site-specific Flood Risk Assessment as part of the planning application process.

The Sequential Testing process has also highlighted five sites that require more detailed assessment prior to allocation due to the flood risk posed. Three of the sites are located within Daventry District and four within South Northants, as set out below:

**Daventry District**
- Daventry Town Centre, Sites 3 and 5
- Daventry South East
- North of Middlemore

**South Northamptonshire**
- Towcester Racecourse, Towcester, Site 6
- Former Furtho Pit, Cosgrove Road, Cosgrove, Site 11

The two sites in South Northamptonshire have been reviewed in more detail as part of the preparation of this SFRA update. This has included an assessment of the fluvial flood risk to the sites from un-modelled ordinary watercourses, which are part of the geography of each site.
The findings of this additional work have confirmed that the two sites can be allocated, subject to site-specific policies relating to the location of development on the site, using the sequential approach to avoiding development in flood risk areas and within close proximity of the ordinary watercourse(s). There remains a requirement for a more detailed site-specific flood risk assessment to be accompanied with any planning application including the hydraulic modelling of these ordinary watercourses to ensure that development is not located within the defined flood risk area.
1. INTRODUCTION

1.1 The West Northamptonshire Joint Core Strategy (JCS) Local Plan (Part 1) was adopted on 15th December 2014 and covers the administrative areas of Daventry District Council (DDC), Northampton Borough Council (NBC) and South Northamptonshire Council (SNC). The JCS sets out the long-term vision and objectives for the whole of the West Northamptonshire area for the plan period up to 2029, and includes strategic policies to steer and shape development.

1.2 The Level 1 Strategic Flood Risk Assessment (SFRA) was produced in February 2009 by Scott Wilson for the West Northamptonshire Joint Planning Unit (JPU) on behalf of NBC, DDC and SNC to ensure compliance with Planning Policy Statement (PPS) 25: Development and Flood Risk, which was the policy guidance at that time.

1.3 PPS25 has since been replaced by the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance. There have also been a number of legislative and procedural changes, alongside updates to a number of flood and water data sets, modelling and mapping layers. These changes need to be reflected within the SFRA, to ensure that a sound flood and water management evidence base is available to support the development plan-making process. In light of these changes, in May 2017 the West Northamptonshire JPU commissioned Northamptonshire County Council (NCC) to prepare an updated Level 1 SFRA to satisfy the requirements of the NPPF.

1.4 One of the aims of the NPPF is to ensure that flood risk is taken into consideration at all stages in the plan-making process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest flood risk. Where new development is necessary in such areas, it aims to test this concept and make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

1.5 Paragraph 19 of the NPPF requires Local Planning Authorities (LPAs) to apply a risk-based sequential approach as part of the identification of land for development in areas at risk of flooding. The purpose of the sequential approach is to ensure that areas of low flood risk are developed in preference to areas of higher flood risk; and within this, ensuring that the developments that are most vulnerable to flood risk are located at the lowest flood risk areas. The application of the sequential test needs to be underpinned by an appropriate assessment of flood risk. The sequential approach process uses this information to avoid the highest flood risk areas and where this is not possible, take opportunities to substitute more vulnerable development to lower flood risk areas, or mitigate the risk of flooding.

Applying the Sequential Test for Plan Making Purposes

1.6 The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest risk of flooding. The detailed mapping, found within the accompanying Site Specific and Strategic Map Documents, provides the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with the lowest risk of flooding from rivers or sea). Where there are no reasonably available or sufficient sites located within Flood Zone 1, LPAs in their decision-making process should take into account the flood risk vulnerability of land uses and consider reasonably available sites located within Flood Zone 2 (areas with a medium risk of flooding from rivers or sea), applying the Exception Test, if required. Only where there are no reasonably available sites located within Flood Zone 1 or Flood Zone 2 should the suitability of sites located within Flood Zone 3 (areas with a high risk of flooding from rivers or sea) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test, if required (see Image 1).
1.7 Robust application of the Sequential Test in the plan-making process will help to ensure that development can be safely and sustainably delivered and developers do not waste time and resources promoting proposals which are inappropriate on flood risk grounds.

1.8 All sources of flooding should be treated consistently with river flooding in terms of mapping probability and assessing vulnerability to ensure that the Sequential Test and approach is properly applied across all flood zones.

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**Image 1: Extract from the National Planning Policy Framework**

**Applying the Exception Test for Plan Making Purposes**

1.9 The Exception Test, as set out in Paragraph 102 of the NPPF, is a method to demonstrate and ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

1.10 Essentially, the two parts to the Test (see Image 1) require proposed development to show 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 seek to reduce flood risk overall.

1.11 This process is summarised in Image 2. The Exception Test should only be applied as set out in National Planning Practice Guidance Flood Risk and Coastal Change (6th March 2014).
Study Area

1.12 West Northamptonshire is located within the southern part of central England. It covers a large geographical area and encompasses the administrative areas of NBC, DDC and SNC in the county of Northamptonshire. Its total area is 1376 km². The area includes four towns: Northampton, Daventry, Towcester and Brackley, and over 190 villages located in the extensive rural areas within South Northamptonshire and Daventry.

1.13 West Northamptonshire has a total population of 396,749². Whilst the land area is predominately rural, 55% of this population resides within the urban area of Northampton. The majority of residents in South Northamptonshire and Daventry districts live in the rural areas outside the market towns of Brackley, Daventry and Towcester.

Flood Risk Objectives

1.14 The general aim of the National Planning Policy Framework (NPPF) is to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest flood risk.

1.15 The NPPF specifically states that “Local Plans should take account of climate change over the longer term, including factors such as flood risk…and that new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change”.

1.16 There is an element of flexibility within the NPPF for new development that is brought forward in areas which are vulnerable. In these instances the NPPF recommends that “care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure”.

1.17 The SFRA is a strategic assessment of flood risk which all LPAs are required to carry out in preparation of their Local Development Documents (LDDs). It aims to enable sound and reliable sustainability appraisals, land allocations and development control policies, to be

² Office of National Statistics 2016 mid-year estimate
informed by an understanding of the catchment-wide flooding issues affecting the area and the implications of climate change.

1.18 This updated SFRA will form a key part of the evidence base to help inform the Local Plan Part 2 preparation. A Level 1 SFRA is principally a desk-based study required to provide the LPAs with flood risk information to apply the Sequential Test. Where it is clear that a proposed development and infrastructure cannot be accommodated in accordance with the Sequential Test, taking account of the flood vulnerability of the intended use, then a more detailed Level 2 SFRA is required to facilitate the application of the Exception Test.

1.19 At the planning application stage, an appropriate site-specific flood risk assessment (FRA) will be required for all major development proposals, sites of 1 hectare or greater located within Flood Zone 1, and for all proposals for new development located in Flood Zone 2 and Flood Zone 3. This is required to demonstrate how flood risk from all sources of flooding to the development itself, and flood risk to others, will be managed taking climate change into account. Developers, and those promoting sites, should ensure that all site-specific FRAs use the information included within this assessment to inform their production.

1.20 The aims of the updated Level 1 SFRA are to:

- Provide a sound evidence base for site allocation purposes;
- Improve the understanding of flood risk within West Northamptonshire;
- Provide information that reflects the changes to planning policy and guidance since 2009;
- Incorporate updated flood and water mapping;
- Include a climate change position statement;
- Provide an assessment of the flood risk (fluvial, pluvial, reservoir and groundwater) to inform the suitability of proposed development sites;
- Provide updated information on existing flood defences within the area;
- Provide sufficient information to enable the Sequential Test and approach (as defined in the NPPF) to be undertaken where required; and
- Include recommended policies and practices to ensure that development at risk of flooding can incorporate appropriate mitigation measures.

The Strategic Flood Risk Assessment Structure

1.21 The NPPF and associated guidance recommends that SFRAs are completed in two consecutive stages, which follow an iterative approach and to provide LPAs with sufficient information to inform and update decisions regarding development sites. The two stages are:

- **Level 1 SFRA** - the objective of this document is to collate and review available information on flood risk for the study area. This enables a review of the preliminary site allocations through the Sequential Test process, to determine if a Level 2 SFRA is required along with the scope.

- **Level 2 SFRA** - The principal objective of this document is to facilitate the application of the Exception Test. The Level 2 SFRA uses information from the Level 1 SFRA and potential additional work for sites allocated in areas at risk of flooding, which have been identified following Level 1 Sequential Testing. Modelling of key watercourses may be required to define the functional floodplain as well as the extent of the floodplain, taking into account climate change, where no data is available. The Level 2 SFRA will highlight areas where it is considered necessary to undertake flood defence works. Clear guidance will be given on appropriate policies for the application of the Exception Test and the preparation of site-specific flood risk assessments will be provided.
2. METHODOLOGY

Overview

2.1 As outlined in Paragraph 1.20 the aim of the Level 1 SFRA is to collect, collate and review the information available relating to flooding in the study area, and also review existing documents and guidance, making recommendations to ensure that the document follows current best practice and guidance.

Tasks

2.2 The following sets out the sequence of tasks undertaken in the preparation of the updated Level 1 SFRA:

- Attended an inception meeting with the LPAs, West Northamptonshire JPU, Environment Agency (EA) and Anglian Water on 4th May 2017;
- Identified the local stakeholders;
- Contacted the EA requesting data / information;
- Collated and reviewed the data;
- Undertook the Sequential Test for SNC and DDC only;
- Presented the available and relevant information on all flood sources.

2.3 All of the tasks set out above were completed between May and July 2017.

Stakeholders

2.4 The stakeholders relevant to West Northamptonshire are as follows:

- DDC;
- SNC;
- NBC;
- NCC Highways (KierWSP);
- EA;
- Highways England;
- Anglian Water;
- Thames Water;
- Severn Trent Water;
- Canal and Rivers Trust; and
- Bedford Group (Ouzel and Buckingham) of Internal Drainage Boards (IDBs).

2.5 Where relevant, all flood and water management related information and data received from the stakeholders has been reviewed and incorporated into this document.
3. DATA COLLECTION AND REVIEW

Overview

3.1 In order to inform the production of this SFRA, all data related to flood risk and proposed development has been reviewed.

3.2 Data has been obtained from DDC, SNC, NBC, the EA, Anglian Water, Thames Water, Severn Trent Water, the Highways Authority, Highways England and existing data held by the Lead Local Flood Authority (LLFA). This data includes:

- Growth aspirations for the area;
- Existing flood risk management plans, strategies and studies;
- Local development plans;
- Flood warning and alert areas;
- Environment Agency Flood Maps – fluvial, surface water and groundwater;
- Flood related asset information from all stakeholders;
- Historical flooding information including DG5 (sewer) data from Anglian Water;
- Details relating to reservoirs within and adjacent to the study area;
- Terrain/topography maps; and
- Geological maps.

Topography and Geology

3.3 The main catchments within West Northamptonshire drain from west to east with the exception of the River Cherwell catchment, which flows from north to south. The River Nene, River Great Ouse (including River Tove), River Cherwell, and their tributaries, all rise within West Northamptonshire. The upper reaches of these catchments are classed as being ‘flashy’ due to the underlying hard rock geology, leading to relatively short catchment response times. In addition to the above watercourses there are also interactions with the Grand Union Canal (with River Nene) and the Oxford Canal (with River Cherwell). A map of all watercourses and canals within West Northamptonshire is provided on Map 13: Watercourse and Canal Network, in the accompanying Strategic Map Document.

3.4 River Nene: The catchment of the River Nene covers the majority of Daventry District and Northampton Borough. The River Nene rises on the mainly clay soils of the Northampton Uplands at sources near Badby, Naseby and Yelvertoft and then crosses the gently undulating rural land to the flat plains of Peterborough. From here, the River Nene is embanked across the low-lying land of the Fens, in its course to The Wash. The principal tributaries of the River Nene within West Northamptonshire are:

- Wootton Brook;
- The Kislingbury Branch; and
- The Brampton Branch.

3.5 Northampton lies at the confluence of the River Nene’s main upper tributaries, which include the Kislingbury Branch, the Brampton Branch and Wootton Brook. Through Northampton, the river is defended, and the Northampton Washlands and Upton flood attenuation area compensate for the effect of upstream development on flow downstream. The Washlands consist of an area of former gravel workings into which floodwaters are diverted and stored for controlled release, when required.

3.6 River Great Ouse: The Great Ouse river system starts in Northamptonshire (near Brackley), passing through Buckingham, Newport Pagnell, Bedford, St Neots, St Ives and Earth before
crossing the Fens and flowing into The Wash. The River Tove and other tributaries of the Great Ouse in Northamptonshire, such as Silverstone Brook and Wood Burcote Brook, are also important watercourses in West Northamptonshire.

3.7 **River Cherwell:** The River Cherwell rises at Hellidon to the south east of Daventry, flowing in a southerly direction through parts of Daventry and South Northamptonshire, and ultimately into the River Thames.

3.8 **River Leam:** The River Leam rises at Hellidon Hill near Daventry then flows to the west into the Warwickshire Avon, a tributary of the River Severn.

3.9 **River Avon:** The River Avon rises in Northamptonshire, and flows through the counties of Leicestershire, Warwickshire, Worcestershire and Gloucestershire.

3.10 LIDAR and OS Terrain® 5 data exists for West Northamptonshire and has been presented in Map 2: Topography, in the accompanying Strategic Map Document. These models represent the bare surface of the ground, void of any vegetation or buildings. It provides an accurate demonstration of the topography within the area.

3.11 West Northamptonshire has a varied topography and bedrock geology as seen in Map 2: Topography and Map 3: Bedrock Geology, in the accompanying Strategic Map Document.

**GIS Layers**

3.12 Using the data collected from a variety of partners, a series of Geographic Information System (GIS) layers were collated to assist any site allocation decisions. Using GIS, the data was analysed and interrogated to produce flood related statistics. Broadly, the layers can be classified into three main categories; planning policy, informative and flood risk categories, as detailed in Table 1.

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<tr>
<th>Planning Policy</th>
<th>Informative</th>
<th>Flood Risk</th>
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<tr>
<td>LPA Boundaries</td>
<td>Main River</td>
<td>EA Flood Zones • Flood Map for Planning • Surface Water Flood Map • Flood Zone 3a and 3b split (where available) • Flood defences • Flood extent • Major reservoirs and water bodies • Reservoir breach plans</td>
</tr>
<tr>
<td>Potential Development Sites</td>
<td>Historical Maps</td>
<td>DG5 Flooding Information (Anglian Water)</td>
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<td>Ordinary Watercourse</td>
<td>Flood Alert and Warning Areas (EA)</td>
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<td>Canals</td>
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<td>Flood Defences</td>
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<td>Background Ordnance Survey Mapping (1:10,000, 1:25,000 and 1:250,000)</td>
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<td>Historic flood hotspot data – Borough and Districts, Bedford Group of IDBs, Canal and Rivers Trust, Highways England and Highways Authority.</td>
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*Table 1: List of GIS layers used*
Data Gaps and Assumptions

3.13 The main gaps in the data relate to watercourses where no flooding information is available. Whilst it is possible that there is no flooding related to these watercourses, it is possible that this may indeed be a gap in the data.

3.14 One of the requirements of the NPPF is that the functional floodplain, Flood Zone 3b, should be identified and mapped to highlight those areas where only water-compatible development and land use is recommended. Where this data is available the extent has been mapped. Elsewhere Flood Zone 3 has been treated as functional floodplain (Flood Zone 3b).
4. RELEVANT FLOOD RISK MANAGEMENT PLANS, STRATEGIES AND STUDIES

4.1 The plans, studies and strategies that have been reviewed to inform the update of this assessment are set out below. The key points with specific reference to flood and water management have been extracted and should be used to inform the development of future planning policy and the undertaking of site-specific flood risk assessments.

National Flood and Coastal Erosion Management Strategy for England

4.2 The National Flood and Coastal Erosion Management Strategy for England was published in September 2011 and provides guidance on “Understanding the risks, empowering communities and building resilience.”

4.3 The document builds upon existing approaches to flood and coastal erosion risk management and promotes the use of a wide range of measures to manage risk. The strategy promotes a framework to enable communities to have a greater role in local risk management decisions. The strategy encourages more effective risk management by enabling people, communities, business, infrastructure operators and the public sector to work together to:

- Ensure a clear understanding of the risks of flooding and coastal erosion, nationally and locally, so that investment in risk management can be prioritised more effectively;
- Set out clear and consistent plans for risk management so that communities and businesses can make informed decisions about the management of the remaining risk;
- Manage flood and coastal erosion risks in an appropriate way, taking account of the needs of communities and the natural environment;
- Ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond effectively to flood forecasts, warnings and advice; and
- Help communities to recover more quickly and effectively after incidents.

4.4 This document is relevant because it promotes the concept of “the better understanding of flood risk through detailed assessment”. Therefore this SFRA contributes towards providing this improved awareness and understanding.

Preliminary Flood Risk Assessments

4.5 A Preliminary Flood Risk Assessment (PFRA) is a requirement under the Flood Risk Regulations (2009), which implement the European Floods Directive (2007) into UK law. The PFRA is an assessment of:

- Flooding that has taken place in the past;
- Flooding that could take place in the future.

4.6 It considers flooding from surface water runoff, groundwater and ordinary watercourses, and is updated on a six year basis.

4.7 PFRAs are used to identify areas that are at risk of significant flooding and the first were prepared by LLFAs in 2011. These areas are called Indicative Flood Risk Areas (iFRA). LLFAs are responsible for preparing preliminary assessment reports and reviewing iFRAs identified nationally for local sources of flood risk (surface water, groundwater and small watercourses), or determining new iFRAs.

4.8 For the 2011 to 2017 planning cycle, NCC were required to identify flood risk areas for local sources using guidance produced by Defra. The areas represent ‘clusters’ where flood risk is an issue and where 30,000 people or more live. The Northamptonshire PFRA and associated iFRA Map illustrated that there were none in Northamptonshire.
LLFAs are responsible for mapping local flood hazard and flood risk for each iFRA and the EA is responsible for mapping flood hazard and flood risk for rivers, the sea and reservoirs, and for publishing the maps. These are reviewed and if required, updated and re-published every six years. These flood hazard and flood risk maps are used by the EA to prepare the Flood Risk Management Plans (FRMPs).

Following on from the previous six years, the EA will publish the updated PFRAs and iFRAs in December 2017 and these will be valid until 2023. The updated PFRA has identified Northampton Town as an iFRA due to its characteristics as a heavily urbanised environment and susceptibility to surface water flooding. This susceptibility to surface water flooding had already been identified within the Northampton Surface Water Management Plan (SWMP) and the GIS and Prioritisation Report, which emanated from the Northamptonshire Local Flood Risk Management Strategy (LFRMS) update (November 2016). As the consideration of the Northampton Borough site specific allocations is out of scope as part of this update, the implication of the Northampton Town iFRA has not been assessed. However, when these sites are put forward for review, the Northampton Town iFRA, as defined within the PFRA, should be considered in more detail.

The review has also necessitated an assessment of flooding incidents since 2011 that have had ‘significant’ human health, economic, cultural or environmental consequences. For the purposes of the review, and in accordance with guidance issued by the EA, all incidents investigated under Section 19 (Local Authorities: Investigations) of the Flood and Water Management Act (FWMA) have been assessed, a total of 51 incidents.

**Flood Risk Management Plans and River Basin Management Plans**

FRMPs build on Catchment Flood Management Plans (CFMPs) and highlight the hazards and risks of flooding from rivers, the sea, surface water, groundwater and reservoirs. They also set out how Risk Management Authorities (RMAs) work together with communities to manage flood risk. By law (EU Floods Directive 2007) the EA must produce FRMPs for each River Basin District.

Each FRMP covers a specific River Basin District. There are 11 River Basin Districts in England and Wales, as defined in the legislation. A River Basin District is an area of land covering one or more river catchments. A river catchment is the area of land from which rainfall drains to a specific river.

**Anglian Flood Risk Management Plan**

Northampton Borough is located wholly within the Anglian River Basin District. The relevant FRMP is therefore the ‘Anglian River Basin District Flood Risk Management Plan’ (Anglian FRMP), which was published on the 17th March 2016.
Thames Flood Risk Management Plan

4.15 South Northamptonshire falls partly within the Anglian FRMP area (as defined above) and the western edge of the district falls within the ‘Thames River Basin District Flood Risk Management Plan’ area.
Severn Flood Risk Management Plan

4.16 Daventry District falls mainly within the Anglian FRMP area (as defined above), and the north western part of the district falls within the ‘Severn River Basin District Flood Risk Management Plan’ area. This FRMP was published in March 2016. The south-western extent of the district also falls within the Thames FRMP area (as defined above).
4.17 The FRMPs describe the river basin and the likely source and characteristics of flooding, as well as the key objectives for managing the flood risk. The FRMPs set out actions, known as ‘measures’, which demonstrate the ways in which RMAs focus efforts to reduce flood risk. The plans promote four key themes as follows:

- **Preventing risk** - Identifying and mitigating flood risk through the development of schemes and appropriate maintenance programmes;
- **Preparing for risk** - Working with communities to help them recognise their flood risk and ensure that they are adequately prepared for flooding;
- **Protecting from risk** - Actively reducing the likelihood of flooding affecting people and property, including maintaining watercourses that pose the most significant risk;
- **Recovery and review** - Investigating instances of flooding to help communities recover from their impact and consider actions that may mitigate future risk.

4.18 FRMPs set out how RMAs (including LPAs) and communities will work together to reduce the potential adverse consequences of flooding. The EA worked in partnership with LLFAs and other risk management authorities to develop these plans at a catchment scale by pooling information from various existing plans such as Catchment Flood Management Plans and Reservoir Plans. The FRMPs are high-level documents that should be referred to when developing spatial policies.

4.19 To meet the requirements of the Water Framework Directive (WFD), each River Basin District also has a River Basin Management Plan (RBMP), which looks at how to protect and improve water quality and ecology, and use water in a sustainable way. FRMPs and RBMPs work to a 6-year planning cycle. The current cycle is from 2015 to 2021. Both flood risk management and river basin management form an important part of a collaborative and integrated approach to catchment planning for water.

4.20 The relevant RBMPs for the West Northamptonshire Area are:

- Anglian River Basin District Management Plan
- Thames River Basin District Management Plan
- Severn River Basin Management Plan

**County-wide Local Flood Risk Management Strategy**

4.21 **Section 9 of the FWMA** requires an LLFA, in this case NCC, to develop, maintain, apply and monitor a strategy for local flood risk management in its area. Local flood risk includes surface runoff, groundwater and ordinary watercourse flooding. The Northamptonshire LFRMS was first published in November 2013 and is reviewed and updated every three years.

4.22 The LFRMS provides an overall picture of flood risk at a county scale and outlines how NCC, as the LLFA, will coordinate and manage flood risk along with its RMAs. The strategy sets out the policy direction for flood defence consenting, thresholds for formal flood investigations, formal partnership and management arrangements, details regarding the asset register, and a great deal of general advice and guidance relating to flood mitigation and resilience.

4.23 The updated LFRMS and associated documents were approved by the NCC Cabinet in November 2016 and are available on the [Flood Toolkit](#), including the annual action plan, which incorporates partner actions, projects and flood alleviation schemes.
Flood and Water Related Work

West Northamptonshire Strategic Flood Risk Assessment. Final Level 1 Report – Volume 1 (February 2009)

4.24 Scott Wilson completed a Level 1 SFRA in August 2007 for West Northamptonshire (updated January 2009), which covers the combined administrative areas of DDC, SNC and NBC. This report provides an update to this document.

West Northamptonshire (Daventry and South Northamptonshire) Level 2 Strategic Flood Risk Assessment. “Living Document” (June 2009)

4.25 This Level 2 SFRA covers the combined administrative areas of DDC and SNC (i.e. excluding NBC). This document provides an increased scope from the Level 1 SFRA in locations where the Sequential Test has identified that development pressures exist for sites located in areas that are at medium or high flood risk of flooding (i.e. Flood Zone 2 or Flood Zone 3 respectively), and there are no other suitable alternative areas for development taking account of the flood vulnerability category of the intended use. Five sites were further assessed in Daventry District and fifteen in South Northamptonshire.

4.26 A number of sites were located within only a minor extent of Flood Zone 2 and Flood Zone 3 in proportion to the site areas, and it was considered that flood risk policy statements and guidance could be provided for these sites to ensure acceptability. Likewise the boundaries of several sites were reduced following a recommendation to ensure the sites are located solely within Flood Zone 1. For the remaining sites, it was recommended that these were not allocated and that site-specific FRAs be undertaken as part of any planning application process to ensure that the risk was adequately assessed, modelled and mitigated against.

Northampton Level 2 Strategic Flood Risk Assessment. Living Document (February 2010)

4.27 The Level 2 SFRA study area consists of NBC’s administrative area, the rural hinterland located within Daventry District and South Northamptonshire, referred to as the Northampton Longer Term Growth Options Study (NLTGOS) areas.

4.28 The study found that eight of the potential development areas fell within the defended floodplain. These areas have a residual risk of fluvial flooding and were assessed using the EA hydraulic breach model. Five of the potential development areas are located within the undefended floodplain (Flood Zone 3a). The flood risk at these areas was addressed using either depth hazard or full hazard mapping. Nineteen potential development areas were identified as being at risk of drainage flooding based on historical sewer flooding data.

4.29 Recommendations were made for addressing the flood risk at these areas. Four areas were identified that had un-modelled watercourses flowing through or adjacent to the area. The fluvial flood risk at these areas was therefore not quantified. These were not recommended for allocation and instead suggested that the risk should be addressed at the site-specific FRA stage.

West Northamptonshire Development Corporation Water Cycle Strategy. Phase 1. Outline Study (May 2009)

4.30 The Phase 1 Water Cycle Strategy (WCS) was developed by Halcrow in 2009 and reviewed the major growth proposed in West Northamptonshire and the challenges of accommodating large scale housing and development in the area. It assesses the potential impacts and constraints associated with the proposed major development areas with regard to:

- Flood risk;
- Water resources and supply;
- Foul sewerage;
- Wastewater treatment;
- Water quality; and
- Water-related ecology.

4.31 This WCS also provides guidance on the role of water cycle infrastructure in achieving sustainable development. It identifies actions and responsibilities to help move forward toward a future vision, as well as addressing potential barriers to achieving this vision.


4.32 The WCS assesses the potential impacts and constraints associated with the proposed major development areas (as proposed in 2011) with regard to the key topics identified in Section 4.31 of this document.

4.33 The WCS also provides guidance on the role of water cycle infrastructure in achieving sustainable development. It identifies actions and responsibilities to help move forward, as well as addressing potential barriers to achieving this vision.

4.34 This detailed WCS updates and extends the Phase 1 WCS outline study. It includes the following:
- A review of the WFD and the RBMPs published by the EA;
- An assessment of the implications of development on water resources and regional strategic water resources infrastructure;
- Demand management scenarios and a water efficiency action plan for consideration;
- An assessment of the implications of the spatial strategy set out in the West Northamptonshire Pre-submission Joint Core Strategy on water services infrastructure capacity;
- Identification of the requirements for wastewater treatment, wastewater network and water supply infrastructure.

*Northampton Central Area Action Plan Drainage Assessment (August 2012)*

4.35 This drainage assessment was undertaken by Halcrow Group Limited to be used to support the Northampton Central Area Action Plan (CAAP). The purpose of this assessment was to provide an evidence base for the Northampton CAAP and to investigate the impact of development on the drainage system and options to mitigate the impact. The assessment identified that there is drainage capacity within the surface, foul and combined drainage networks, relating to the new and redevelopment proposals set out in the Northampton CAAP.

4.36 The Northampton Central Area is extensively drained by combined sewers, with only small areas being drained by foul or surface water only sewers. With the exception of the Waterside proposals and Castle Station, Anglian Water Services modelling indicates that their combined and surface water system drains over 85% of the total area of the new and redevelopment proposals. As a result of the prevalence of combined sewers, there are a number of combined sewer overflows within the Northampton Central Area. The study identified that these operate during wet weather conditions and may have an impact on water quality. The artificial drainage system ultimately discharges to a number of open watercourses in the River Nene catchment in Northampton.

4.37 Previous studies had highlighted the issue of surface water flooding, and potential issues with capacity within the below ground drainage systems in Northampton. As many of the proposed development sites only involved a change of use of land or minor improvements to the site, it was considered that there were not any large scale changes in demand for wastewater or
surface water systems. Following the recommendations set out in the CAAP Drainage Assessment, Anglian Water developed and verified a detailed model of the foul/combined sewer network.

Surface Water Management Plan

4.38 The Northampton SWMP was produced in 2014 and the South Northamptonshire SWMP and Daventry SWMP were both produced in 2017. The SWMPs identify areas vulnerable to flooding, known as ‘wet spots’. Once identified, these areas are then prioritised for further investigation, and eventual mitigation options are assessed and implemented where economically viable.

4.39 The key stages of a SWMP are:

- **Stage 1 - Data Collection and Review**
  - Undertake a full catchment analysis and hydrological assessment to quantify the rainfall generated over a range of return periods;

- **Stage 2 - Intermediate and Detailed Assessment**
  - Through the use of hydraulic modelling, identify the sources and mechanisms of surface water flooding within the study area;
  - Assess the current risk of surface water flooding in the settlements/areas to assist in the identification of flood mitigation measures;

- **Stage 3 - Options Assessment undertaken for the identified wet spots**
  - Identify options available to reduce flood risk to the affected properties in the area;
  - Identify the environmental impacts of all options; and

- **Stage 4 - Action Plan and Reporting**
  - Creation of an action plan including an estimation of the cost implications to fund the preferred options, including year on year maintenance forecasts.

4.40 The information gained from the SWMPs have been incorporated into the Northamptonshire LFRMS Action Plan.

4.41 The documents reviewed above can provide a useful evidence base document for the plan-making process and should be reviewed when developing site-specific FRAs.
5. LOCAL PLANS

5.1 The Local Plans that comprise the Statutory Development Plan for West Northamptonshire have been reviewed to inform the update of this assessment. The key development sites have been provided by the LPAs and have been assessed in terms of flood risk in more detail. The key points with specific reference to flood and water management have been extracted and should be used to inform the development of future planning policy and the undertaking of site-specific FRAs submitted as part of future planning applications. This SFRA will be used to inform the development of future planning policy and key decisions on site-specific allocations.

5.2 The requirement to produce a Local Plan was introduced as part of the Planning and Compulsory Purchase Act 2004. The Development Plan in West Northamptonshire consists of a number of documents, all of which have been reviewed as part of the update to this SFRA. These documents include the overarching updated West Northamptonshire JCS Local Plan (Part 1), which was adopted in December 2014 and sets out the long-term vision and objectives for the whole of the area covered by DDC, NBC and SNC, for the plan period up to 2029. A number of site-specific or subject based Supplementary Planning Documents have also been reviewed.

West Northamptonshire Joint Core Strategy (Local Plan Part 1)

5.3 This JCS Local Plan forms Part 1 of the suite of Local Plans in West Northamptonshire. It provides a long-term vision for the area with an overall framework in which more detailed plans will be set out. It contains a broad planning strategy which provides a strategic framework to guide the preparation of Part 2 Local Plans. These will provide more detailed planning policies and site allocations for each of the partner Borough and District Councils.

5.4 The Plan was prepared by the West Northamptonshire JPU on behalf of DDC, NBC and SNC, working together with NCC.

5.5 The JCS sets out the long-term vision and objectives for the whole of the West Northamptonshire area for the plan period up to 2029, including strategic policies for steering and shaping development. It identifies specific locations for new strategic housing and employment and changes to transport infrastructure and other supporting community facilities, as well as defining areas where development will be limited.

5.6 The JCS includes a Policies Map, which identifies areas of protection, areas at risk of flooding and sites allocated for particular land use and development proposals. Sixteen spatial objectives have been identified within the JCS and one, ‘Objective 1 – Climate Change’, specifically references flood risk as detailed in Section 5.8 of this document.

Objective 1 - Climate Change

5.7 ‘To minimise demand for resources and mitigate and adapt to climate change, by:

- Promoting sustainable design and construction in all new development;
- Ensuring strategic development allocations are located and designed so as to be resilient to future climate change and risk of flooding;
- Encouraging renewable energy production in appropriate locations; and
- Ensuring new development promotes the use of sustainable travel modes.

The effects of Climate Change are summarised within this section and the JCS recognises that a response to climate change is something that runs through all areas of policy and that it is important to reiterate that all new development will need to consider ways to help reduce Flood Risk and Water Quality’ (Ref: Para 5.94 JCS December 2014).
5.8 There are a number of specific polices within the JCS, as set out in the following Sections of this document, that specifically refer to flood risk. These include ‘Policy BN1 - Green Infrastructure Connections’, ‘Policy BN7A - Water Supply, Quality and Wastewater Infrastructure’ and ‘Policy BN7 - Flood Risk’.

**POLICY BN1 - GREEN INFRASTRUCTURE CONNECTIONS**

5.9 ‘Green infrastructure corridors of sub-regional and local importance as set out in figure 6 of the joint core strategy will be recognised for their important contribution to sense of place and conserved, managed and enhanced by:

1) Incorporating existing and identified future networks into new development proposals;
2) Securing contributions from development or other sources for the creation of and future management of the green infrastructure networks;
3) Delivering long term management strategies for the sub-regional and local network.

Measures to enhance existing and provide new green infrastructure provision will:

a) be designed and delivered sustainably with prudent use of natural resources;
b) mitigate and adapt to the effects of climate change including through improved flood risk management and as a carbon store;
c) be designed to the highest quality in terms of appearance, access provision and biodiversity enhancement and protection;
d) reflect local character through the planting of native and other climate appropriate species and consideration of natural and cultural heritage features;
e) be supported by a long-term management strategy’.

**POLICY BN7A - WATER SUPPLY, QUALITY AND WASTEWATER INFRASTRUCTURE**

5.10 ‘New development proposals will ensure that adequate and appropriate water supply and wastewater infrastructure is available to meet the additional requirements placed upon it and to ensure that water quality is protected, and as far as is practicable, improved. Development proposals will ensure that adequate wastewater treatment capacity is available to address capacity and environmental constraints. Development should use sustainable drainage systems, wherever practicable, to improve water quality, reduce flood risk and provide environmental and adaptation benefits. To ensure all new housing is water efficient all new development will be required to achieve the equivalent of minimum level 4 standards for water conservation in the code for sustainable homes or any national equivalent standard from 2016’.

**POLICY BN7 - FLOOD RISK**

5.11 ‘Development proposals will comply with flood risk assessment and management requirements set out in the national planning policy framework and planning practice guidance and the West Northamptonshire strategic flood risk assessments to address current and future flood risks with appropriate climate change allowances. A sequential approach will be applied to all proposals for development in order to direct development to areas at the lowest probability of flooding unless it has met the requirements of the sequential test and the exception test as set out within Table 7 and Table 8.

All new development, including regeneration proposals, will need to demonstrate that there is no increased risk of flooding to existing properties, and proposed development is (or can be) safe and shall seek to improve existing flood risk management.
All proposals for development with a site area of 1 hectare or above in flood zone 1 and for development in Flood Zones 2, 3a or 3b must be accompanied by a flood risk assessment that sets out the mitigation measures for the site and agreed with the relevant authority.

A flood risk assessment must also accompany proposals where it may be subject to other sources, and forms, of flooding or where other bodies have indicated that there may be drainage problems. In order to meet the exception test development must:

1) demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk;
2) be accompanied by a site specific flood risk assessment that demonstrates that the development will be safe for its lifetime without increasing flood risk elsewhere and where possible, reduce flood risk overall where flood risk management requires the use of sustainable drainage systems to manage surface water runoff, these should:

   a) separate surface water from foul and combined sewers;
   b) be accompanied by a long term management and maintenance plan; and
   c) protect and enhance water quality. The design standard for the upper Nene catchment (through Northampton and within the Nene catchment upstream of Northampton) is the 0.5% probability (1 in 200 chance of occurring in any year) event plus climate change. Surface water attenuation should be provided up to this standard’.

5.12 Each of the allocated Sustainable Urban Extensions include policy considerations relating to flood risk management from all sources of flooding and the requirement to incorporate Sustainable Drainage Systems (SuDs).

5.13 The JCS has a section on Water Resources, Water Quality and Flood Risk Management and outlines that development can have a significant impact on water resources, from putting additional strain on existing supplies, to affecting flood patterns by changing both the way that water flows across, and percolates, into land. It therefore highlights that it is essential to protect and enhance the quality and quantity of both ground and surface water, ensure necessary water service provision, conserve water supplies and manage flood risk.

5.14 Section 10.49 of the JCS states that, ‘due to the potential effects of climate change there is an increasing need for local authorities to appraise, manage and reduce flood risk from all sources. In accordance with the sequential test and principles of the National Planning Policy Framework and national Planning Practice Guidance, development will be steered away from areas of greatest risk and, where this is not possible, flood risk management will be required to make development safe.’

5.15 Section 10.50 of the JCS concludes by stating that, ‘Flood risk and water quality are significant concerns for West Northamptonshire… [including] fluvial… and surface water flooding.’ The FWMA (2010) and the roles it gives to NCC as the LLFA are set out in Section 10.51 of the JCS.

5.16 Section 10.52 of the JCS states that, ‘All new developments will need to demonstrate that they have regard to existing and future flood patterns and that the need for effective protection and flood risk management measures from all sources, such as sustainable drainage systems and opportunities for strategic flood storage…’

5.17 An overview of the flood related evidence base is provided with the JCS including:

- The West Northamptonshire Level 1 SFRA 2009 (which this document will update);
- The Level 2 SFRA for South Northamptonshire and Daventry District (2010);
- The West Northamptonshire WCS;
- The Drainage Plan for the Central Area of Northampton;
- The River Nene CFMPs (2009);
- The River Ouse CFMPs (2010); and
- The River Thames CFMPs (2009).

5.18 Section 10.58 of the JCS sets out the requirements and purpose of the Sequential and Exception Tests and states that, 'Development will be required to take account [of these] as set out in the NPPF…'

5.19 The JCS is supported by a vast amount of evidence-based documents, in particular the [Sequential and Exception Test Technical Note Update](#) (July 2012) and associated appendices.

**Neighbourhood Planning**

5.20 Neighbourhood planning gives communities direct power to develop a shared vision for their neighbourhood, and help shape the development and growth of their local area. Communities are able to choose where they want new homes, shops and offices to be built, have their say on what those new buildings should look like and what infrastructure should be provided, and grant planning permission for the new buildings they want to see go ahead.

5.21 Neighbourhood planning provides a powerful set of tools for local people to ensure that they get the right types of development for their community, in order to align the aims and aspirations of the neighbourhood with the strategic needs and priorities of the wider local area.

5.22 The Localism Act of 2011 states that “a Local Planning Authority (LPA) should be proactive in providing information to communities about neighbourhood planning and fulfil its duties and take decisions as soon as possible, and within statutory time periods where these apply”. It also suggests that the LPA should set out a clear and transparent decision-making timetable and share this with those wishing to prepare a Neighbourhood Plan.

5.23 Through the development of Neighbourhood Plans, flood risk should be considered early on in the planning process and the LPAs should promote this essential part of the process taking into account the NCC-produced guidance on [‘Neighbourhood Planning and Flood Risk’](#). Those wishing to develop Neighbourhood Plans in West Northamptonshire should refer to this guidance for more information.
6. FLOOD HISTORY

6.1 The area of West Northamptonshire has a long history of flooding, see Map 4: Recorded Flood Incidents, in the accompanying Strategic Map Document, for more information. The earliest flood event on record dates back to 1947. Flood events have been recorded from all sources, including fluvial, surface water and ground water, and have been collated from all RMA records.

6.2 The main source of flooding within West Northamptonshire is fluvial. The main rivers in the study area drain from west to east with the exception of the River Cherwell, which flows from north to south. The River Nene, River Great Ouse (including River Tove), River Cherwell and their tributaries all rise within West Northamptonshire. The upper reaches of these catchments are classed as being ‘flashy’ due to the underlying hard rock geology, leading to relatively short catchment response times. The watercourses also interact with the Grand Union Canal (with River Nene) and the Oxford Canal (with River Cherwell).

6.3 The three most significant flood events on record in the area occurred in March 1947, Easter 1998, and June 2007. In March 1947, a combination of heavy rain on a frozen catchment, followed by rapid snowmelt, resulted in substantial flooding of the River Nene.

6.4 In April 1998, Northampton and the surrounding areas were flooded due to very heavy rainfall, river channel exceedance and surface water flooding. An estimated 4,200 properties were affected causing over £75 million worth of damage. Many of these properties were commercial properties and critical infrastructure was also affected. Towns, villages and agricultural land in Northamptonshire were severely damaged by the flooding. In Northampton alone, over 2,500 properties were flooded, two people died and 150 people were treated in hospital for flood related injuries and hypothermia.

6.5 In June 2007, three intense rainfall events occurred. These were exacerbated by a dry catchment, which resulted in the flooding of numerous properties due to a combination of channel exceedance and local drainage issues, causing surface water flooding.

6.6 On the 21st November 2012, a total of 20-30mm of rain fell across Northamptonshire with some parts getting as much as 40mm. This caused widespread surface water and fluvial flooding. A further 20mm of rain fell on the night of 24th November 2012, which resulted in further flooding across the County. A total of 342 flood incidents were reported in Northamptonshire during the last two weeks of November 2012. As a result of these incidents, it is believed that approximately 140 properties flooded internally.

6.7 A total of 207 flooding incidents were recorded across Northamptonshire on the 9th March 2016; these resulted from a wide spread of surface water flooding and approximately 71 properties were flooded internally.

6.8 A total of 410 flooding incidents have occurred in NBC, 889 in SNC and 587 in DDC. These events have been recorded from the following sources:

- Historical data from each of the three Borough and District Councils;
- Historical data from Anglian Water, Thames Water and Severn Trent Water;
- Information from the Canal and River Trust;
- Information from Highways England and NCC Highways Authority;
- EA records of flooding plus references to historic floods from studies and plans; and
- Reports from members of the public, affected individuals and media reports.

6.9 Where flooding meets thresholds prescribed by the Northamptonshire LFRMS, detailed Formal Flood Investigation reports are produced as required by Section 19 of the FWMA (2010). These reports are published by NCC on the Flood Toolkit. Table 2, Table 3 and Table 4 list the broad
locations where flooding has occurred within West Northamptonshire, along with the total number of properties within each location and total numbers affected.

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of properties affected internally</th>
<th>No. of properties affected externally</th>
<th>Total property numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weedon</td>
<td>48</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Woodford</td>
<td>33</td>
<td>14</td>
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<tr>
<td>Welford</td>
<td>20</td>
<td>15</td>
<td>35</td>
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<tr>
<td>Long Buckby</td>
<td>13</td>
<td>21</td>
<td>34</td>
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<tr>
<td>Barby and Kilsby</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Yelvertoft</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Braunston and Welton</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
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<td>6</td>
</tr>
<tr>
<td>Ravensthorpe</td>
<td>4</td>
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<td>5</td>
</tr>
<tr>
<td>Moulton</td>
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<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Walgrave</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Abbey South</td>
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<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hill</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Drayton</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>159</td>
<td>71</td>
<td>230</td>
</tr>
</tbody>
</table>

Table 2: Flooding incidents affecting properties – Daventry District

*N.B. This table is indicative of reported flood incidents which have affected properties either internally or externally only, rather than broader reported incidents of flooding.*

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of properties affected internally</th>
<th>No. of properties affected externally</th>
<th>Total property numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astwell</td>
<td>47</td>
<td>1</td>
<td>48</td>
</tr>
<tr>
<td>Towcester Mill</td>
<td>41</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Danvers and Wardoun</td>
<td>28</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Hackleton</td>
<td>17</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>Deanshanger</td>
<td>21</td>
<td>10</td>
<td>31</td>
</tr>
<tr>
<td>Washington</td>
<td>22</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Harpole and Grange</td>
<td>20</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Silverstone</td>
<td>24</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Heyfords/Bugbrooke</td>
<td>18</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Blakesley and Cote</td>
<td>14</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Tove</td>
<td>10</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Brackley South</td>
<td>2</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>Brackley East</td>
<td>15</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Kings Sutton</td>
<td>10</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Cosgrove and Grafton</td>
<td>2</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Brafield and Yardley</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Steane</td>
<td>7</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Brackley West</td>
<td>11</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Salcey</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Whittlewood</td>
<td>8</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Blisworth and Roade</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Middleton Cheney</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Towcester Brook</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Little Brook</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Old Stratford</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Kingthorn</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Grange Park</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>349</td>
<td>116</td>
<td>465</td>
</tr>
</tbody>
</table>
Table 3: Flooding incidents affecting properties – South Northamptonshire

*N.B. This table is indicative of reported flood incidents which have affected properties either internally or externally only, rather than broader reported incidents of flooding.*

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of properties affected internally</th>
<th>No. of properties affected externally</th>
<th>Total property numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Hunsbury</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Nene Valley</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Riverside</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Talavera</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Park</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Kingsley</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Billing</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Spencer</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Old Duston</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Castle</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Brookeside</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Kingsthorpe</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Abington</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Semilong</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rushmills</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Delapre and Briar Hill</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Upton</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rectory Farm</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>New Duston</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Phippsville</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>West Hunsbury</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Eastfield</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38</strong></td>
<td><strong>34</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>

Table 4: Flooding incidents affecting properties – Northampton Borough

*N.B. This table is indicative of reported flood incidents which have affected properties either internally or externally only, rather than broader reported incidents of flooding.*

Main Rivers

**River Nene and Tributaries**

6.10 The catchment of the River Nene covers the majority of the DDC and NBC administrative areas. The River Nene rises on the mainly clay soils of the Northampton Uplands at sources near Badby, Naseby and Yelvertoft and then crosses the gently undulating rural country to the flat plains of Peterborough. From here, the River Nene is embanked across the low-lying land of the Fens, in its course to The Wash. Upstream of Peterborough, the principal tributaries of the River Nene are:

- Wootton Brook;
- The Kislingbury Branch;
- The Brampton Branch;
- River Ise;
- Harper’s Brook; and
- Willow Brook.

6.11 Northampton lies at the confluence of the River Nene’s main upper tributaries, which include the Kislingbury Branch, the Brampton Branch and Wootton Brook. Through Northampton, the River Nene is defended and the Northampton Washlands compensate for the effect of upstream development on flow downstream. The Washlands consist of an area of former gravel workings into which floodwaters are diverted and stored for controlled release as the flood subsides.
6.12 A flood storage reservoir was constructed on the Weedon Branch. This reservoir reduces the flood risk in Weedon and along the Kislingbury Branch through to Northampton.

6.13 The catchment area of the River Nene to Peterborough is 1711 km² and the area of the fenland catchment is 556 km², giving a total catchment area of 2267 km².

River Great Ouse and Tributaries

6.14 The Great Ouse catchment (including its tributaries) covers an area in excess of 8,500km². The River Great Ouse is the primary river system, which starts in Northamptonshire (near Brackley), passes through Buckingham, Newport Pagnell, Bedford, St Neots, St Ives and Earith before crossing the Fens and flowing into The Wash. The main tributaries of the River Great Ouse include:

- River Tove;
- River Ouzel;
- River Ivel;
- River Cam;
- River Lark;
- River Wissey; and
- River Little Ouse.

6.15 Of these watercourses only the River Tove is situated within the study area.

6.16 The catchment is largely rural and it supports traditional industries such as manufacturing, tourism, and agriculture. The main towns (Milton Keynes, Bedford, Cambridge and King’s Lynn) are situated downstream of the study area.

River Cherwell and Tributaries

6.17 The River Cherwell rises at Hellidon to the south east of Daventry, flowing in a southerly direction through parts of Daventry and South Northamptonshire. Downstream of the administrative area for South Northamptonshire, near to Cropredy, the Oxford Canal follows the Cherwell Valley. Further downstream the River Cherwell then flows through Banbury and parts of industrial Oxfordshire before flowing through Oxford and ultimately flowing into the River Thames to the west of central Oxford.

River Leam

6.18 The River Leam rises at Hellidon Hill near Daventry then flows to the west into the Warwickshire Avon. It is a tributary of the River Severn but also has its own tributary in Northamptonshire, known as Rains Brook, which runs between the villages of Barby and Kilsby.

River Avon

6.19 The River Avon is a major left-bank tributary of the River Severn. It rises near to the village of Naseby, Daventry, and flows through the counties of Northamptonshire, Leicestershire, Warwickshire, Worcestershire and Gloucestershire. Tributaries of the River Avon include:

- Clifton Brook;
- Clay Coton Brook; and
- Yelvertoft Brook.

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Flood Defence Infrastructure

6.20 NCC, along with its RMA partners, hold a great deal of GIS data showing the location of flood defences and flood defence assets from the RMAs. It should be noted that there is a residual risk of flooding from failure, breach or overtopping of flood defences.

Canals

6.21 There are two canals within the study area, which inter-link with watercourses and may convey floodwaters. In addition to flood risk from canals due to the conveyance of floodwaters, there is also the residual risk of failure of canal embankments.

6.22 The Grand Union Canal: Daventry and Drayton reservoirs in the upper catchment of the Kislingbury branch of the River Nene supply this canal. The canal and its ‘Northampton Arm’ cross the upper catchment of the River Nene. The Northampton Arm of the canal may have some effect on how the catchment responds. However, the canal does not introduce floodwaters from other catchments. Plans remain to construct a ‘Daventry Arm’ to the Grand Union Canal, which will extend southwards into the centre of Daventry.

6.23 The Oxford Canal: starts by the River Thames in Oxford and runs for 77 miles to near Coventry where it connects to the Midlands canal system. Twice along its route, the Oxford canal connects with the Grand Union Canal. The Oxford Canal descends into the valley of the River Cherwell, where it passes briefly through the western edge of the study area. The Canal is predominately situated within the floodplain of the River Cherwell and as such it is likely that the canal would convey floodwaters during a major flooding event.

6.24 Should any development be proposed in the vicinity of the Grand Union or Oxford Canal, then the proposed development sites should be examined in more detail to assess whether they may be affected by canal flooding.

Local Sources of Flood Risk

Ordinary Watercourses

6.25 An ordinary watercourse, is a watercourse not defined by the EA as a main river. Ordinary watercourses are generally smaller than main rivers, and can include streams, ditches and piped watercourses. Ordinary watercourses cover a significant proportion of West Northamptonshire, and providing that they can convey water, can be as small as a ditch. The full extent of the Ordinary Watercourse coverage can be seen on Map 13: Watercourses and Canal Network, in the accompanying Strategic Map Document.

Surface Water Flood Risk

6.26 The full extent of the surface water flood risk in West Northamptonshire can be viewed on Map 9: Risk of Flooding from Surface Water, in the accompanying Strategic Map Document. This map also demonstrates that due to the landform and topography of West Northamptonshire, there is a wide-spread high risk of surface water flooding. Therefore where areas of surface water flood risk fall within a proposed development site, this should be considered as part of any site-specific flood risk assessment.

Water and Sewerage Systems

6.27 Recorded incidences of this type of flooding are known as DG5 incidents and are incorporated within Map 4: Recorded Flood Incidents, in the accompanying Strategic Map Document. It should be noted that Severn Trent Water and Thames Water have not provided their DG5
incident records and therefore the data incorporated relates to Anglian Water DG5 flooding incidents only.

6.28 There have been a total of 419 flooding incidents of this nature within the study area and they are listed in Table 5 below.

6.29 Where incidents are located within 400m of a proposed development site, consideration of the potential effects of capacity resulting in surcharging have been assessed as part of the Sequential Testing process, and should also be considered as part of any site-specific FRA.

<table>
<thead>
<tr>
<th>Administrative area</th>
<th>Internal DG5 incidents</th>
<th>External DG5 incidents</th>
<th>Total no. of recorded DG5 incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daventry</td>
<td>10</td>
<td>58</td>
<td>68</td>
</tr>
<tr>
<td>Northampton</td>
<td>57</td>
<td>191</td>
<td>248</td>
</tr>
<tr>
<td>South Northamptonshire</td>
<td>3</td>
<td>100</td>
<td>103</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>349</td>
<td>419</td>
</tr>
</tbody>
</table>

Table 5: Recorded Anglian Water DG5 flooding incidents within West Northamptonshire

Groundwater Flooding

6.30 Groundwater flooding tends to last longer than fluvial or surface water flooding and mostly affects below surface infrastructure and buildings (for example, tunnels, basements and car parks). The main causes and impacts of groundwater flooding include:

- Rise of typically high groundwater levels to extreme levels in response to prolonged intense rainfall;
- Rising groundwater levels in response to reduced groundwater abstraction in an urban area (termed groundwater rebound) or a mining area (termed mine water rebound);
- Subsidence of the ground surface below the current groundwater level;
- Rise of groundwater levels due to leaking sewers, drains and water supply mains;
- Faulty borehole headworks or casings, causing upward leakage of groundwater driven by high pressure underground; and
- Increases in groundwater levels and changed flow paths due to artificial obstructions or pathways, and loss of natural storage and drainage paths.

6.31 The extent and level of risk posed by ground water flooding across West Northamptonshire can be seen on Map 10: Groundwater Flood Risk, in the accompanying Strategic Map Document. The map shows pockets of very high bedrock.

6.32 There have been a total of 26 reported incidents of groundwater flooding in West Northamptonshire.

6.33 In the upper reaches of the River Nene, River Great Ouse (including River Tove) and the River Cherwell, soil types are typically of a clay nature with underlying strata typically in the form of limestones and ironstones. Sedimentary rocks are potential water bearing formations, however the impermeable nature of the overlying drift means that there is less potential for groundwater emergence and flooding. The full bedrock geology of West Northamptonshire can be found in Map 3: Bedrock Geology, in the accompanying Strategic Map Document.

6.34 Consideration of the potential effects of groundwater flooding should be considered as part of any site-specific FRA.
**Reservoir Risk**

6.35 The EA have provided a list of data relating to a number of reservoirs and inland water bodies that either fall within the study area or where significant failure / breach would have an effect upon watercourses within the study area.

6.36 Map 11: Flood Storage and Water Supply Reservoirs, in the accompanying Strategic Map Document, shows the location of these reservoirs within the study area. In addition, there are a number of reservoirs located outside of the study area that may affect the study area if they were to fail / breach. Table 6 lists the reservoirs, their location, capacity and surface area (where known).

6.37 Where there is a risk of flooding to development sites as a consequence of reservoir breach, failure or overtopping, this has been captured within the maps provided in the accompanying Site Specific Map Document. An appropriate analysis should be undertaken as part of any site specific FRA for any development site that falls within a breach location.

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Location</th>
<th>Capacity (m³)</th>
<th>Surface Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biddlesden Park Upper Lake</td>
<td>Near Town</td>
<td>38500</td>
<td>24000</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Waters, Fawsley</td>
<td>Near Daventry</td>
<td>120000</td>
<td>619000</td>
</tr>
<tr>
<td>Boddington</td>
<td>Near Banbury</td>
<td>930000</td>
<td>290000</td>
</tr>
<tr>
<td>Castle Ashby - Engine Pond</td>
<td>Near Northampton</td>
<td>25000</td>
<td>23000</td>
</tr>
<tr>
<td>Castle Ashby - Menagerie</td>
<td>Near Northampton</td>
<td>28000</td>
<td>18900</td>
</tr>
<tr>
<td>Castle Ashby - Park Pond</td>
<td>Near Northampton</td>
<td>53000</td>
<td>35330</td>
</tr>
<tr>
<td>Clattercote</td>
<td>Near Banbury</td>
<td>250000</td>
<td>85000</td>
</tr>
<tr>
<td>Dallington Brook</td>
<td>Near Northampton</td>
<td>51740</td>
<td>21340</td>
</tr>
<tr>
<td>Daventry</td>
<td>Near Daventry</td>
<td>933000</td>
<td>324000</td>
</tr>
<tr>
<td>Drayton</td>
<td>Near Daventry</td>
<td>324000</td>
<td>107000</td>
</tr>
<tr>
<td>Duston Mill Flood Storage Area</td>
<td>Near Northampton</td>
<td>480000</td>
<td>160000</td>
</tr>
<tr>
<td>Grendon Quarter Pond</td>
<td>Near Castle Ashby</td>
<td>35000</td>
<td>35000</td>
</tr>
<tr>
<td>Grimsbury</td>
<td>Near Banbury</td>
<td>234000</td>
<td>71000</td>
</tr>
<tr>
<td>Harlestone Lake</td>
<td>Near Northampton</td>
<td>36000</td>
<td>23000</td>
</tr>
<tr>
<td>High Park Lake</td>
<td>Near Daventry</td>
<td>80000</td>
<td>55000</td>
</tr>
<tr>
<td>Hollowell</td>
<td>Near Spratton</td>
<td>2064000</td>
<td>542000</td>
</tr>
<tr>
<td>Naseby</td>
<td>Near Naseby</td>
<td>1141000</td>
<td>330000</td>
</tr>
<tr>
<td>Northampton Washlands</td>
<td>Near Northampton</td>
<td>2340000</td>
<td>970000</td>
</tr>
<tr>
<td>Overstone Lower (Pike Pond)</td>
<td>Near Northampton</td>
<td>50000</td>
<td>16000</td>
</tr>
<tr>
<td>Overstone Park Lake</td>
<td>Near Northampton</td>
<td>180000</td>
<td>86000</td>
</tr>
<tr>
<td>Overstone Upper Pond</td>
<td>Near Northampton</td>
<td>25000</td>
<td>23000</td>
</tr>
<tr>
<td>Pitsford</td>
<td>Near Northampton</td>
<td>17545000</td>
<td>3030000</td>
</tr>
<tr>
<td>Ravensthorpe</td>
<td>Near Spratton</td>
<td>1884000</td>
<td>460000</td>
</tr>
<tr>
<td>Scotland Pond (Castle Ashby)</td>
<td>Near Castle Ashby</td>
<td>28500</td>
<td>25800</td>
</tr>
<tr>
<td>Sulby</td>
<td>Near Welford</td>
<td>400000</td>
<td>143000</td>
</tr>
<tr>
<td>Sywell</td>
<td>Near Wellingborough</td>
<td>1073000</td>
<td>270000</td>
</tr>
<tr>
<td>Stanford Upon Avon</td>
<td>North West of Northamptonshire</td>
<td>1527000</td>
<td>550000</td>
</tr>
<tr>
<td>Reservoir Name</td>
<td>Location</td>
<td>Capacity 1</td>
<td>Capacity 2</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Towcester Flood Storage Reservoir</td>
<td>Near Towcester</td>
<td>105000</td>
<td>155000</td>
</tr>
<tr>
<td>Upton Flood Storage Reservoir</td>
<td>Northampton</td>
<td>350000</td>
<td>-</td>
</tr>
<tr>
<td>Wakefield Lodge</td>
<td>Near Potterspury</td>
<td>80000</td>
<td>5700</td>
</tr>
<tr>
<td>Weedon Flood Storage Reservoir</td>
<td>Near Weedon Bec</td>
<td>81000</td>
<td>456000</td>
</tr>
<tr>
<td>Welford</td>
<td>Near Welford</td>
<td>274000</td>
<td>81000</td>
</tr>
<tr>
<td>West Cherwell Flood Storage Area</td>
<td>Near Banbury</td>
<td>79000</td>
<td>-</td>
</tr>
<tr>
<td>Wormleighton</td>
<td>Near Banbury</td>
<td>79000</td>
<td>52000</td>
</tr>
</tbody>
</table>

* Reservoirs with capacity >25,000m$^3$ fall under the Reservoirs Act (1975)

Table 6: Reservoirs in close proximity to and within the Study Area

6.38 There is a requirement within the NPPF to consider all sources of flood risk and therefore flood risk from reservoirs has been reviewed as part of this assessment.

6.39 Reservoir flooding may occur as a result of the facility being overtopped and / or as a result of a breach developing in the dam wall. The latter can happen suddenly resulting in rapidly flowing, deep water that can cause a significant threat to life and major property damage.

6.40 A breach to the Pitsford, Ravensthorpe or Northampton Washlands Reservoirs could result in extensive flooding to Daventry District and Northampton Borough, with potentially severe consequences on properties and infrastructure. A breach could also lead to a flood wave coming down the River Nene posing a threat to anglers, boaters and other passers-by near the river. This threat is shown on Map 11: Flood Storage and Water Supply Reservoirs, in the accompanying Strategic Map Document.

6.41 If development is proposed within a reservoir inundation extent as shown on Map 11: Flood Storage and Water Supply Reservoirs, in the accompanying Strategic Map Document, then it is recommended that a site-specific FRA be produced and that this FRA should consider flood risk from a breach of the reservoir.

6.42 The EA is responsible for enforcing the Reservoirs Act (1975 as amended by the FWMA 2010), which is the safety legislation for reservoirs in the United Kingdom. However, the responsibility for safety lies with reservoir owners. There are different requirements for reservoirs that hold 25,000m$^3$ or more of water above ground level (known as large raised reservoirs), and for reservoirs that hold less than 25,000m$^3$ of water above ground level. Reservoirs must be registered with the EA if it holds or could hold 25,000m$^3$ or more of water above ground level.

6.43 The EA is also responsible for establishing and maintaining a register of reservoirs, and making this information available to the public. As the associated enforcement authority, the EA must ensure flood plans are produced for specified reservoirs.

6.44 Reservoir owners (Undertakers) have ultimate responsibility for the safety of their reservoirs. They must appoint a Panel Engineer (a specialist civil engineer who is qualified and experienced in reservoir safety) to continuously supervise the reservoir (Supervising Engineer) and to carry out periodic inspections (Inspecting Engineer). A Panel Engineer must also be appointed to design and construct a new reservoir or repair or make changes to an existing reservoir (Construction Engineer).

6.45 A periodic inspection, by an Inspecting Engineer, is required every ten years or more frequently if necessary. As a result of that inspection, a safe operating regime will be specified and works required ‘in the interests of safety’ may be recommended. A Supervising Engineer is required to supervise the operation and maintenance of the reservoir and produce an annual statement.
The Supervising Engineer can recommend that a periodic inspection is carried out\(^4\). As a result of inspections and assessments of reservoirs, the risk of catastrophic breach, failure or overtopping is reduced, although there is still a residual risk.

\(^4\) [https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements](https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements)
7. **PREDICTED FLOOD RISK**

**Surface Water flooding**

7.1 Also known as pluvial flooding, surface water flooding occurs when rainfall generates runoff which flows over the surface of the ground and ponds in low lying areas. It is usually associated with high intensity rainfall events and can be exacerbated when the ground is saturated or when the drainage network has insufficient capacity to cope with the additional flow.

7.2 Flooding occurs as a result of the rainfall that does not soak into the land or enter a drainage system or watercourse, but remains on the surface. Runoff does not necessarily cause a problem if it flows straight into drains or watercourses, or on to land where it can quickly soak away. However, in some cases runoff flows onto the road network creating a hazard, particularly in winter conditions, or into homes or onto their land where it can cause damage and disruption. Runoff may also pass into small ditches or channels that run through or adjacent to property. If not maintained these flow routes can become ineffective and flooding may occur. Surface water can also be caused by flood water coming out of a drainage system where capacity has been exceeded.

7.3 Surface water flooding can also originate from farmland, often termed agricultural runoff. This is a particular risk where soil has been compacted or vegetation removed, either seasonally by ploughing or temporarily as topsoil is stripped to allow for development, as rainwater is no longer able to quickly soak into the ground. Instead the rainwater flows over the land, carrying soil with it to create a “muddy flood”. The farmland itself can be damaged because the floodwater can carry away topsoil and even crops.

7.4 The updated Flood Map for Surface Water produced by the EA has been used to inform the findings of this report and in particular the site-specific assessment found in Section 8 of this document. This mapping layer assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- 1 in 30 (3.3%);
- 1 in 100 (1%); and
- 1 in 1000 (0.1%).

7.5 It provides the following data for each flooding scenario:

- Extent;
- Depth;
- Velocity (including flow direction at maximum velocity); and
- Hazard (as a function of depth and velocity).

7.6 It includes information about the source of the data (i.e. whether it was from the nationally or locally produced modelling) and the confidence in the data outputs.

7.7 Map 9: Risk of Flooding from Surface Water, in the accompanying Strategic Map Document, presents this data within the study area and demonstrates that a large proportion of West Northamptonshire is affected by the risk of surface water flooding.

7.8 The data has also been used to inform the site-specific assessments and the associated maps show that there are numerous potential development sites at risk from surface water flooding, particularly those close to the watercourses and with undulating topography.

7.9 In total, there are 40,758 properties at risk of surface water flooding in the study area and this is divided across the three Local Authority areas as follows:
- DDC - 8,022 properties;
- SNC - 7,350 properties; and
- NBC - 25,386 properties.

**General Drainage Issues**

7.10 Overflowing surface water drains can lead to flooding, either due to under capacity of drainage or failure of a drainage system, such as blocked pipes, mechanical breakdown or operational errors. Gravity drained systems can back up due to an inability to flow into the river because of high river levels occurring in the receiving watercourse. Individually these impacts usually have little consequence for the flood risk across the wider catchment. However, due to their widespread occurrence, the local impacts cannot be ignored.

7.11 Sewers are typically designed to cater for a storm period from 2% up to the 3.33% Annual Exceedance Probability (AEP). Combined sewer systems (where surface water and foul water use the same network), in comparison to the separate systems, have more limited capacity. They often do not have the capacity to convey all flows during a significant event, with excess flows being discharged into adjacent watercourses via combined sewer overflows. Furthermore, during high flow events, excess flood water can flow out of the combined sewer system at manholes, and flood roads and properties in the vicinity. The level of performance of the sewers will be reduced by lack of regular maintenance.

7.12 It is clear from the number of instances of flooding in the study area, combined with the increased pressure for development and the impacts of climate change, that localised flood risk, arising from inadequate surface water drainage capacity, will need to be managed effectively to deliver an overall reduction in flood risk. Where known capacity issues have been identified, as part of the site-specific assessments, these have been highlighted.

7.13 Detailed consideration and assessment will be required for certain sites as part of the planning application process, and this has been outlined within the Sequential Testing tables set out in Section 8 of this document.

**Fluvial Flooding**

7.14 River flooding, also known as fluvial flooding, occurs when a watercourse cannot accommodate the volume of water that is flowing into it. Rivers are categorised into main rivers and ordinary watercourses. Main rivers are usually large watercourses, but also include smaller watercourses of strategic drainage importance. These are coordinated, in flood risk terms, by the EA. Smaller watercourses, ditches and streams are classified as ordinary watercourses. Ordinary watercourses in Northamptonshire are those not defined as main rivers and are coordinated in flood risk terms by NCC. All Borough and District Councils have permissive powers under the Land Drainage Act (1991 as amended) to undertake works on these watercourses.

7.15 The main rivers in the study area have been identified in the following maps, in the accompanying Strategic Map Document:

- Map 1a: Study Area and Main Rivers;
- Map 1b: Study Area and Main Rivers in South Northamptonshire District;
- Map 1c: Study Area and Main Rivers in South Northamptonshire District;
- Map 1d: Study Area and Main Rivers in Northampton Borough;
- Map 1e: Study Area and Main Rivers in Daventry District.

7.16 Within West Northamptonshire there are 5,423 properties identified as being located in Flood Zone 2 and 2,870 properties located in Flood Zone 3. Map 6: Fluvial Flood Zones, in the accompanying Strategic Map Document, identifies these zones.
7.17 Detailed consideration should be given to fluvial flood risk as part of the preparation of any site-specific FRA and should include the updated climate change allowances. See Appendix 4 ‘Guidance on the preparation of FRAs’ and Appendix 5 ‘Guidance on Climate Change Allowances’ for more information. This information should also be used to inform future planning policy considerations.

7.18 The risk of fluvial flooding from Flood Zone 3a and Flood Zone 3b in West Northamptonshire is presented, where available, on Map 7: Flood Zone 3a and 3b, in the accompanying Strategic Map Document. Flood Zone 3a extends across all three areas of West Northamptonshire, to the east of South Northamptonshire and to the north of Daventry. These areas are mainly located where the main rivers can be found, e.g. the River Nene.

7.19 Land deemed to be in Flood Zone 3a is described as having a high probability of flooding, with a predicted 1 in 100 (1%) or greater annual probability of river flooding.

7.20 Flood Zone 3b comprises land where water has to flow or be stored in times of flood. It is a requirement within the NPPF that LPAs identify in their SFRAs areas of functional floodplain. This Flood Zone depicts areas with an annual probability of flooding of 1 in 20 (5%) or greater in any year. It also highlights areas that are designed to flood (such as flood storage reservoirs) in an extreme (0.1% annual probability) flood. The functional floodplain is a very important planning tool in ensuring that space is made for flood waters when flooding occurs. Development should be directed away from these areas.

7.21 For several watercourses within the study area, the EA hold detailed modelled flood outlines for the 1 in 20 year (5% annual probability) flood events. Where this is the case, this data has been used to map the functional floodplain. Where this information is not available, the EA Flood Map for Planning (Rivers and Sea), Flood Zone 3, has been used. This provides the best estimate for the areas of land at risk of flooding, when the presence of flood defences are not considered. This zone also covers land with a 1 in 100 (1%) or greater chance of flooding each year from rivers.

Residual Flood Risk

7.22 Flood defence infrastructure data has been provided in the study area to control floodwater and to reduce fluvial flood risk. Flood defence infrastructure comes in a variety of forms (flood walls, flood embankments, flood relief channels and flood storage reservoirs), and it is important to stress that this infrastructure does not altogether alleviate the risk of flooding.

7.23 Residual flood risk will remain if there is a system malfunction and / or if the magnitude of the flood event exceeds the flood management design standard of the infrastructure. Regular maintenance of the flood defence assets, as well emergency preparedness, will help keep this residual risk as low as possible. A key element of emergency preparedness is the maintenance of a flood warning service.

7.24 The NPPF defines residual risks as those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- The failure of flood management infrastructure, such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- Failure of a reservoir; or
- A severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.
7.25 Development areas located behind flood defences are at particular risk from rapid onset of fast-flowing and deep water flooding, with little or no warning if defences are overtopped or breached. Therefore, where areas have been formally identified as benefitting from formal or informal defences on Map 6: Fluvial Flood Zones, in the accompanying Strategic Map Document, this should be considered as part of the preparation of any site-specific FRA. The Environment Agency also hold hazard mapping data for Northampton and therefore if any proposed development in Northampton is to be located behind existing defences within the town this should be requested from the EA and incorporated into the FRA.

**Groundwater flooding**

7.26 This type of flooding occurs when the water table rises and water levels in the ground rise above the surface of the land. Flooding tends to occur after long periods of sustained heavy rainfall and can last for weeks or even months. The areas at most risk are often low-lying areas where the water table is more likely to be at a shallow depth and flooding can be experienced through water rising up from the underlying aquifer, or from water flowing from springs. Flooding from groundwater is most common in areas where the underlying bedrock is chalk, but it can also happen in locations with sand and gravel, such as in the Northamptonshire river valleys.

7.27 The main causes and impacts of groundwater flooding have previously been identified in Section 6.27 of this document.

7.28 Map 10: Groundwater Flood Risk, in the accompanying Strategic Map Document illustrates the groundwater flood risk in West Northamptonshire. A number of spring lines have also been identified, which may lead to groundwater flooding. A total of 4,567 properties in the study area are located in areas at very high risk of groundwater flooding, with 3,508 properties at high risk, 5,620 at moderate risk, 12,129 at low risk, 29,172 at very low risk and 127,503 at negligible risk. This is split as follows:

- **South Northamptonshire**
  - 1,337 properties at very high risk;
  - 737 properties at high risk;
  - 920 properties at moderate risk;
  - 435 properties at low risk;
  - 6,309 properties at very low risk; and
  - 28,894 properties at negligible risk.

- **Daventry District**
  - 444 properties at very high risk;
  - 645 properties at high risk;
  - 673 properties at moderate risk;
  - 65 properties at low risk;
  - 5,421 properties at very low risk; and
  - 28,072 properties at negligible risk.

- **Northampton Borough**
  - 2,786 properties at very high risk;
  - 2,126 properties at high risk;
  - 4,027 properties at moderate risk;
  - 399 properties at low risk;
  - 17,442 properties at very low risk; and
  - 70,537 properties at negligible risk.
7.29 Further investigation should be carried out as part of the preparation of a site-specific FRA, for any site deemed to be at groundwater flood risk. The FRA should incorporate a site-based assessment of the potential risk from groundwater flooding to the site, confirming from borehole data whether groundwater is a source of flood risk for the site, and setting out any mitigation measures proposed.

7.30 More information about this type of flood risk along with the detailed Northamptonshire Groundwater Flood Risk Study (2016), prepared by ESI, and associated planning guidance, can be found on the NCC Flood Toolkit.
8. SITE-SPECIFIC INFORMATION

8.1 Seventeen sites have been reviewed in terms of flood risk within Daventry and South Northamptonshire, as set out in Table 7 and Table 8 respectively. This review has included a site-specific assessment of the fluvial, surface water, surface water sewer flooding (DG5), groundwater and reservoir breach flood risk. Site-specific assessments have not been possible for Northampton because at the time of writing, no sites had been identified for the Part 2 Local Plan. To illustrate the risk of flooding, a map has been provided for each site in the accompanying Site Specific Map Document.

8.2 Where a site has experienced flooding in the past, or flooding has been experienced in close proximity (i.e. within 100m), this has been highlighted. Where a site has a watercourse located adjacent or flowing through it, the need for a Land Drainage Consent (for Ordinary Watercourses) or Environmental Permit (for Main Rivers) has also been highlighted. Where these watercourses have not been modelled, this has also been identified as a requirement.

8.3 Where sewer flooding (surface water) due to capacity issues has been experienced within 400m of the site, this has been included within the assessment.

8.4 Site-specific development considerations have been provided for each site and additional advice provided where considered appropriate. The data displayed in Table 7 and Table 8 includes a Red, Amber, Green (RAG) Assessment, which has been used to communicate the following:

- Limited flood risk to site, acceptable for allocation in flood risk management terms
- Site deliverable in flood risk management terms, providing the site-specific considerations e.g. sequential approach are incorporated into the policy requirement for the site
- Additional consideration / work required before any allocation

8.5 Where potential development sites are at risk from flooding, ideally they should be relocated to Flood Zone 1, if possible, in line with the Sequential Testing. However, in the absence of other suitable locations, the development sites may be located in Flood Zone 2 and Flood Zone 3 (in order of preference respectively), where the Sequential Approach to the site can be taken, or the Exception Test could be applied, if the land use classifications are not compatible. Any development sites that are either wholly or partly situated in Flood Zone 2 or Flood Zone 3 will require further assessment, and justification through successful application of the Exception Test.

8.6 It should be noted and acknowledged that sites which are located within Flood Zone 2 and Flood Zone 3, often have an area also located within Flood Zone 1. Therefore a sequential approach to the site layout can be adopted, providing the scale and density of the proposed development is known, with a view to locating more vulnerable land uses in Flood Zone 1 and less vulnerable uses in the higher risk Flood Zones. Site boundaries can also be redefined to avoid areas of high flood risk if required.
### Daventry District

<table>
<thead>
<tr>
<th>SITE</th>
<th>Name/Site</th>
<th>Location</th>
<th>Is the site affected by Flood Zone 1, 2 or 3</th>
<th>Is the site affected by local sources of flood risk?</th>
<th>Sequential Test</th>
<th>Site specific development requirements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Map 1. Daventry Town Centre, Site 1</td>
<td>Daventry Town Centre</td>
<td>Flood Zone 1</td>
<td>High</td>
<td>Very Low</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Map 2. Daventry Town Centre, Sites 3 and 5</td>
<td>Daventry Town Centre</td>
<td>Flood Zone 1</td>
<td>High</td>
<td>Very Low</td>
<td>Yes</td>
<td>No</td>
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</tbody>
</table>
Ensure Land Drainage Consent is sought from the Bedford Group of IDBs.

Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land.

**Reservoir flooding:** Although the site is located close to Drayton Reservoir, breach analysis models do not show inundation to the site.

**Surface water:** Several surface water flow paths run through the site, including adjacent to the ordinary watercourse. Avoid development in surface water flood area. Due to the topography, run off would flow down the hill, entering the site from the west and north. The south of the site would also receive run off from the south, flowing down Newnham Hill.

**Ordinary watercourse:** Runs through the site which will require detailed modelling as part of the detailed planning application to ascertain floodplain extent. Any development should not take place within 9m to ensure adequate maintenance and accessibility.

---

<table>
<thead>
<tr>
<th>Map 3. Middlemore, Sites 7 and 8</th>
<th>Middlemore</th>
<th>Flood Zone 1</th>
<th>Low</th>
<th>Very Low</th>
<th>No</th>
<th>N/A</th>
<th>Use of on-site surface water drainage systems required and better provision for flow path conveyance.</th>
</tr>
</thead>
</table>

- **Avoid built development on part of the site affected by Surface Water Flood Zone.**
- Use of on-site surface water drainage systems required and better provision for flow path conveyance.

<table>
<thead>
<tr>
<th>Map 4. Daventry South East</th>
<th>Daventry South East</th>
<th>Flood Zone 1</th>
<th>High</th>
<th>High</th>
<th>Yes</th>
<th>No</th>
<th>Avoid built development on part of the site affected by Surface Water Flood Zone. Use of on-site surface water drainage systems required and better provision for flow path conveyance.</th>
</tr>
</thead>
</table>

- **Surface water:** Several surface water flow paths run through the site, including adjacent to the ordinary watercourse. Avoid development in surface water flood area. Due to the topography, run off would flow down the hill, entering the site from the west and north. The south of the site would also receive run off from the south, flowing down Newnham Hill.

- **Ordinary watercourse:** Runs through the site which will require detailed modelling as part of the detailed planning application to ascertain floodplain extent. Any development should not take place within 9m to ensure adequate maintenance and accessibility.
Ensure Land Drainage Consent is sought from the Bedford Group of IDBs.

Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land.

modelling including climate change considerations to ascertain floodplain extent and any proposed development should avoid this area. No development should take place within 9m to ensure adequate maintenance and accessibility.

Flood incident: A DG5 has been reported within close proximity of the site, indicating incapacity within the surface water system resulting in surcharging. Further investigation relating to capacity is needed prior to any development.

Groundwater: The eastern section of the site is susceptible to groundwater flooding. Any development would need to avoid basements and ensure adequate mitigation measures are incorporated.

Level 2 SRFA: States that there is an un-modelled ‘ordinary watercourse’ which runs through the centre of the site which may pose a risk of flooding. This should be addressed as part of a site-specific FRA to determine the extent of Flood Zone 3 plus an allowance for climate change in order to clearly address the Sequential Test and Part C of the Exception Test.

LFRMS: Eastern half of the site is located within Weedon Ward, identified as one of the fifteen most at risk wards in Northamptonshire based on the combined flood risk from rivers, surface water and groundwater.
### Site layout:
Should take into account extent of Flood Zone 3 within a detailed site specific FRA. DDC have confirmed that they are happy to exclude any development within Flood Zone 3.

### Flood incident:
DG5 flooding incident identified within 100m of the site, relating to surface water system capacity issue, leading to surcharge. Capacity assessment required as part of any development coming forward.

<table>
<thead>
<tr>
<th>Map 5, Daventry, The Knoll</th>
<th>Daventry, The Knoll</th>
<th>Flood Zone 1</th>
<th>Low</th>
<th>Very Low</th>
<th>Yes</th>
<th>Yes</th>
<th>Use of on-site surface water drainage systems required and better provision for flow path conveyance. Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe.</th>
</tr>
</thead>
</table>

| Map 6, North of Middlemore | North of Middlemore | Flood Zone 1 | High | Very Low | Yes | No | Avoid built development on part of the site affected by Surface Water Flood Zone. Use of on-site surface water drainage systems required and better provision for flow path conveyance. Ensure Land Drainage Consent is sought from the Bedford Group of IDBs. Surface water: Three surface water flow paths run through the site, including adjacent to the ordinary watercourse. Avoid development in surface water flood area. Ordinary watercourses: Run through the site to the west and intersecting the northern section of the site, which will require detailed modelling including climate change scenarios to ascertain floodplain extent and any proposed development should avoid this area. No development should take place within 9m to ensure adequate maintenance and accessibility. |
Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe.

The development should incorporate a buffer zone of at least 8m around the canal to make space for water and allow access for maintenance should any repair be required.

Reservoir flooding: Although the site is located close to Drayton Reservoir, breach analysis models do not show any inundation to the site.

Grand Union Canal: Intersects the site from east to west in the centre section of the site. The residual risk from breach or failure should be assessed as part of the detailed Flood Risk Assessment.

<table>
<thead>
<tr>
<th>Map 7. North of Micklewell</th>
<th>North of Micklewell</th>
<th>Flood Zone 1</th>
<th>Medium</th>
<th>Very Low</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of on-site surface water drainage systems required and better provision for flow path conveyance.</td>
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</tbody>
</table>

Surface water: Avoid development in small section of surface water flood area.

<table>
<thead>
<tr>
<th>Map 8. Daventry South West</th>
<th>Daventry South West</th>
<th>Flood Zone 1</th>
<th>High</th>
<th>Very Low</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid built development on part of the site affected by Surface Water Flood Zone. Use of on-site surface water drainage systems required and better provision for flow path conveyance.</td>
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</tbody>
</table>

Surface water: Three surface water flow paths run through the site. Avoid development in surface water flood area.
Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land.

<table>
<thead>
<tr>
<th>Map 9. Daventry, Apex Park Extension</th>
<th>Daventry, Apex Park Extension</th>
<th>Flood Zone 1</th>
<th>High</th>
<th>Very Low</th>
<th>No</th>
<th>N/A</th>
<th>Use of on-site surface water drainage systems required and better provision for flow path conveyance.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map 10 Daventry, Farnborough Drive</td>
<td>Daventry, Farnborough Drive</td>
<td>Flood Zone 1</td>
<td>High</td>
<td>Very Low</td>
<td>Yes</td>
<td>Yes</td>
<td>Avoid built development on part of the site affected by Surface Water Flood Zone. Use of on-site surface water drainage systems required and better provision for flow path conveyance.</td>
</tr>
</tbody>
</table>

**Surface water:** Avoid development in small section of surface water flood area.

**Surface water:** A surface water flow path runs along the eastern boundary of the site. Avoid development in surface water flood area.

Table 7: Sequential testing of key development sites within Daventry District
<table>
<thead>
<tr>
<th>Name/Site</th>
<th>Location</th>
<th>Is the site affected by Flood Zone 1, 2 or 3</th>
<th>Is the site affected by local sources of flood risk?</th>
<th>Sequential Test</th>
<th>Site specific development requirements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map 11, North West of Brackley, Site 2</td>
<td>North West of Brackley, Brackley</td>
<td>Flood Zone 1</td>
<td>Surface Water: High</td>
<td>Ground Water: Very High</td>
<td>Required</td>
<td>Passed</td>
</tr>
<tr>
<td>Map 12. Westminster Close, Brackley, Site 3</td>
<td>Westminster Close, Brackley</td>
<td>Flood Zone 1</td>
<td>High</td>
<td>Very Low</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>

<p>| Map 13. Bell Plantation, Towcester, Site 5 | Bell Plantation, Towcester | Flood Zone 1 | High | Very Low | Yes | Yes | Avoid built development on part of the site affected by Surface Water Flood Zone. Use of on-site surface water drainage systems required and better provision for flow path conveyance. |
|------------------------------------------|-----------------------------|--------------|------|----------|-----|-----|Surface water: A surface water flow path runs along the north-eastern edge of the site, adjacent to the ordinary watercourse. Two flow paths intersect the site to the north-west. Avoid development in surface water flood areas. |
|                                          |                             |              |      |          |     |     | Flood incidents: There are several recorded flood incidents in close proximity to the site, with at least one incident, relating to the flooding of the A5, a consequence of surface water runoff emanating from agricultural fields. |</p>
<table>
<thead>
<tr>
<th>Map 14. Towcester Racecourse, Site 6</th>
<th>Towcester Racecourse, Towcester</th>
<th>Flood Zone 1</th>
<th>High</th>
<th>Very Low</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
</table>
| **Ensure Land Drainage Consent is sought from the Bedford Group of IDBs.**

Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land.

**Reservoir flooding:** Although the site is located close to Towcester Road Flood Storage Reservoir, breach analysis models do not show any inundation to the site.

**Surface water:** Two surface water flow paths run through the site, adjacent to the ordinary watercourse that runs through the site. Avoid development in surface water flood area.

**Ordinary watercourse:** An ordinary watercourse runs through the site which will require detailed modelling to ascertain floodplain extent, including the consideration of climate change scenarios. Any development should not take place within 9m to ensure adequate maintenance and accessibility.

**Reservoir flooding:** Although the site is located close to Towcester Road Flood Storage Reservoir, breach analysis models do not show any inundation to the site.

**Flood incidents:** Two recorded flood
Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land.

**Incidents** are located in close proximity to the site relating to flooding of the A5, which is adjacent to the southern boundary of the site. Any proposal coming forward should incorporate an investigation of the highways surface water drainage at this location.

**Surface water**
   - The west of the site is prone to high risk of surface water flooding as well as the A5 / Towcester Road / Towcester Road bypass roundabout. Three flood incidents have been recorded at this location. Highway surface water drainage to be investigated as part of any proposal coming forward. Avoid development in surface water flood area.

**Fluvial flood risk**
   - A very small section of the site to the west intersects with Flood Zone 3. Any proposals coming forward must avoid development in this area.

**Reservoir flooding**
   - Although the site is located close to Towcester Road Flood Storage Reservoir, breach analysis models do not show any inundation to the site.

**Flood storage area**
   - Opportunity to increase the extent of the flood storage area to the south of the site should be considered as part of any proposal coming forward to provide betterment to

<table>
<thead>
<tr>
<th>Map 15. Woolgrowers Field, Towcester, Site 7</th>
<th>Woolgrowers Field, Towcester</th>
<th>Flood Zone 3</th>
<th>High</th>
<th>Low</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
</table>

Avoid built development on part of the site affected by Surface Water and Fluvial Flood Zone.

- Use of on-site surface water drainage systems required and better provision for flow path conveyance.
- Ensure Land Drainage Consent is sought from the Bedford Group of IDBs.

Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not
| Map 16, Former Furtho Pit, Cosgrove, Site 11 | Former Furtho Pit, Cosgrove Road, Cosgrove | Flood Zone 3 | High | High | Yes | Yes | **Avoid built development on part of the site affected by Flood Zone.**<br>**Use of on-site surface water drainage systems required and better provision for flow path conveyance.**<br>**Ensure Land Drainage Consent is sought from the Bedford Group of IDBs.**<br>**Ensure an Environmental Permit is sought from the EA.**<br>**Flooding has been experienced on the site or within close proximity. A detailed site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land.**<br>**Fluvial flood risk:** A section of the site is located within Flood Zone 3b. A site-specific FRA will be required to ensure that the development is safe and does not increase flood risk to any adjacent land. | increase flood risk to any adjacent land. | Planning Application: S/2010/0923/MAO covers the north-western part of the site. This application was accompanied by a FRA, but did not incorporate any detailed modelling. The SFRA found that Dogsmouth Brook was unlikely to reach a level exceeding 67.77m Ordinance Datum and therefore one of the recommendations is that no site levels within 300mm of this will be altered to maintain existing flow routes and storage. The FRA also recommended that the proposed buildings would have a finished floor level of 70.35m above Ordinance Datum, which provides in excess of 2.5m freeboard over the predicted worse case flood level, set at 67.77m. | Level 2 SFRA: This site was reviewed as part of the Level 2 SFRA (Site: Old Stratford – A5). The SFRA determined that the site mostly fell within Flood Zone 1 except a small area within the north of the site located within Flood Zone 2 and Flood Zone 3 of Dogsmouth Brook. It was noted that historically there were records of the Dogsmouth Brook flooding at the north east corner of the site, where the brook flows beneath Cosgrove Road at Dogsmouth Bridge. The SFRA recommended that development should be restricted to outside the Flood Zone 2 outline. |
specific FRA must consider this matter fully.

**Surface water:** A surface water flow path runs through the site; ensure that development is avoided in surface water flood areas.

**Flood incidents:** several recorded flood incidents are located within or in close proximity to the site, relating to highway drainage incapacity and flooding from Dogsmouth Brook. Highway surface water drainage to be investigated as part of any proposal coming forward and link to LFRMS action relating to Cosgrove Road highway drainage improvement scheme.

**Reservoir flooding:** a large proportion of the site is prone to flooding if a reservoir breach were to occur at the Wakefield Lodge Reservoir. The anticipated time from breach to the site flooding is 2 hours 15 minutes with the peak of the flooding after approximately 2.5 hours.

**Groundwater:** at least half of the site is susceptible to groundwater flooding. Any development would need to avoid basements and ensure adequate mitigation measures are incorporated.

<table>
<thead>
<tr>
<th>Site</th>
<th>Flood Zone</th>
<th>Height</th>
<th>Risk</th>
<th>Avoidance</th>
<th>Surface water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shacks Barn Farm, Whittlebury</td>
<td>Zone 1</td>
<td>High</td>
<td>Very High</td>
<td>Yes</td>
<td>Two flood flow paths run through the centre and south of the site. A small pond is located in the western section of the site, with an area at risk of surface water flooding extending 150m from the pond in a north-easterly direction.</td>
</tr>
</tbody>
</table>
Use of on-site surface water drainage systems required and better provision for flow path conveyance. Direction. Avoid development in surface water flood areas.

**Groundwater:** The northeast of the site is susceptible to groundwater flooding. Any development would need to avoid basements and ensure adequate mitigation measures are incorporated.

Table 8: Sequential testing of key development sites within South Northamptonshire District
8.7 Using the information provided within the Sequential Testing tables, three sites within Daventry District and two sites within South Northamptonshire have been identified as requiring additional information, as set out below:

**Daventry District**
- Daventry Town Centre, Sites 3 and 5 combined
- Daventry South East
- North of Middlemore

**South Northamptonshire**
- Towcester Racecourse, Towcester, Site 6
- Former Furtho Pit, Cosgrove Road, Cosgrove, Site 11

8.8 The two sites in South Northamptonshire have been reviewed in more detail to assess the fluvial flood risk to the sites from the un-modelled ordinary watercourses.

8.9 The aim of this additional work is to inform whether the proposed development can be located outside of the fluvial Flood Zones, in line with a sequential approach. This has been achieved by undertaking a high-level desktop assessment using publicly available data alongside basic hydrology and flow calculations. This has provided an indication of the risk of flooding to the sites from the ordinary watercourses and an assessment as to whether hydraulic modelling is needed. If required, a recommendation as to whether this should be undertaken as part of a Level 2 SFRA, or as part of a site-specific FRA, has been outlined. The outputs of this additional work are:

- An assessment of the ground levels of the site in relation to the ordinary watercourse(s) using EA LiDAR data;
- A basic assessment of the hydrology and simple flow calculations to provide an understanding of the size and flow of the watercourse(s) and an indication of the potential flood extents; and
- Desk-based review of freely available data such as EA flood mapping and existing SFRAs.

8.10 There are limitations relating to this work, including:

- The findings are based on flood risk information available and current at the time of drafting; and
- The flood risk to the site has been assessed in its current state and should not be used to inform site-specific planning applications and/or FRAs.

**Towcester Racecourse, Towcester**

**Site Description**

8.11 The site is located to the east of Towcester Racecourse and the A5 London Road runs along the southern boundary of the site.
8.12 The site is located to the south of the River Tove which is designated as a Main River and therefore falls under the management of the EA. An unnamed ordinary watercourse flows through the site which falls under riparian ownership.

8.13 Online British Geological Survey (BGS) published geological data indicates that the site lies largely on a Bedrock Whitby Mudstone Formation, and Rutland Formation Mudstone to the south of the site. The underlying bedrock has a classification as unproductive strata; these are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Oadby Member (Diamicton) makes up the superficial deposits underlying the site. These superficial deposits are classified as a secondary undifferentiated aquifer based on the EA’s aquifer designation. This means that the location in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. Therefore the site is unlikely to be at risk from groundwater flooding.

8.14 The entirety of the site is located within Flood Zone 1 on the EA’s Flood Map for Planning, which equates to land having a less than a 0.1% (1 in 1,000 year) annual probability of river or sea flooding. The site is also shown to be at very low risk of flooding on the EA’s Risk of Flooding from Rivers and Sea map.
8.15 Although the site is shown to be at very low risk of flooding, the ordinary watercourse which flows through the site may pose a fluvial flood risk to the site, which is not currently included in the Risk of Flooding from Rivers and Sea map due to its size and the fact it has not been modelled. The watercourse flows north towards the River Tove. It starts off as two branches within the south of the site (a main channel and a separate drainage channel) with a confluence towards the centre of the site. It then flows north just outside and parallel to the eastern site boundary.

**Comparison of Ground Levels**

8.16 EA LiDAR has been used to compare the ground levels across the site to the level of the ordinary watercourse, in an attempt to determine what flood risk the watercourse poses to the rest of the site. The LiDAR plot in Image 7 shows that the site slopes down from the south (at approximately 114m Ordnance Datum) towards the River Tove in the north (at approximately 84m Ordnance Datum).

![Image 7: LiDAR Analysis, Towcester Racecourse](image)

8.17 Three cross-sections were extracted from the LIDAR to determine the channel geometry and the slope of the watercourse. They were extracted over a distance of approximately 770m, with the cross-sections shown in Image 8.
8.18 The cross-sections confirm that the watercourse has a relatively steep gradient, with a bed level of approximately 102m Ordinance Datum in the upstream part of the site, falling to approximately 85m Ordinance Datum downstream.

8.19 The upstream cross-section also picks up the other drainage channel to the west, however the bed level is approximately 3m higher than the main channel. The cross-sections also confirm that the land rises away from the channel, particularly in the upper reaches of the site, with a flatter cross-section in the downstream reach.

8.20 From the LIDAR, the channel width is approximately 5m in the upper reaches, increasing to approximately 8m downstream. Generally the channel is approximately 0.8 – 1.5m deep. The form of the channel would need to be confirmed by topographical survey as part of a site-specific FRA.
**Hydrology and Flow Calculations**

8.21 Catchment descriptors were extracted for the tributary from the Flood Estimation Handbook (FEH) online portal. The catchment is approximately 0.63km². An initial FEH flow estimation (using purely catchment descriptors) via the Revitalised Flood Hydrograph Method (ReFH) shows that the 1% (1 in 100 year) peak flow would be in the order of 0.8m³/s. If climate change allowances were included (an increase of 70% on peak flows for the upper end estimate for the 2080s1) then the flow would be in the order of 1.3m³/s.

8.22 Using Manning’s equation, and the cross-sections extracted above, it can be shown that the 1% (1 in 100 year) peak flow including climate change would be maintained within the main channel area. This is primarily due to the small size of the catchment in this area and the steepness of the site.

8.23 This is in agreement with the surface water flood map for the area (see Map 9: Surface Water Flood Risk, identified in the Strategic Map Document), which shows water is maintained in the channel, with some out of bank flow on the road in the downstream reaches.

**Findings**

8.24 The site is in the upstream reaches of a small catchment that drains to the River Tove. LIDAR for the site has shown that the site ranges from 114m Ordinance Datum in the south, to 84m Ordinance Datum in the north. It is therefore a steep site.

8.25 Cross-sections of the LIDAR show that the channel is approximately 5m wide and 0.8m deep at it’s smallest. Flow calculations have shown that it is expected that the 1% (1 in 100 year) flow, including an allowance for climate change would be contained within the channel itself. The surrounding land then rises away from the channel.

8.26 Based on the LIDAR available for the site, it is expected that the floodplain would be contained within the channel area and therefore fluvial risk to the site is thought to be low. The site is therefore suitable for development in terms of fluvial flood risk provided the development is located 9m away from the channel area, and suitable freeboard between flood levels and building floor levels is provided.

8.27 Any development on the site would need to re-assess the flood risk from this drainage channel utilising site topographic information to verify the findings based on the LIDAR analysis. This would be included within the FRA for the site. The FRA will also need to consider the impact the development will have on flood risk downstream. Based on the information available as part of this review it is likely that the site would have to be drained by attenuation as it appears that soakaways are unlikely to be appropriate. The development would therefore have to include sufficient space for attenuation and long term storage volumes.

**Land at Former Furtho Pit, Cosgrove Road, Cosgrove**

**Site Description**

8.28 The site is located south of the village of Cosgrove with the A5 running along the southern boundary of the site and the A508 along the western boundary of the site. A location plan of the site can be seen in Image 9.
Existing Watercourses and Bodies of Water

8.29 A number of watercourses are present within and close to the site boundary:
- The River Great Ouse flows past the southern and eastern boundaries of the site and is a designated Main River
- An Ordinary Watercourse, known as the Dogsmouth Brook, flows through the site before it joins the River Great Ouse, south-east of the site boundary; and
- The Buckingham Branch of the Grand Union Canal runs through the centre of the site.

Geology and Hydrology

8.30 Online BGS published geological data indicates that the site lies largely on a Bedrock of Whitby Mudstone Formation. To the north of the site there are areas that lie on the Rutland Formation Mudstone and the Blisworth Limestone Formation.

8.31 The underlying bedrock of Whitby Mudstone Formation has a classification as unproductive strata; these are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The Rutland Formation Bedrock is classified as a secondary B aquifer, and the Blisworth Limestone formation is classified as a principal aquifer.

8.32 Oadby Member (Diamicton) makes up the majority of superficial deposits underlying the site. Areas of Glaciofluvial Deposits and Alluvium are also present. These superficial deposits are classified as a secondary undifferentiated aquifer based on the EA’s aquifer designation. This means that the location in question has previously been designated as both minor and non-aquifer in different locations, due to the variable characteristics of the rock type.
**Historical Flooding**

8.33 EA records show three historic flood outlines within the site boundary. All of the flood outlines are associated with flooding which occurred during Easter 1998. Two of the outlines are associated with the Dogsmouth Brook, with the other from the River Great Ouse.

8.34 The West Northamptonshire Level 2 SFRA (2009) and LLFA also holds records of flooding within the site boundary, where the brook flows under the Cosgrove Road crossing at Dogsmouth Bridge.

**Fluvial Flood Risk**

8.35 An extract of the EA Flood Map for Planning shows that the majority of the site is located within Flood Zone 1, which equates to land having less than a 0.1% (1 in 1,000 year) annual probability of flooding. However the land directly beside the Dogsmouth Brook is within Flood Zone 2 and Flood Zone 3. Land in Flood Zone 2 has between a 1% and 0.1% (1 in 100 year and 1 in 1,000 year) annual probability of river flooding, and land in Flood Zone 3 has a 1% (1 in 100 year) or greater annual probability of river flooding.

**Surface Water Flood Risk**

8.36 The surface water flood risk map shows that the surface water flooding is associated primarily with the watercourses across the site, and there is limited other ponding on the site. The primary risk to the site is therefore the fluvial risk. There is some surface water flooding associated with the A5, which could affect access and egress to the site. This would need to be considered as part of the site specific FRA once access routes are confirmed.

**Ground Levels**

8.37 EA LiDAR has been used to compare the ground levels across the site to the levels of the ordinary watercourse in an attempt to determine what flood risk the watercourse poses to the rest of the site. A LiDAR plot for the site is shown in Image 10. This shows that the site varies from an elevation of approximately 75m Ordnance Datum in the west, to 64m Ordnance Datum in the east.
8.38 Three cross-sections were extracted from the LiDAR to determine the channel geometry and the slope of the watercourse. They were extracted over a distance of approximately 750m, as shown in Image 11.

8.39 The cross-sections confirm that the watercourse has a relatively gentle gradient, with a bed level of approximately 66m Ordinance Datum in the upstream part of the site, falling to 63m Ordinance Datum downstream, over a distance of approximately 750m. From the LiDAR it appears that the channel is larger in size upstream, with a height of approximately 2.6m and width of almost 20m, although this is likely to include some floodplain. In the downstream reach the cross-section appears to be in the order of 1.4m high and approximately 10m wide.
Catchment descriptors were extracted for the Dogsmouth Brook from the FEH online portal. The catchment is approximately 20km². An initial FEH flow estimation (using purely catchment descriptors) via the ReFH shows that the 1% (1 in 100 year) peak flow would be in the order of 9.5m³/s. If climate change allowances were included (an increase of 70% on peak flows for the upper end estimate for the 2080s) then the flow would be in the order of 16m³/s.

Using Manning’s equation, and the cross-sections extracted above, it can be shown that the 1% (1 in 100 year) peak flow including climate change would be contained within the main channel area. This is in agreement with the surface water flood map for the area. Uncertainty remains over the channel dimensions and therefore the form of the channel would need to be confirmed by topographical survey as part of any site specific FRA.

There are however a number of potential constrictions on and near to the site that could impact on the areas that flood. These include:

- The culvert under the A508 – this may restrict the flow onto the site, depending on the size of the culvert and the potential for water to spill over the road;
- The bridge / culvert under Stratford Road – this may restrict the flow and cause backing up in the upstream areas, potentially affecting the site in the nearby area;
- The canal – the mapping suggests that the watercourse runs underneath the canal. Again this may cause a constriction to flow in the extreme events;
- The culvert of the Great Ouse under the A5 – again this may restrict the flow onto the site or impact on the flow routes if water can spill over the A5; and
- The locations listed above will need detailed consideration as part of any site specific Flood Risk Assessment.
**Findings**

8.43 The site is located south of village of Cosgrove with the A5 running along the southern boundary of the site and the A508 along the western boundary of the site. The River Great Ouse flows past the southern and eastern boundaries of the site, whilst the Dogsmouth Brook flows from west to east through the site, until it meets the River Great Ouse downstream of the site. The Buckingham Branch of the Grand Union Canal runs through the centre of the site. LiDAR shows that the site varies from an elevation of approximately 75m Ordnance Datum in the west, to 64m Ordnance Datum in the east.

8.44 Cross-sections of the LiDAR taken through the Dogsmouth Brook show that the channel varies in dimension, from approximately 10m to 20m wide and 1.4m to 2.6m deep. Flow calculations have shown that it is expected that the 1% (1 in 100 year) flow, including an allowance for climate change would be contained within the channel itself (as shown by the LiDAR cross-sections extracted). However, the cross-sections suggest that the land adjacent to the brook is then relatively flat, if not slightly lower than the banks in places, particularly in the eastern part of the site. If the banks are exceeded then flooding would extend wider into the site.

8.45 Based on the LiDAR available and initial flow calculations for the site, it is expected that the floodplain would be contained within the channel area (i.e. up to 20m width around the channel) and therefore fluvial risk to the site is thought to be low. The site is therefore suitable for development in terms of fluvial flood risk provided the development is located away from the channel area and suitable freeboard between flood levels and building floor levels is provided. These calculations do not however include the potential impact of constrictions within the site, which may impact on the flooded area. All potential constrictions on the site would therefore need to be included in a topographic survey of the site and assessed by hydraulic modelling to support a site specific FRA. Safe access and egress to the site via highway areas affected by surface water flood risk should also be assessed.

8.46 Any development on the site would need to re-assess the flood risk from the drainage channel utilising site topographic information to verify the findings based on the LiDAR analysis. This would be included within the FRA for the site. The FRA will also need to consider the impact the development will have on flood risk upstream and downstream. Based on the information available as part of this review it is likely that the site would have to be drained by attenuation as it appears that soakaways are unlikely to be appropriate, based on review of available information on ground conditions. The development would therefore need to include sufficient space for attenuation and long term storage volumes.

**Further Site Specific Requirements**

8.47 The three remaining sites (in Daventry District, as set out in Section 8.7 of this document) that have not been assessed will require additional information prior to formal allocation, or the following options could be taken:

- The site boundaries could be amended / reduced on certain sites to eliminate the flood risk;
- The sites could be removed from the site allocation process and dealt with at the planning application stage (at which point the information required could be provided by the applicant);
- The sites could be assessed as part of a Level 2 SFRA; and
- The sites could be included within the Part 2 Local Plan with associated policy regarding the flood risk attributed to them and outlining the additional information that is required.
9. FLOOD RISK MANAGEMENT, RESILIENCE AND RESISTANCE

Flood Defences and Assets

9.1 Flood defences and assets within the County of Northamptonshire have been identified within the Section 21 (of the Flood and Water Management Act 2010) Asset Register. This register has been created by NCC as the LLFA and is a legal duty. This register is available to any member of the public to view at the Council Offices and an appointment can be made by using the following details: floodandwater@northamptonshire.gov.uk.

9.2 The asset register contains information about assets that could have an effect on flood risk in the county, including raised defences such as embankments and flood walls as well as flood storage reservoirs and flood relief channels. Additionally the Environment Agency holds data along the defined main rivers.

9.3 The key defences within the study area have been identified and these are shown on Map 6: Fluvial Flood Zones, in the associated Strategic Map document.

9.4 With regards to reservoir safety, following the preparation of the reservoir inundation maps, emergency planners have prepared specific plans for those that have been judged to be higher priority reservoirs. The NCC Emergency Planning Team used these maps to develop emergency flood plans in partnership with the Local Resilience Forum. Developers and those promoting sites may need to refer to this information to support their site-specific flood risk assessment and therefore more information can be obtained from: EmergencyPlanning1@northamptonshire.gov.uk.

Flood Warning and Hydrometric Stations

9.5 The Environment Agency measures river levels, river flows and rainfall across England at strategic locations. The hydrometric data, combined with flood forecasting models, are used to inform the Environment Agency’s Flood Warning System and the details of those located within West Northamptonshire are provided in Table 9. Real-time information is available for most of these stations and therefore hyperlinks to this information have been provided. This data can be used to inform site-specific flood risk assessments and associated flood model data.

<table>
<thead>
<tr>
<th>Location</th>
<th>Type</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nene/Kislingbury at Dodford</td>
<td>Crump weir. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/32008">http://nrfa.ceh.ac.uk/data/station/info/32008</a></td>
</tr>
<tr>
<td>Nene/Kislingbury at Upton Total Total</td>
<td>Flume and Crump weir. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/32006">http://nrfa.ceh.ac.uk/data/station/info/32006</a></td>
</tr>
<tr>
<td>Flore at Experimental Catchment</td>
<td>Flume. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/32029">http://nrfa.ceh.ac.uk/data/station/info/32029</a></td>
</tr>
<tr>
<td>Nene/Brampton at St Andrews Total</td>
<td>Flume/Broad-crested weir. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/32007">http://nrfa.ceh.ac.uk/data/station/info/32007</a></td>
</tr>
<tr>
<td>Wootton Brook at Wootton Park</td>
<td>Flat V. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/32031">http://nrfa.ceh.ac.uk/data/station/info/32031</a></td>
</tr>
<tr>
<td>Wootton Brook at Lady Bridge</td>
<td>Crump weir. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/32012">http://nrfa.ceh.ac.uk/data/station/info/32012</a></td>
</tr>
<tr>
<td>Tove at Cappenhahm Bridge</td>
<td>Compound broad-crested weir. See</td>
<td><a href="http://nrfa.ceh.ac.uk/data/station/info/33018">http://nrfa.ceh.ac.uk/data/station/info/33018</a></td>
</tr>
</tbody>
</table>

Table 9: Hydrometric stations within the study area
9.6 The timely issue, receipt and response to warnings of floods are essential elements in the management of the residual risk of flooding and where development is located in flood risk areas this provides an essential service to provide early warnings. The Environment Agency is responsible for monitoring flood events and for issuing warnings to people in properties and businesses at risk of flooding.

9.7 Flood forecasting requires real time data and forecast model data to provide accurate and timely flood warnings to the public. The Environment Agency’s procedures for distributing warnings are activated by triggers for individual river level and flow sites. Once a rain gauge and/or a river level gauge reaches pre-determined levels, catchment conditions are assessed using a combination of soil moisture deficit data, rainfall information from radar and real-time rainfall and river responses. When conditions suggest that a flood is expected, a flood warning is issued and the Environment Agency’s flood warning service is activated. This is known as the Floodline Warnings Direct (FWD).

9.8 Four codes are used, which are:

- Flood Alert, when flooding of low-lying land and roads is possible.
- Flood Warning, when flooding of homes, businesses and main roads is expected.
- Severe Flood Warning, when severe flooding is expected. Under such conditions, there will be significant risk to life and property; and
- Warning no longer in force, when flood alerts or flood warnings are no longer in place.

9.9 Upon reaching an action trigger there is a built-in two-hour lead time before the onset of flooding. This lead time allows people to take remedial action in the face of an oncoming flood such as lifting carpets, moving furniture and evacuating buildings.

9.10 Properties covered by the EA’s Flood Warning and Alert areas have been presented on Map 5: Flood Alert and Warning Areas, in the associated Strategic Flood Risk Map Document. All new development being promoted within these areas should be by exception and should detail within their FRA a robust strategy for ensuring new residents sign up to the FWD service.

9.11 Local Authorities are encouraged to work with the Environment Agency to ensure that as many homeowners as possible are signed up to FWD and that any new properties are made aware of this service.

Emergency planning and new development

9.12 Where efforts to avoid and reduce flood risk have been exhausted at the planning application stage, flood risk can be further managed by mitigating the damages caused by flooding on homes, businesses and infrastructures. This can be achieved by promoting flood resilience and flood resistance measures as set out below.

9.13 During flood events, the Environment Agency and Local Authorities are required (under the Civil Contingencies Act 2004) to liaise closely, and the Councils will implement a range of contingency plans to detail how local services are to work together to respond to any incident or disaster. These plans include but are not limited to a Civil Emergency Manual, Flood Plan, and Emergency Communication plan.

9.14 Evacuation plans should be designed and put in place for new development areas identified as being at risk of flooding and should take into account that the occupiers are likely to lack local knowledge. The mobility of occupants also needs to be considered.

9.15 Developers and those promoting sites should refer to the guidance produced by NCC regarding New Development and Emergency Flood Plans, which can be found on the Flood Toolkit, when producing their site-specific FRAs.
Flood resilience

9.16 The concept of flood resilience refers to the ability of a building to recover following the inundation from flood water. Flood resilient buildings are designed to reduce the consequences of flooding and facilitate recovery from the effects of flooding sooner than conventional buildings.

9.17 Flood resilience may be achieved through the use of water-resistant materials for floors, walls and fixtures and by ensuring electrical controls, cables and appliances are placed at a higher than normal level. More information is available, including interactive diagrams, on the Flood Prevention pages of the Northamptonshire Flood Toolkit.

9.18 Where possible, the finished floor levels (lowest floor level) should be raised above the predicted flood level to prevent the ingress of flood water. For fluvial flooding in the upper Nene catchment this should generally be 300mm above the 1% (1 in 100) probability flood level and 300mm above the 0.5% (1 in 200), including an allowance for climate change (see Appendix 5 for more information).

9.19 In the West Midlands area, the finished floor levels should be no lower than 600mm above the 100 year, including an allowance for climate change (see Appendix 5 for more information).

9.20 For single storey residential development (bungalows and ground floor flats), finished floor levels should be set 300mm above the 0.1% (1 in 1000) annual probability flood event, including an allowance for climate change (see Appendix 5 for more information).

9.21 Consideration must be given to providing access for those with restricted mobility. In considering appropriate resilience measures, it will be necessary to plan for specific circumstances and have a clear understanding of the mechanisms that lead to flooding and the nature of the flood risk. This information will need to be included within any FRA supporting the planning application where a risk of flooding has been demonstrated (see Appendix 4: Guidance on Preparation of FRAs, for more information).

Flood resistance

9.22 The concept of flood resistance refers to the ability of a building to keep floodwater from entering it, even if surrounded by it. Flood resistant construction prevents the entry of water or minimises the amount of water that may enter a building where there is flooding outside and therefore relies on the operational deployment of flood defences at the property scale. This can be achieved by raising finished floor levels for instance, and often these measures rely on the availability of a reliable flood forecasting and warning system and well established mobilisation and closure processes.

9.23 This form of construction should be used with caution and accompanied by resilience measures, as effective flood exclusion may rely on the effective deployment of elements such as barriers to doorways. Temporary and demountable defences are not normally appropriate for new developments.

9.24 Resilient construction is favoured because it can be achieved more consistently and is less likely to encourage occupiers to remain in buildings surrounded by rapidly rising water levels, thereby making access for emergency services difficult and possibly hazardous.

9.25 Essential infrastructure which has to be located in flood risk areas should be designed to remain operational when floods occur. More information is available on flood resistance can be found on the NCC Flood Toolkit.
Reducing flood risk through site layout and design

9.26 Flood risk should be considered at an early stage in designing the layout and development form of a site to provide an opportunity to reduce flood risk within the development.

9.27 The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land-use to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas. However, vehicular parking in floodplains should be based on the nature of flooding, flood depths and hazard including evacuation procedures and flood warnings.

9.28 Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise.

Modification of ground levels

9.29 Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the risk is entirely from tidal flooding or the land does not act as conveyance for flood waters. However, care must be taken at locations where raising ground levels could adversely affect existing communities and property.

9.30 In most areas of fluvial flood risk, raising land above the floodplain would reduce conveyance or flood storage in flood cells and could adversely impact flood risk downstream or on neighbouring land.

9.31 Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated).

9.32 Raising ground levels can also deflect flood flows, so appropriate assessment should be performed to demonstrate that there are no adverse effects on third party land.

9.33 Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to ensure that it would not cause increased ponding or build-up of surface runoff on third party land.

Buffer strips

9.34 As a minimum, developers should set back development eight metres from the landward toe of a watercourse (fluvial defences or top of bank where defences do not exist) for main river and nine metres for ordinary watercourses. This provides a buffer strip to ‘make space for water’, allow additional capacity to accommodate climate change, ensure access to defences is secured for maintenance purposes and provide added resistance to the site. Where works are required within eight metres of main river an Environmental Permit for flood risk activities may be required. Where works are required within nine metres of an ordinary watercourse Flood Defence Consent will be required.

Houses in multiple occupation

9.35 Houses in multiple occupation can put residents at greater risk in areas of high flood risk as they often have bedrooms on the ground floor or have basements that are converted into living
accommodation. Basements, by their very nature, are susceptible to flooding particularly in areas that are located in flood risk areas or have a residual flood risk from being located behind flood defences.

9.36 Proposals in areas of flood risk may not be appropriate where previously unoccupied ground floor rooms are proposed to be converted to living accommodation. Therefore, all planning applications for the conversion of dwellings into homes of multiple occupation, must be accompanied by a site-specific flood risk assessment demonstrating that the accommodation (and indeed the whole development) is safe from the risk of flooding from all sources and includes safe refuge. It is recommended that full consideration is given to whether or not planning permission should be granted for proposals for houses in multiple occupation if it cannot be demonstrated that there would not be an increase in the number of people at risk from flooding.

Developer contributions

9.37 In some cases, and following the application of the Sequential Test, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both the proposed new development and the existing local community (subject to any contribution request meeting the legal tests at Regulation 122 of the Community Infrastructure Levy (CIL) Regulations).

9.38 For new development in locations without existing defences, or where the development is the only beneficiary, the full costs of appropriate risk management measures for the life of the assets proposed must be funded by the developer.

9.39 Funding from developers should be explored prior to the granting of planning permission and in partnership with the LPA and the Environment Agency and/or LLFA.

9.40 The appropriate route for the consideration of strategic measures to address flood risk issues is the Northamptonshire LFRMS. The LFRMS and associated documents can be found on the Flood Toolkit and describes the priorities with respect to local flood risk management. The action plan includes the measures to be taken, their timescale for completion and how they will be funded. Developers should be able to demonstrate that strategic provisions are in accordance with the LFRMS, and can be afforded and maintained for their lifetime.
10. SUSTAINABLE DRAINAGE SYSTEMS

Statutory Consultee Role

10.1 As of April 2015, all major planning applications have to demonstrate the use of sustainable drainage as part of their development. NCC, as LLFA, is now a statutory consultee on these planning applications.

What are Sustainable Drainage Systems?

10.2 Sustainable Drainage Systems (SuDS) mimic natural drainage in a built environment. Instead of surface water being piped underground, water remains at the surface, where it is cleaned and stored, reducing flood risk and improving the quality of the water before it either soaks into the ground or discharges to a watercourse. This allows for greater biodiversity, habitat creation and visual amenity.

10.3 NCC encourages all new development and redevelopment that requires planning permission to use SuDS in order to reduce flood risk, improve water quality and present options for biodiversity and public amenity gains. This is consistent with existing national guidance and local planning policy.

General SuDS Advice for Developers in Northamptonshire

10.4 The demands of each individual development will lead to a wide variety of solutions. Understanding NCC’s priorities in terms of SuDS will help ensure the solutions are appropriate to the defined requirements.

10.5 It is important that developers establish the geological and hydrological conditions of their site at an early stage through ground investigations, before coming to any conclusions about the suitability of any particular SuDS system.

10.6 SuDS incorporate cost-effective techniques that are applicable to a wide range of schemes, from small developments to major residential, leisure, commercial or industrial operations with large areas of hard standing and roof.

10.7 They can also be successfully retro-fitted into existing developments.

Local Standards and Guidance for Surface Water Drainage in Northamptonshire

10.8 NCC updated this document in September 2017, which is intended to assist developers in the design of all surface water drainage systems, and to support Local Planning Authorities in considering drainage proposals for new development in Northamptonshire. The guide sets out the standards that NCC applies in assessing all surface water drainage proposals. The Local Standards and Guidance for Surface Water Drainage in Northamptonshire provides more information including local SuDS standards for the relevant water and sewerage companies (AWS/STW/TW).

Flood Data and Information Requests

10.9 NCC can provide the following information to inform and supplement any flood risk/drainage assessment, regardless of the size or nature of the development:

- A review of surface water drainage constraints from national mapping;
- A review of site specific flood risk issues;
- A summary of any historic flood incidents that have occurred on the site or within the related locality;
- A review of flood related assets that are within the related locality;
- A statement of any flood related issues you should consider further;
- Advice on the type and nature of surface water drainage that could be designed into the relevant development; and
- Information about flood risk consenting that may be required for your proposed development.

10.10 For more information about these data requests, the Surface Water Drainage Team can be contacted at: swdrainage@northamptonshire.gov.uk

**Technical Flood Advice Service**

10.11 NCC also provides technical advice on the surface water drainage design and other local sources of flood risk, for any proposed development in the County. The use of formal pre-application discussions is advocated to ensure SuDS and their management can be incorporated into developments in a well-planned manner from the early stages of design formation, which will then streamline the planning determination process.

10.12 For more information about the technical flood advice service, the Surface Water Drainage Team can be contacted at: swdrainage@northamptonshire.gov.uk
11. RESPONSIBILITIES FOR RISK MANAGEMENT AUTHORITIES

Overview

11.1 Numerous organisations, agencies, authorities and individuals have roles and responsibilities relating to flood risk management. This section sets out what these roles and responsibilities are for each of the different organisations, agencies and authorities.

11.2 Part 1, Section 6 (13) of the Flood and Water Management Act defines the following as flood risk management authorities:

- The Environment Agency;
- A Lead Local Flood Authority;
- A District Council for an area for which there is no unitary authority;
- An Internal Drainage Board;
- A Water Company; and
- A Highway Authority.

11.3 Under Section 13(4) of the Act, a risk management authority can arrange for a flood risk management function to be exercised on its behalf by another risk management authority. A flood risk management function is defined in the Land Drainage Act 1991 as including anything done to maintain, operate, improve, alter or remove existing works; and to construct or repair new works, to maintain or restore natural processes, to monitor, investigate or survey a location or natural process, or to increase or reduce the level of water.

The Environment Agency

11.4 The Environment Agency is responsible for the management of flood risk from the sea, main rivers and reservoirs. It has a strategic overview role for all forms of flooding in addition to responsibilities for the prevention, mitigation and remedying of flood damage for main rivers and coastal areas.

11.5 Main rivers are watercourses shown on the statutory main river map held by the Environment Agency and Defra. The Environment Agency has permissive powers to carry out works of maintenance, improvement and flood defence on main rivers. This can include any structure or appliance for controlling or regulating flow of water into or out of the channel. The overall responsibility for maintenance of main rivers, however, lies with the riparian owner.

11.6 The Environment Agency is the lead organisation responsible for all flood and erosion risk management around the coastline of England, including tidal flood risk. The Environment Agency leads the country in developing a coastal management plan that works at a local, regional and national level, with partner organisations, including local authorities, putting agreed plans into practical action. The Environment Agency supports this by administering Grant-in-Aid funding and overseeing the work carried out.

11.7 The Environment Agency enforces the Reservoirs Act 1975, which is the safety legislation for reservoirs in the United Kingdom. Although the responsibility for safety lies with the owners, the Environment Agency is responsible as Enforcement Authority of reservoirs in England and Wales that are greater than 25,000m³. The Environment Agency is also responsible for establishing and maintaining a register of reservoirs, and making this information available to the public. As Enforcement Authority the Environment Agency must ensure flood plans are produced for specified reservoirs.

11.8 The Environment Agency is responsible for controlling works which affect main rivers and flood defences through permitting works under the Environmental Permitting Regulations.
11.9 The Environment Agency is also responsible for providing advice to planning authorities, providing fluvial and coastal flood warnings, monitoring flood and coastal erosion risks and supporting emergency responders when flooding occurs.

11.10 In support of its objectives, the Environment Agency is involved in land use planning, including advising on strategic planning guidance, development plans and planning applications. Its primary role, subject to any changes in light of the Planning Green Paper, is to advise on those aspects of draft plans, planning applications, environmental statements and hazardous substances consent applications which relate to its operational functions and particular expertise, using information it already has. The Agency also has a role in providing advice at the early stages in the planning process: both to help shape development briefs and draft plans before they go out to consultation; and to advise prospective applicants on the potential implications of their proposals before an application is made to the local planning authority. If the Agency considers there to be gaps in the evidence base underpinning a planning authority’s draft plan or appraisal of an application from the wider sustainability point of view, it should draw the authority’s attention to this. Where the Agency provides advice it should do so in a timely, consistent, justifiable and understandable way (DEFRA, 2002, para 5.3).

11.11 The Environment Agency is a statutory consultee on a number of types of development, for the purposes of responding on planning application consultations from Local Planning Authorities and pre-planning application enquiries from developers. In addition they provide consultation responses on some types of development on which they are not a statutory consultee.

11.12 When planning proposals are brought forward for major new road, rail or airport developments the Environment Agency will require that:

- Drainage is via sustainable drainage systems (SuDS) designed and maintained to current good practice standards, including the provision of suitable treatment or pollution prevention measures. The point of discharge of such systems should normally be outside Source Protection Zone (SPZ) 1 and ideally outside SPZ2; and
- Where there is an existing or unavoidable need to discharge in SPZ1, the Environment Agency requires a detailed risk assessment to demonstrate that pollution of groundwater will not occur.

11.13 The Government’s expectation is that sustainable drainage systems (SuDS) will be provided in new developments wherever this is appropriate.

11.14 Where infiltration SuDS are to be used for surface run-off from roads, car parking and public or amenity areas, they should:

- Be suitably designed;
- Meet the Government’s non-statutory technical standards for sustainable drainage systems – these standards should be used in conjunction with the National Planning Policy Framework and Planning Practice Guidance; and
- Use a SuDS management treatment train – that is, use drainage components in series to achieve a robust surface water management system that does not pose an unacceptable risk of pollution to groundwater.

11.15 Where infiltration SuDS are proposed for anything other than clean roof drainage in a SPZ1, a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply.

11.16 Discharges of surface water run-off to ground at sites affected by land contamination, or from sites used for the storage of potential pollutants are likely to require an Environmental Permit.

11.17 This applies especially to sites where storage, handling or use of hazardous substances occurs (for example, garage forecourts, coach and lorry parks/turning areas and metal recycling/vehicle
dismantling facilities). These sites will need to be subject to risk assessment with acceptable effluent treatment provided.

11.18 In its strategic overview of all sources of flood risk role, the Environment Agency provides:

- Advice to Government on flood and coastal erosion risk, supporting future national responses, policy and strategy;
- Supervision of flood and coastal erosion risk management;
- Allocation of flood and coastal erosion risk management capital funding; and
- Support to LLFAs by providing data and guidance on assessing, planning and carrying out flood risk management for flooding from ordinary watercourses, surface runoff and groundwater.

Lead Local Flood Authority

11.19 NCC is an LLFA and as such is responsible for the coordination and management of flood risk from surface runoff, ordinary watercourses and groundwater.

11.20 The following table sets out all of the functions that the County Council can exercise under the Flood and Water Management Act (2010) and the Flood Risk Regulations (2009).
<table>
<thead>
<tr>
<th>Function</th>
<th>Legislation</th>
<th>Explanation</th>
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| Local Flood Risk Management Strategy          | Flood & Water Management Act (2010)             | Develop, maintain, apply and monitor a strategy for local flood risk management of the area for surface runoff, groundwater and ordinary watercourses. The strategy must specify:  
  - The risk management authorities in the authority’s area;  
  - The flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area;  
  - The objectives for managing local flood risk;  
  - The measures proposed to achieve those objectives;  
  - How and when the measures are expected to be implemented;  
  - The costs and benefits of those measures, and how they are to be paid for;  
  - The assessment of local flood risk for the purpose of the strategy;  
  - How and when the strategy is to be reviewed; and  
  - How the strategy contributes to the achievement of wider environmental objectives. |
<p>| Co-operation and joint working arrangements   | Flood &amp; Water Management Act (2010)             | Authorities must co-operate with each other in exercising functions. Authorities can also delegate functions to each other by local agreement.                                                                   |
| Power to request information                  | Flood &amp; Water Management Act (2010)             | LLFAs and the Environment Agency may request information from an individual in relation to the authority’s risk management functions. The information must be provided in the form/manner and period specified within the request. Enforcement action may be taken if the individual neglects to comply with the request. A financial penalty may also be imposed. |
| Creation and maintenance of an asset register | Flood &amp; Water Management Act (2010)             | This section requires LLFAs to establish and maintain a register of structures, or features, which may significantly affect flood risk in their administrative area and also provide a record of information about such structures and features, including ownership and state of repair. The register must be available for public inspection at all reasonable times. This requirement does not apply to the record which may contain personal or other confidential data. The method by which inspection of the register is provided is not specified in the legislation. |
| Investigation of flooding incidents           | Flood &amp; Water Management Act (2010)             | The purpose of this provision is to require the LLFA to investigate flooding incidents where appropriate, so as to try and ascertain where responsibility for managing the flood risk lies and what is being done about it. The LLFA must publish the results of any investigation and notify any relevant flood risk management authority of those results. |</p>
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<thead>
<tr>
<th>Function</th>
<th>Legislation</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>Designation of Features</td>
<td>Flood &amp; Water Management Act (2010)</td>
<td>This Schedule to the Act provides additional legal powers for certain authorities in England and Wales to formally designate assets or features which affect flood risk. It increases the regulatory control of the significant number of assets or features, which form flood risk management systems, but which are not maintained or operated by those formally responsible for managing the risk. Once a feature is designated, the owner must seek consent from the designating authority to alter, remove, or replace it. A series of conditions have to be met prior to designation.</td>
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<tr>
<td>enforcement powers</td>
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<tr>
<td>Surface Water Drainage – Statutory Consultee</td>
<td>Article 2(1) of the Town and Country Planning</td>
<td>On the 24th March 2015, the Government laid a statutory instrument making the County Council, as LLFA, a statutory consultee to the planning application process for major development only that have surface water drainage implications. Major development is defined as development involving any one or more of the following; (a) the winning and working of minerals or the use of land for mineral-working deposits; (b) waste development; (c) the provision of dwellinghouses where— (i) the number of dwellinghouses to be provided is 10 or more; or (ii) the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within subparagraph (c)(i); (d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or (e) development carried out on a site having an area of 1 hectare or more.</td>
</tr>
<tr>
<td>Role to the planning application process</td>
<td>Development Management Procedure (England) Order 2015</td>
<td></td>
</tr>
<tr>
<td>Identify areas of significant flood risk</td>
<td>Flood Risk Regulations (2009)</td>
<td>Ministerial guidance has been published about the criteria for assessing whether a risk of flooding is significant. The Environment Agency has used the Flood Map for Surface Water and the Defra guidance to produce indicative flood risk areas. It is important to note that no Indicative Flood Risk Areas have been identified in Northamptonshire.</td>
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positive outfall. Public sewers are designed to protect properties from the risk of flooding in normal wet weather conditions. However, in extreme weather conditions there is a risk that sewer systems can become overwhelmed and result in sewer flooding.

11.22 The water and sewerage companies that operate within West Northamptonshire are:

- Anglian Water
- Thames Water
- Severn Trent

11.23 In October 2011, under the ‘Private Sewer Transfer’, water and sewerage companies adopted piped systems on private land that serve more than one property and connect to a public sewer. Sewerage undertakers have a duty under Section 94 of the Water Industry Act 1991, to provide, improve and extend sewers for the drainage of buildings and associated paved areas.

District and Borough Councils

11.24 The information set out below highlights the full range of mechanisms available to NBC, SNC and DDC in the exercise of their flood risk management functions.

11.25 Responsibilities under the **Flood and Water Management Act 2010** include:

- **Section 6**: District Councils are classed as Risk Management Authorities.
- **Section 11**: In exercising its flood and coastal erosion risk management functions, a district council must act in a manner which is consistent with the national strategy and associated guidance, and also act in a manner which is consistent with local strategies and associated guidance. In exercising any other function in a manner which may affect a flood risk or coastal erosion risk, a District Council must have regard to the national and local strategies and guidance.
- **Section 13**: A District Council must co-operate with other Risk Management Authorities in the exercise of their flood and coastal erosion risk management functions. A District Council may share information with another risk management authority for the purpose of discharging its duty in the exercise of their Flood and Coastal Erosion Risk Management functions. In addition, a district council may arrange for a flood risk management function to be exercised on its behalf by another risk management authority or a navigation authority.
- **Section 27**: In exercising a flood or coastal erosion risk management function, district councils must aim to make a contribution towards the achievement of sustainable development.
- **Section 39**: A District Council may carry out work (as specified by Section 3 (3) (a) to (e) of the Act) that will or may cause flooding, increase water below the ground or coastal erosion.
- **Schedule 1**: District Councils are classed as designating authorities under Schedule 1 of the Act. This allows district councils, where the conditions outlined in Schedule 1 are satisfied, to designate a structure, or a natural or man-made feature of the environment where the authority thinks that the existence or location of the structure or feature affects flood risk. The effect of designation is that a person may not alter, remove or replace a designated structure or feature without the consent of the responsible authority.

11.26 Responsibilities under the **Land Drainage Act 1991** (as amended by the Act) include:

- **Section 14A**: A District Council may carry out flood risk management work where the authority considers the work desirable having regard to the local flood risk management strategy for its area and that the purpose of the work is to manage a flood risk in the authority's area from an ordinary watercourse.
- **Section 66**: A District Council may make byelaws to secure the efficient working of a drainage system in the authority's district or area, to regulate the effects on the environment, to secure the effectiveness of flood risk management work within the meaning of section 14A and/or to
secure the effectiveness of works done in reliance on Section 39 of the Flood and Water Management Act 2010.

11.27 Responsibilities under the Public Health Act 1936 include:

- **Section 260**: A District Council may undertake works to manage statutory nuisances in connection with watercourses, ditches, ponds, etc. as outlined by Section 259 of the Public Health Act 1936. This includes the clearance of any obstruction or impediment to the proper flow of water. Other provisions within the Public Health Act 1936 outline further provisions related to watercourses, culvering and land drainage.

11.28 Responsibilities under the Environmental Protection Act 1990 include:

- **Section 79**: Section 79 (Statutory nuisances and inspections therefore) outlines that the following would constitute a statutory nuisance; that any water covering land or land covered with water which is in such a state as to be prejudicial to health or a nuisance.

11.29 Responsibilities under the Localism Act 2011 include:

- **Section 9FH and 9JB**: A District Council (as a risk management authority) must comply with a request made by a lead local flood authority’s overview and scrutiny committee, in the course of its arrangements to review and scrutinise the exercise by risk management authorities of flood risk management functions which may affect the local authority’s area. District Councils must have regard to reports and recommendations of an overview and scrutiny committee in the course of arrangement outlined above.

11.30 Under planning legislation, Borough and District Councils operate their development planning and control functions, having due regard to the National Planning Policy Framework and associated technical guidance.

**Highway Authority**

11.31 Northamptonshire Highways is the Highway Authority responsible for the provision and management of highway drainage under the Highways Act (1980). This excludes motorways and trunk roads that are the responsibility of Highways England.

11.32 Northamptonshire Highways has various duties and powers in relation to flooding and drainage on the highway. The Highway Authority is not responsible for flooding or drainage on private land – this is the responsibility of the owner or occupier of the land. Where flooding on a highway is caused by another person (e.g. an adjoining landowner), the Highway Authority can take action against the person responsible.

11.33 Highway drainage systems are for the primary purpose of accepting surface water runoff from the highway and are the responsibility of the Highway Authority unless they have been specifically adopted by the sewerage undertaker.

**Highways England**

11.34 Highways England is responsible for all of the trunk roads located in West Northamptonshire, including the: M1, M45, A5, A14, A43 (between M1 Junction 15a and the Oxfordshire boundary), and the A45 (between M1 Junction 15 and the A14).

11.35 Where a motorway or trunk road is identified as being at risk from flooding, contingency plans are prepared to warn road users and, where necessary, divert them away from the problem. Where possible, weather data from the Met Office is analysed and if intense rainfall events are forecast in sensitive flood areas, suitable warnings are posted using the variable message signs.
Riparian Owners

11.36 Under common law, a riparian owner is someone who has a watercourse within or adjacent to any boundary of their property. Where a watercourse is sited between two or more property boundaries each owner may be equally responsible up to the centre line of the watercourse.

11.37 Although not defined as a flood risk management authority under the Act, riparian owners retain their own duties and responsibilities for watercourses on or adjacent to their land as set out in the Land Drainage Act 1991. This includes the responsibility for the maintenance of any river, stream, ditch, drain, cut, dyke, sluice, culvert, sewer (excluding public sewers) or any other passage through which water flows.

11.38 The Flood Toolkit provides a vast amount of guidance to help clarify the rights and responsibilities of riparian owners: www.floodtoolkit.com

Parish Councils

11.39 Parish Councils have the powers to undertake maintenance works on ponds, ditches and other open drainage in order to prevent the feature from becoming a risk to health. Parish Councils can also play an important role in managing flood risk at the community level by preparing community flood plans, raising additional funding for local flood resilience and flood defence measures, and gathering information on flooding by reporting any flood incidents in their area. For further details on the roles of Parish Councils please see Flood Guide 19 on the Flood Toolkit.

Other bodies

11.40 There are many other bodies that play an important role in flood risk management: for example, Natural England, The Met Office, the Flood Forecasting Centre; and charities such as the National Flood Forum, Red Cross and Salvation Army; and the National Farmers Union.
12. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

12.1 The area of West Northamptonshire is currently and will continue to undergo significant expansion as part of the growth proposals. This Level 1 SFRA update has considered all sources of flood risk based on information gained through consultation with all RMAs as specified within the NPPF. This Level 1 SFRA update is therefore compliant with the NPPF and will continue to inform land allocation and future flood risk management needs within West Northamptonshire. The information presented in this updated Level 1 SFRA is sufficient to inform the preparation of all Local Development Plan documents.

12.2 Fluvial flood risk poses the greatest risk in West Northamptonshire from both the Main Rivers and Ordinary Watercourses.

12.3 Surface water flooding has also been identified as a more recent concern and a key consideration for all new development. Major new developments now have to address surface water drainage requirements set out in the National Standards and local guidance produced by NCC. This guidance will ensure that careful design of the site lay-out and drainage system, giving due consideration to the implementation of SuDS solutions and their ongoing maintenance where appropriate, is factored into new development.

12.4 Groundwater flooding is also a key consideration to future growth and detailed guidance has been produced by NCC as the LLFA and should be considered at all stages of the planning process.

12.5 Finally, the reservoirs identified may pose a residual flood risk to local communities if they were to breach along with flood defences. Areas located within the potential flow path or behind defences should be incorporated within any assessment at all stages of the planning application process.

Recommendations

12.6 Any potential development sites that incorporate or are located adjacent (typically within 8m – 9m) to a stretch of main river or ordinary watercourse without flooding information (i.e. broad-scale flood zone maps and modelling) should either be examined in more detail during a Level 2 SFRA or during a site-specific FRA at the planning application stage. This should include modelling to define the functional floodplain and its extent, including climate change scenarios.

12.7 Where a watercourse runs through a development site, incorporation of river naturalisation and environmental enhancement should be considered where feasible, providing these do not increase flood risk.

12.8 Development should be located in the lowest flood risk areas. Sites should only be allocated in accordance with the Sequential Test to reduce the flood risk and ensure that the vulnerability classification of the proposed development is appropriate to the flood zone classification.

12.9 Flood Risk Assessments (FRAs) should be undertaken for all major developments (residential developments consisting of sites greater than 1 ha or greater than 10 dwellings and commercial developments that are greater than 1 ha or have a floor area greater than 1000 m²) and sites located within Flood Zone 2 and Flood Zone 3. The FRAs should assess the risk of flooding to the development from all sources and should identify options to mitigate the flood risk to the development, site users and surrounding area. The detailed guidance provided in Appendix 4, relating to site specific Flood Risk Assessments should be followed.

12.10 The potential risk of flooding from raised canals should also be considered. A canal breach has the potential to cause rapid, high velocity inundation and risk to life and infrastructure. Flood
Risk Assessments should therefore assess the following in relation to the impact of a canal overtopping or a breach:

- Whether the proposed site lower than the canal bank level or the canal embankment is above the site.
- Whether the site is within 1km of the canal.
- Whether there been past incidences of canal breach which may show that the location of the development site is vulnerable to canal breach.

12.11 Any development which meets these criteria will need to assess the residual risk of any breach or failure. It is also recommended that if a canal flows through or is adjacent to a development site, a buffer zone of at least 8m is incorporated to allow access for maintenance should any repair be required.

12.12 Where floodplain storage is removed, the development should provide compensatory storage on a level for level and volume for volume basis to ensure that there is no loss in flood storage capacity.

12.13 Development should not be located within 9m (ordinary watercourse) - 8m (main river) of the riverbank to ensure adequate access for maintenance and a riparian corridor.

12.14 In accordance with the NPPF and as stated JCS Local Plan Part 1, a specific policy on flood risk should be included within the Local Plan Part 2 Documents to ensure that the advice provided for each site outlined within the sequential test table is incorporated.

12.15 The Environment Agency’s ‘Water stressed areas – final classification’ identifies that West Northamptonshire sits within an area classified as an area of serious water stress. The water stress classification takes a long-term view of the balance between water availability and the demand for public water supply. It considers where the current and future household demand for water is a high proportion of the current effective rainfall. High population density and high levels of demand increase the pressure on available supplies, as well as environmental factors such as local water resource availability. Future population change and development also contributes, with parts of the east of England forecast to be the fastest growing in England.

12.16 Policy BN7A of the West Northamptonshire Local Plan Part 1 (Joint Core Strategy) includes specific reference to water efficiency standard for new developments. This aligns with the National Planning Practice Guidance which enables local planning authorities to set out the optional water efficiency requirement in a Local Plan where it can be demonstrated that there is a clear need. In order to ensure that all new housing is water efficient, all new developments will be required to comply with this policy.

12.17 Continued partnership working between all RMAs should be promoted to maximise opportunities for holistic flood risk management and natural resilience.

12.18 Early consultation with the Borough and District Councils, the EA, LLFA and developers should be encouraged for any proposed development.

12.19 Emergency planning is imperative to minimise the risk to life posed by flooding within the area. It is recommended that the Borough and District Councils advise the Local Resilience Forum of the risks raised in light of this SFRA, ensuring that the planning for future emergency response can be reviewed accordingly.

12.20 This SFRA relies upon the policy framework set out by the NPPF and therefore if this is significantly altered along with any associated guidance, this SFRA will need to be once again reviewed to ensure adequate consideration of flood risk matters. This can be achieved by ensuring the following actions take place:
• During future iterations the key stakeholders should be contacted to ensure that the most up-to-date records are included in the SFRA update;
• Information on all sources of flooding should continue to be collected, where possible;
• When more detailed or updated hydraulic modelling becomes available, these should be included in the SFRA as soon as possible and used to update the document and any relevant definitions;
• When more detailed information is carried out by developers and land owners, information should be captured and submitted to the Borough and District Councils as part of the development control process; and
• Datasets that are updated regularly should be identified, saved and recorded.

Level 2 SFRA

12.21 Following the completion of the Sequential Testing, the sites that cannot be located within a low flood risk area (i.e. Flood Zone 1 or identified as amber/red in the Sequential Test tables) could be examined in more detail during a Level 2 SFRA, which will provide enough information to allow the relevant LPA to either re-apply their Sequential Testing, in light of further information or to apply the Exception Test to the proposed development site. Alternatively they can be removed from the site allocation process or their boundaries amended to exclude flood risk areas.

NBC additional work

12.22 NBC have not commenced the site allocations process and therefore the Sequential Testing process has not been undertaken. Once sites have been identified these should be tested using the information provided within this updated Level 1 SFRA.
### APPENDIX 1: GLOSSARY OF TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition/enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquifer</td>
<td>A source of groundwater comprising water-bearing rock, sand or gravel capable of yielding significant quantities of water.</td>
</tr>
<tr>
<td>Breach</td>
<td>Flooding caused by the constructional failure of a flood defence or other structure that is acting as a flood defence.</td>
</tr>
<tr>
<td>Catchment Flood Management Plans (CFMP)</td>
<td>Catchment Flood Management Plans have been produced by the Environment Agency and are high-level planning tools that set out objectives for flood risk management for each river catchment and estuary. CFMPs consider inland risk from rivers, surface water, groundwater and tidal flooding but do not consider sewer flooding. The CFMPs that cover Northamptonshire are: <a href="#">River Nene Catchment Flood Management Plan</a> (December 2009), <a href="#">Thames Catchment Flood Management Plan</a> (December 2009), <a href="#">Great Ouse Catchment Flood Management Plan</a> (January 2011) and the <a href="#">River Welland Catchment Flood Management Plan</a> (December 2009). Flood Risk Management Plans build upon Catchment Flood Management Plans.</td>
</tr>
<tr>
<td>Climate Change</td>
<td>A long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average, for example, greater or fewer extreme weather events. Climate change may be limited to a specific region, or may occur across the whole planet.</td>
</tr>
<tr>
<td>Culvert</td>
<td>A closed conduit or pipe used for the conveyance of water under a road, railway, canal, property, or other impediment.</td>
</tr>
<tr>
<td>Defence</td>
<td>A structure that alters the natural flow of water or flood water for the purposes of flood defence, thereby reducing the risk of flooding. A defence may be ‘formal’ (a structure built and maintained specifically for flood defence purposes) or ‘informal’ (a structure that provides a flood defence function but has not been built and/or maintained for this purpose).</td>
</tr>
<tr>
<td>Environment Agency</td>
<td>An Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales. The Environment Agency’s principal aims are to protect and improve the environment, and to promote sustainable development. They play a central role in delivering the environmental priorities of central government and the Welsh Assembly Government through our functions and roles.</td>
</tr>
<tr>
<td>Environmental Permit for Flood Risk Activities</td>
<td>A permit required under the Environmental Permitting (England and Wales) Regulations 2010 from the Environment Agency for any proposed works or structures, in, under, over or within eight metres of the top of the bank of any watercourse, designated a ‘main river’. This was formerly called a Flood Defence Consent. Some activities are also now excluded or exempt. A permit is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: <a href="https://www.gov.uk/guidance/flood-risk-activities-environmental-permits">https://www.gov.uk/guidance/flood-risk-activities-environmental-permits</a>.</td>
</tr>
<tr>
<td><strong>Flood</strong></td>
<td>A flood is an overflow of an expanse of water that submerges land. Both the Flood and Water Management Act (2010) and the Flood Risk Regulations (2009) state that it doesn’t matter whether a flood is caused by: heavy rainfall; a river overflowing its banks of being breached; a dam overflowing or being breached; tidal waters; groundwater; or anything else including a combination of factors. However, both state that a ‘flood’ does not include: a flood caused from any part of a sewerage system, unless wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system; or a flood caused by a burst water main.</td>
</tr>
</tbody>
</table>
| **Flood Defence / Land Drainage Consent** | A Consent required if a landowner wants:  
- Do work on, over, under or near an ordinary watercourse (within 9 metres of the landward toe of the bank); and  
- Make changes to any structure that helps control water. |
| **Flood Map for Planning (rivers and sea)** | A multi-layered map produced by the Environment Agency, which provides information on flooding from rivers and the sea for England and Wales, in the form of Flood Zones. The Flood Map also has information on flood defences and the areas benefiting from those flood defences. This map is intended for use as a planning tool. The Environment Agency has also published maps of the Risk of Flooding from Rivers and Seas, which includes the impact of any flood defences in the area. |
| **Flood Map for Surface Water** | The Flood Map for Surface Water represents the mechanisms that cause surface water flooding. |
| **Flood and Water Management Act (2010)** | The Act brings together the recommendations of the Pitt report and previous policies, to improve the management of water resources and create a more comprehensive and risk based regime for managing the risk of flooding from all sources. The Act reinforces the need to take an integrated approach to the management of flooding and places a number of roles and responsibilities on local authorities, such as the County Council, under the role of Lead Local Flood Authority. |
| **Flood Resilience** | Actions taken which allow the ingress of flood water through a property but enable swift recovery after the flood event. Flood resilience measures may include (among others) flood-resistant construction materials, raised electricity sockets and water-resistant flooring. |
| **Flood Resistance** | Actions taken to prevent the ingress of flood water to a property. Flood Resistance measures may include flood barriers placed over doorways. |
| **Flood Risk** | Flood risk is a combination of two components: the chance (or probability) of a particular flood event occurring and the impact (or consequence) that the event would cause if it took place. |
Flood Risk Map

A map showing: the number of people living in the area who are likely to be affected in the event of flooding; the type of economic activity likely to be affected in the event of flooding; any industrial activities in the area that may increase the risk of pollution in the event of flooding; any relevant protected areas that may be affected in the event of flooding; any areas of water subject to specified measures or protection for the purpose of maintaining the water quality that may be affected in the event of flooding; and any other effect on human health, economic activity or the environment (including cultural heritage). The Environment Agency has produced a suite of maps which can be found on [https://www.gov.uk/](https://www.gov.uk/). These maps are also available in the Flood Toolkit.

Flood Risk Management Plans (FRMP)

Flood Risk Management Plans (FRMPs) highlight the hazards and risks of flooding from rivers, the sea, surface water, groundwater and reservoirs, and set out how Risk Management Authorities (RMAs) work together with communities to manage flood risk. By law Environment Agency (EA) must produce flood risk management plans (FRMPs) for each River Basin District. The FRMPs with relevance to West Northamptonshire are as follows:

- Anglian River Basin District Flood Risk Management Plan
- Thames River Basin District Flood Risk Management Plan
- Severn River Basin District Flood Risk Management Plan

The Flood Risk Regulations

The Flood Risk Regulations were enacted in December 2009 to implement the requirements of the EU Floods Directive, which aims to provide a consistent approach to managing flood risk across Europe. The regulations outline the roles and responsibilities of the various authorities consistent with the Flood and Water Management Act 2010 and provide for the delivery of the outputs required by the directive. The Directive requires Member States to develop and update a series of tools for managing all sources of flood risk.

Flood storage

A temporary area that stores excess runoff or river flow often ponds or reservoirs.

Flood Zones

Nationally consistent delineation of ‘high’ and ‘medium’ flood risk, published on a quarterly basis by the Environment Agency and based on the definitions within NPPF.

Flood Zone 1 Low Probability

Defined as an area only at risk of flooding from flood events with an Annual Exceedence Probability (AEP) of less than 0.1% (1 in 1000). The probability of flooding occurring in this area in any one year is less than 0.1%.

Flood Zone 2 Medium Probability

Defined as an area at risk of flooding from flood events with an Annual Exceedence Probability (AEP) of between 1% (1 in 100) and 0.1% (1 in 1000). The probability of flooding occurring in this area in any one year is between 1% and 0.1%.

Flood Zone 3a High probability

Defined as an area at risk of flooding from flood events with an Annual Exceedence Probability (AEP) of greater than 1% (1 in 100). The probability of flooding occurring in this area in any one year is greater than 1%.
Flood Zone 3b Functional Floodplain
Defined as land where water has to flow or be stored in times of flood. Usually defined as areas at risk of flooding from flood events with an Annual Exceedence Probability (AEP) of greater than 5% (1 in 20) design event. The probability of flooding occurring in this area in any one year is greater than 5%.

Fluvial
The processes associated with rivers and streams and the deposits and landforms created by them.

Functional Floodplain
This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities are required to identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly.

Geographical Information Systems (GIS)
GIS is any system which stores geographical data, such as elevations, location of buildings and extent of flood outlines.

Groundwater
Water located beneath the ground surface, either in soil pore spaces or fractures in rock.

Internal Drainage Board
Independent body with responsibility of ordinary watercourses within a specified district.

Inundation
To cover with floodwater.

Local Planning Authority
Body that is responsible for controlling planning and development through the planning system.

Main River
All watercourses shown on the statutory main river maps held by the Environment Agency. This can include any structure or for controlling or regulating the flow of water into, in or out of the channel. The Environment Agency has permissive power to carry out works of maintenance and improvement on these rivers.

Mitigation measure
An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.

National Flood and Coastal Erosion Risk Management Strategy
The Environment Agency’s National Strategy was published in May 2011 and provides an overview of how flood risk and the risk of coastal erosion will be managed across England. The aims and objectives of the National Strategy have been translated onto a local scale through this Local Strategy for the County Council.

National Planning Policy Framework (NPPF)
Sets out the Government’s planning policies for England and how these are expected to be applied. It sets out the Government’s requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

National Planning Practice Guidance (NPPG)
A planning practice guidance web-based resource. Links between the National Planning Policy Framework and relevant planning practice guidance.

Ordinary Watercourse
Any section of watercourse not designated as a main river.
| Pitt Review | Sir Michael Pitt carried out an independent review of the 2007 floods and made a number of recommendations for future flood risk management. In particular, he recommended that local authorities should play a more significant role in tackling local problems of flooding and coordinating all relevant agencies. Many of the recommendations of The Pitt Review have been enacted through the Flood and Water Management Act. |
| Pluvial | Direct runoff as a result of rainfall and the processes associated with it. |
| Precipitation | Describes rain, sleet, hail, snow and other forms of water falling from the sky. |
| Preliminary Flood Risk Assessment (PFRA) | The PFRA is a process involving an assessment of past floods and the possible harmful consequences of future floods, leading to the identification of Areas of Significant Risk. All LLFAs must prepare a PFRA report in relation to flooding in the LLFA’s area. The floods to be included are those which had significant harmful consequences for human health, economic activity or the environment (including cultural heritage), or which would have significant harmful consequences for those matters if they were to occur now. |
| Reservoir | Artificial lake used to store water. Reservoirs may be created in river valleys by the construction of a dam or may be built by excavation in the ground or by conventional construction techniques such a brickwork or cast concrete. Reservoirs greater than 25,000m³ are governed by the Reservoirs Act. |
| Residual Risk | The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented. |
| Return Period | The probability of a flood of a given magnitude occurring within any one year e.g. a 1% (1 in 100) Annual Exceedance Probability (AEP) flood event has a 1% probability of occurring once in any one year. |
| Riparian Owner | All landowners whose property is adjoining to a body of water have the right to make reasonable use of it and the responsibility to suitably maintain it. |
| Risk | The probability or likelihood of an event occurring. |
| Risk Management Authority | Flood Risk Management Authorities have a range of roles and responsibilities relating to flood risk management. These authorities include: (a) the Environment Agency, (b) a lead local flood authority, (c) a district council for an area for which there is no unitary authority, (d) an internal drainage board, (e) a water company, and (f) a highway authority. |
| **River Basin Management Plans (RBMP)** | River Basin Management Plans have been produced by the Environment Agency for the eleven river basin districts in England and Wales and are the central tool setting out the objectives and actions required to achieve the objectives of the Water Framework Directive. RBMPs describe the main issues for each river basin district and state the environmental objectives for the basin, explain the objectives selected to achieve good ecological status and summarise the actions needed to deliver those objectives. A River Basin District is: a river basin, or several river basins, and the river basin’s adjacent coastal waters. |
| **Sequential Test** | Informed by a SFRA, a planning authority applies the Sequential Test to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed. |
| **Sewer** | A sewer is a pipe which carries and removes either rainwater (surface) or foul water (or a combination of both) from more than one property. A sewer can also be categorised as being a private or public sewer and can carry surface or foul water.  
- A Private Sewer is solely the responsibility of the occupiers/owners of the properties that it serves.  
- A Public Sewer is a sewer that has been adopted and maintained by a Sewerage Undertaker. |
| **Sewer flooding** | The consequence of sewer systems exceeding their capacity during a rainfall event. Sewer flooding can also occur due to structural or operational issues. |
| **Strategic Flood Risk Assessment (SFRA)** | An SFRA is used as a tool by a planning authority to assess flood risk for spatial planning, producing development briefs, setting constraints, informing sustainability appraisals and identifying locations of emergency planning measures and requirements for flood risk assessments. The purpose of a SFRA is to assess and map all forms of flood risk from groundwater, surface water, impounded water bodies, sewer and river sources, taking into account future climate change predictions, to allow planning authorities to use this as an evidence base to locate future development primarily in low flood risk areas. The outputs from an SFRA also assist in the production of sustainable policies for the long-term management of flood risk. |
| **SuDS** | Sustainable Drainage Systems. SuDS are drainage systems which are designed to reduce the impact of urbanisation on the hydrology of a river system. |
| **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. Areas that suffer a depth of greater than 0.1m are considered to be at risk of surface water flooding. Flooding that is greater than 0.3m deep is classed as being at risk of deep surface water flooding. |
Surface Water Management Plans (SWMP) | SWMPs are produced by local authorities and are described as a framework through which key local partners with a responsibility for surface water and drainage in their area work together to understand the causes of surface water flooding and agree the most cost effective way of managing that risk. The purpose is to make sustainable surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views. A SWMP should establish a long-term action plan to manage surface water in an area and should influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.

| 1% annual probability flood event | Event that on average will occur once every 100 years. Expressed as an event which has a 1% probability of occurring in any one year. |
| 0.5% annual probability flood event | Event that on average will occur once every 200 years. Expressed as an event which has a 0.5% probability of occurring in any one year. |
| 0.1% annual probability flood event | Event that on average will occur once every 1000 years. Expressed as an event, which has a 0.1% probability of occurring in any one year. |
## APPENDIX 2: ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning / Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEP</td>
<td>Annual Exceedance Probability</td>
</tr>
<tr>
<td>AWS</td>
<td>Anglian Water Services</td>
</tr>
<tr>
<td>BGS</td>
<td>British Geological Society</td>
</tr>
<tr>
<td>CFMP</td>
<td>Catchment Flood Management Plan</td>
</tr>
<tr>
<td>CIL</td>
<td>Community Infrastructure Strategy</td>
</tr>
<tr>
<td>CRT</td>
<td>Canal and Rivers Trust</td>
</tr>
<tr>
<td>DDC</td>
<td>Daventry District Council</td>
</tr>
<tr>
<td>Defra</td>
<td>The Department for Food and Rural Affairs</td>
</tr>
<tr>
<td>DPD</td>
<td>Development Plan Document</td>
</tr>
<tr>
<td>EA</td>
<td>Environment Agency</td>
</tr>
<tr>
<td>FCERM</td>
<td>Flood and Coastal Erosion Risk Management</td>
</tr>
<tr>
<td>JCS</td>
<td>Joint Core Strategy</td>
</tr>
<tr>
<td>FEH</td>
<td>Flood Estimation Handbook</td>
</tr>
<tr>
<td>FRMP</td>
<td>Flood Risk Management Plan</td>
</tr>
<tr>
<td>FMfSW</td>
<td>Flood Map for Surface Water</td>
</tr>
<tr>
<td>FRA</td>
<td>Flood Risk Assessment and/or Flood Risk Area</td>
</tr>
<tr>
<td>FSR</td>
<td>Flood Storage Reservoir</td>
</tr>
<tr>
<td>FWD</td>
<td>Floodline Warnings Direct</td>
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<tr>
<td>FWMA</td>
<td>Flood and Water Management Act 2010</td>
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<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>IDB</td>
<td>Internal Drainage Board</td>
</tr>
<tr>
<td>JCS</td>
<td>Joint Core Strategy</td>
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<tr>
<td>LDD</td>
<td>Local Development Document</td>
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<tr>
<td>LFRMS</td>
<td>Local Flood Risk Management Strategy</td>
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<tr>
<td>LiDAR</td>
<td>Light Detection and Ranging</td>
</tr>
<tr>
<td>LLFA</td>
<td>Lead Local Flood Authority</td>
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<tr>
<td>LPA</td>
<td>Local Planning Authority</td>
</tr>
<tr>
<td>LDF</td>
<td>Local Development Framework</td>
</tr>
<tr>
<td>LRF</td>
<td>Local Resilience Forum</td>
</tr>
<tr>
<td>NBC</td>
<td>Northampton Borough Council</td>
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<tr>
<td>NCC</td>
<td>Northamptonshire County Council</td>
</tr>
<tr>
<td>NPPF</td>
<td>National Planning Policy Framework</td>
</tr>
<tr>
<td>PFRA</td>
<td>Preliminary Flood Risk Assessment</td>
</tr>
<tr>
<td>PPS25</td>
<td>Planning Policy Statement 25</td>
</tr>
<tr>
<td>RBMP</td>
<td>River Basin Management Plan</td>
</tr>
<tr>
<td>RMA</td>
<td>Risk Management Authority</td>
</tr>
<tr>
<td>ST</td>
<td>Severn Trent</td>
</tr>
<tr>
<td>SFRA</td>
<td>Strategic Flood Risk Assessment</td>
</tr>
<tr>
<td>SNC</td>
<td>South Northamptonshire Council</td>
</tr>
<tr>
<td>SoP</td>
<td>Standard of Protection</td>
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<tr>
<td>SPD</td>
<td>Supplementary Planning Document</td>
</tr>
<tr>
<td>SuDS</td>
<td>Sustainable Drainage Systems</td>
</tr>
<tr>
<td>SWMP</td>
<td>Surface Water Management Plan</td>
</tr>
<tr>
<td>TW</td>
<td>Thames Water</td>
</tr>
<tr>
<td>WFD</td>
<td>Water Framework Directive</td>
</tr>
<tr>
<td>WCS</td>
<td>Water Cycle Study or Strategy</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Meaning / Definition</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>WNJPU</td>
<td>West Northamptonshire Joint Planning Unit</td>
</tr>
</tbody>
</table>
APPENDIX 3: HYDRAULIC MODEL INFORMATION

Fluvial hydraulic models

A number of flood risk studies have previously been completed in this geographical area. As part of these, hydraulic models have been developed to improve the understanding of flooding and map flood risk across the catchment. The hydraulic models relevant to West Northamptonshire are:

East Anglia – Cambridgeshire and Bedfordshire

The Upper Great Ouse Flood Mapping Project covers part of Northamptonshire County. The release date for this model is April 2012. The model includes detailed and broad scale modelling. It covers the following watercourses:

- River Great Ouse
- River Tove
- River Ouzel
- Towcester - Flood Alleviation Scheme
- Towcester – River Tove Pre-feasibility
- Towcester / Silverstone – Pre-feasibility
- Brackley – Flood Alleviation Scheme
- Brackley – Pre-feasibility
- Stony Stratford / Maids Morton SoP
- Stony Stratford – Pre-feasibility

The Flood Map for Planning (Rivers and Sea) consists of several smaller models. It is primarily the Upper Great Ouse model, but also includes the Brackley Pre-Feasibility model, the Buckingham PAR (Project Appraisal Report) model, and JFLOW modelling.

Lincolnshire & Northamptonshire

- Billing Brook August 2013, 1D ISIS model (extents in Upper Nene)
- Dallington Brook August 2013, 1D ISIS model
- Ecton Brook August 2013, 1D ISIS model (extents 2011)
- Heyford Brook August 2013, 1D ISIS model
- Middle Nene September 2013, 1D ISIS model
- River Ise August 2013, 1D ISIS model
- Nene Strategic Model
- Upper Nene September 2013, hybrid 1D-2D ISIS-TuFLOW model- Updated 2016 final outputs not Qad will provide once available
- Wootton Brook August 2013, 1D ISIS model
- Kislingbury - Flood Alleviation Scheme
- Upper Wootton - Pre-feasibility
- Lower Wootton - Pre-feasibility

Thames

- Cherwell (Banbury) Model 2005
- Calibrated and Verified Model Input Data for Cherwell (Banbury) 2005 & Cherwell (Banbury) 2015
West Midlands

- Clay Coton and Yelvertoft Brooks

**Environment Agency Flood Maps**

The Environment Agency’s Flood Map considers flood risk from rivers and from the sea only and is available on the [Flood Toolkit](#).

The Flood Map ignores the presence of formal flood defences and the land is divided into the three following Flood Zones:

- The low probability Flood Zone 1 assessed as the land having a less than 0.1% AEP of river or sea flooding in any one year;
- The medium probability Flood Zone 2 assessed as the land having between a 0.1% and 1% AEP of river flooding or between a 0.1% and 0.5% AEP of sea flooding in any year; and
- The high probability Flood Zone 3 assessed as the land having 1% or greater AEP of river flooding or a 0.5% or greater AEP of sea flooding in any year.

Flood Zone 3b comprises land where water has to flow or be stored in times of flooding.

The National Planning Policy Framework (NPPF) states that LPAs should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. This information has therefore been presented in Map 7: Flood Zone 3a and 3b, in the accompanying Strategic Flood Map Document.

The NPPF also states that only Water-compatible Development and Essential Infrastructure should be permitted within the functional floodplain. However such development or infrastructure is required to ensure the functional floodplain remains operational and safe for users in times of flood, not to impede water flows nor increase flood risk elsewhere and to result in no net loss of floodplain storage.

**GIS Data Gaps & Assumptions**

Data has been provided by the EA and collated by the LLFA, and the main gap in the data relates to ordinary watercourses where no flooding information/hydraulic modelling is available. Whilst it is possible that there is no flooding related to the stretch of watercourse, it is possible that this may indeed be a gap in the data.

Any potential development sites adjacent (typically within 8m - 9m) to a stretch of watercourse without flooding information (i.e. broad-scale flood zone maps) should either be examined in more detail as part of a Level 2 SFRA or during a site-specific flood risk assessment.

**Historical Flood Mapping**

Outlines of mapped historical flooding events have been combined to delineate approximate areas that have previously flooded. Much of the information used to create the outlines is estimated following a flood and some inaccuracies may exist. However the layer serves a useful purpose to highlight to DDC, SNC and NBC that there are areas, outside the flood zone maps, that have previously experienced flooding.

**Local Flooding Hotspots**

The LLFA has provided this data which relates to known incidences of flooding within the respective authority areas. Flooding has been attributed to lack of capacity of structures, watercourses and areas where surface water and groundwater flooding is known to be an issue.
**Surface Water / Sewer Flooding**

Incidents of storm water flooding due to a lack of hydraulic capacity at key local sites provided to the LLFA by Anglian Water have been used. This is in the form of DG5 data.

**Flood Alert and Warning Layers**

Areas benefitting from an EA Flood Alert and Warning have been shown as a separate GIS layer. Emergency Planning Officers can use the flood warning layers in conjunction with the flood zone maps and flood defence information to assist in developing emergency plans for areas at risk of flooding within the study area.

**Reservoir Act (1975) Water Bodies**

A map displaying major water bodies falling under the regulation of the Reservoir Act has been provided. This can assist DDC, SNC and NBC in assessing sites immediately downstream of major water bodies.

**Flood Defence Infrastructure**

<table>
<thead>
<tr>
<th>Flood Defence Scheme</th>
<th>Standard of Defence / Capacity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weedon Flood Alleviation Scheme</td>
<td>50 year / 810,000 m³</td>
<td>Completed in late 2003, designed to alleviate flooding in the village of Weedon Bec. On-line (Dodford Mill) flood storage reservoir on a tributary of the Kislingbury Branch of the Nene at Dodford Mill, 1.5km upstream of Weedon Bec. Also has benefit to Northampton (to downstream) as it effectively reduces the flood peak.</td>
</tr>
<tr>
<td>Kislingbury Flood Alleviation Scheme</td>
<td>75 year</td>
<td>Work commenced on scheme in 2003. In the form of floodwalls and embankments to protect Kislingbury (to south bank of River Nene).</td>
</tr>
<tr>
<td>Towcester Flood Storage Reservoir</td>
<td>50 year / 105,000 m³</td>
<td>Impounding reservoir. Previous work undertaken by Royal Haskoning and Halcrow. Halcrow model held by Scott Wilson.</td>
</tr>
<tr>
<td>Clay Coton Flood Defence Embankment</td>
<td>-</td>
<td>Flood defence embankment on Clay Coton Brook to protect village of Clay Coton.</td>
</tr>
<tr>
<td>Yelvertoft Attenuation Area</td>
<td>-</td>
<td>Attenuation area at Crick Road in Yelvertoft. On line storage area on Yelvertoft Brook.</td>
</tr>
<tr>
<td>Everdon Mill Flood Defence Embankment</td>
<td>-</td>
<td>Structure on ordinary watercourse constructed as joint venture between riparian owner, DDC and EA. Protects three properties.</td>
</tr>
<tr>
<td>River Nene through Northampton post 1998 Flood Alleviation Scheme</td>
<td>&gt; 200 year</td>
<td>This scheme was completed in early 2003 comprising a series of concrete walls and earth embankments providing protection over and above the 200-year standard. It is expected that the Upton FSR is likely to further increase the schemes standard of service.</td>
</tr>
<tr>
<td>Northampton Washlands</td>
<td>3,400,000 m³</td>
<td>On the River Nene between Brackmills and Billing, to downstream of central Northampton. Washland inflows controlled by two sluices. Built in late 1970’s and reduces flood peak to downstream of Northampton.</td>
</tr>
<tr>
<td>Duston Flood Storage Reservoir</td>
<td>&gt; 200 year / 328,000 m³</td>
<td>Constructed to provide compensatory storage for additional runoff from large developments to south west (upstream) of Northampton.</td>
</tr>
</tbody>
</table>
Northampton. Off-line reservoir situated to south of Kislingbury branch of River Nene.

<table>
<thead>
<tr>
<th>Reservoir Name</th>
<th>Volume</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dallington Flood Storage Reservoir</td>
<td>50 year / 13,000 m³</td>
<td>Off-line reservoir constructed in 1980s to accommodate runoff from proposed upstream development (to 2000). Scheme is formed by a series of small on-line and off-line lakes between Kislingbury Nene confluence and A508 at Collingtree. Levels maintained by weirs at downstream ends. NBC consider the lakes as amenity lakes and not flood storage reservoirs. Two of five recommended runoff-balancing ponds on tributary to Wootton Brook (for Wootton Fields development) have been constructed to date. Those remaining will be implemented as part of the ongoing development proposals.</td>
</tr>
<tr>
<td>Wootton Brook</td>
<td>-</td>
<td>Scheme is formed by a series of small on-line and off-line lakes between Kislingbury Nene confluence and A508 at Collingtree. Levels maintained by weirs at downstream ends. NBC consider the lakes as amenity lakes and not flood storage reservoirs. Two of five recommended runoff-balancing ponds on tributary to Wootton Brook (for Wootton Fields development) have been constructed to date. Those remaining will be implemented as part of the ongoing development proposals.</td>
</tr>
<tr>
<td>Delapre Lake</td>
<td>-</td>
<td>Large on-line lake covering 14 ha (north east of Delapre Park). Discharges to Hardingstone Dyke. Potential significant flood peak attenuation.</td>
</tr>
<tr>
<td>Brackmills</td>
<td>-</td>
<td>Runoff retention lagoons and large pond. Discharge to Hardingstone Dyke.</td>
</tr>
<tr>
<td>The Bedford Road Lakes</td>
<td>-</td>
<td>Small redundant former sections of the River Nene. Minimal capacity within former channel of the River Nene, inflows / outflows controlled by sluices. Downstream of central Northampton.</td>
</tr>
<tr>
<td>Billing and Ecton Brooks</td>
<td>-</td>
<td>Series of on line ponds along both watercourses. Constructed for amenity.</td>
</tr>
<tr>
<td>Upton Flood Storage Reservoir</td>
<td>350,000 m³</td>
<td>Homes and Communities Agency owned and maintained. Scheme provides mitigation for the loss of floodplain capacity as a result of removing the development from the floodplain. Scheme will allow the regeneration of Sixfields, Ransome Road and Harvey Reeves Road (brownfield initiative sites) and also add further protection to Northampton.</td>
</tr>
</tbody>
</table>

Table 10: Key Flood Defence Measures
APPENDIX 4: GUIDANCE ON THE PREPARATION OF FRAS

Guidance for LPAs can be found on the National Government webpages in the guide on reviewing flood risk assessments.

Developers will usually need to pay a flood risk specialist to carry out the FRA. Planning applications can be refused by LPAs if a flood risk assessment is not satisfactory.

FRAs are required for most developments within one of the flood zones. This includes developments:

- in flood zone 2 or 3 including minor development and change of use
- more than 1 hectare (ha) in flood zone 1
- less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (e.g. from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water drains, reservoirs).

Standing advice

Developers should follow the Environment Agency’s standing advice if they are carrying out a flood risk assessment of a development classed as:

- a minor extension (household extensions or non-domestic extensions less than 250 square metres) in flood zone 2 or 3
- ‘more vulnerable’ in flood zone 2 (except for landfill or waste facility sites, caravan or camping sites)
- ‘less vulnerable’ in flood zone 2 (except for agriculture and forestry, waste treatment, mineral processing, and water and sewage treatment)
- ‘water compatible’ in flood zone 2

Developers also need to follow standing advice for developments involving a change of use into one of these vulnerable categories or into the water compatible category.

Information to support a Flood Risk Assessment

The following products or packages of information available from the Environment Agency may help to complete a flood risk assessment:

- product 1: Flood Map, including flood zones, defences and storage areas and areas benefiting from flood defences
- product 3: Basic Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations and some key modelled flood levels
- product 4: Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from our computer river models (including model extent, information on one or more specific points, flood levels, flood flows)
- product 5: reports, including flood modelling and hydrology reports and modelling guidelines
- product 6: Model Output Data, including product 5
- product 7: Calibrated and Verified Model Input Data
- product 8: Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard

Contact the Environment Agency to obtain this data and to find out if there is a charge for the product and the contact details of the local team that will deal with your request.

The following information is available from NCC as the LLFA:
Local Standards and guidance for surface water drainage in Northamptonshire, which should be incorporated into every FRA

- Historic flood events/hotspot data
- Asset Data
- Groundwater flooding
- Flood Map for Surface Water

More information about the charge for this data and the contact details of the team that will deal with your request is available on the Flood Toolkit.

Requirements for Flood Risk Assessments

The aim of an FRA is to demonstrate that the development is protected to the 1 in 100-year (1% AEP) event and is safe during the design flood event, including an allowance for climate change.

Upstream of Northampton this increases to 1 in 200-year (0.5% AEP), including an allowance for climate change. A plan of this area is available on the Flood Risk Map.

Where appropriate, the following aspects of flood risk should be addressed in all planning applications in flood risk areas:

- The area liable to flooding
- The probability of flooding occurring now and over time
- The extent and standard of existing flood defences and their effectiveness over time
- The likely depth of flooding
- The rates of flow likely to be involved
- The likelihood of impacts to other areas, properties and habitats
- The effects of climate change – based on the updated allowances (see Appendix 5 for more information)
- The nature and currently expected lifetime of the development proposed and the extent to which it is designed to deal with flood risk

Development proposals requiring FRAs should:

- Apply the Sequential approach
- Apply the Sequential Test and, when necessary, Exception Tests
- Not increase flood risk, either upstream or downstream, of the site, taking into account the impacts of climate change
- Not increase surface water volumes or peak flow rates, which would result in increased flood risk to the receiving catchments
- Use opportunities provided by new development to, where practicable, reduce flood risk within the site and elsewhere
- Ensure that where development is necessary in areas of flood risk (after application of Sequential and Exception Tests), it is made safe from flooding for the lifetime of the development, taking into account the impact of climate change
- All sources of flood risk, including fluvial, surface water, groundwater, reservoir and drainage need to be considered.

FRAs should follow government guidance on development and flood risk, complying with the approach recommended by the NPPF (and its associated guidance) and guidance provided by the Environment Agency.

The NPPF advocates a risk-based approach to flood risk management in terms of appraising, managing and reducing the consequences of flooding both to and from a development site.
In circumstances where FRAs are prepared for windfall sites then they should include evidence that demonstrates the proposals are in accordance with the policies described in the Local Plan.

**Finished floor levels**

Where possible, the finished floor levels (lowest floor level) should be raised above the predicted flood level to prevent the ingress of flood water. For fluvial flooding in the upper Nene catchment this should generally be 300mm above the 1% (1 in 100) probability flood level and 300mm above the 0.5% (1 in 200), including an allowance for climate change (see Appendix 5 for more information).

In the West Midlands area, the finished floor levels should be no lower than 600mm above the 100 year, including an allowance for climate change (see Appendix 5 for more information).

For single storey residential development (bungalows and ground floor flats), finished floor levels should be set 300mm above the 0.1% (1 in 1000) annual probability flood event, including an allowance for climate change (see Appendix 5 for more information).

**Modifying ground levels**

In most areas of fluvial flood risk, developments which propose to raise land levels above the floodplain risk reducing conveyance or flood storage and this could adversely impact flood risk upstream, downstream or on neighbouring land.

In such cases, details of compensatory flood storage should be provided as part of an FRA. It is expected that this will be on a level for level, volume for volume basis to ensure that there is no loss in flood storage capacity, and on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated).

Raising ground levels can also deflect flood flows, so appropriate assessment should be performed to demonstrate that there are no adverse effects on third party land.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to ensure that it would not cause increased ponding or build-up of surface runoff on third party land.
APPENDIX 5: GUIDANCE ON CLIMATE CHANGE ALLOWANCES

**Climate Change Allowances**

The National Planning Policy Framework (NPPF) sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. NPPF and supporting planning practice guidance on Flood Risk and Coastal Change explain when and how flood risk assessments should be used. This includes demonstrating how flood risk will be managed now and over the development’s lifetime, taking climate change into account. Local planning authorities refer to this when preparing local plans and considering planning applications.

Making an allowance for climate change in your flood risk assessment will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. The climate change allowances are predictions of anticipated change for:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

**Climate change allowances update**

On 19th February 2016, the Environment Agency published new guidance on the climate change allowances that should be used in the assessment of flood risk. This guidance can be found on the GOV.UK website.

For assessment of rainfall intensity allowances, Table 2 of the guidance provides two allowances based on central and upper end predictions of climate change impacts.

**Climate change allowances for rainfall**

Under the new guidance, for development with a design life to 2060-2115, NCC expects that all developers should design the surface water attenuation on site to accommodate the +20% climate change allowance, and undertake a sensitivity analysis to understand the flooding implications of the +40% climate change allowance.

If the implications are significant, i.e. the site could flood existing development (by allowing additional flow of runoff from the site) or put people at risk (as a result of increased hazard levels within or off the site), then a view may be taken to provide more attenuation within the drainage design up towards the +40% allowance, or to provide additional mitigation, for example a higher freeboard to ensure no risk to third parties/onsite users for the +40% allowance. This will tie into existing principles for designing for exceedance. NCC may also request that the +40% allowance is accounted for on development sites which could have a direct impact on sites of known flood risk, where no other mitigation is proposed.

This climate change guidance needs to be considered in the FRA/drainage design for all developments submitted for planning permission on and after 19th February 2016, even if the technical work was completed in advance of this date.

**Climate change allowances for fluvial flooding**

To ensure that the appropriate climate change allowances are considered within a site-specific flood risk assessment for fluvial flood risk matters, it is recommended that developers consult directly with the Environment Agency.
**Northampton standards of protection**

Following the significant flooding to Northampton town centre in Easter 1998 improvements were made to the defences along the River Nene. In order to secure the level of protection afforded by the new defence the Environment Agency agreed with the West Northants Joint Planning Unit that the standards set for new development should be improved.

Therefore all new development in the Upper Nene catchment (see Image 12) should be designed for a flood with a 0.5% probability (1 in 200 chance) occurring in any year, including the appropriate allowance for climate change as described above. This includes design of mitigation for Main River flooding and any surface water attenuation. This applies across the whole of the Upper Nene catchment including all branches and arms of the Nene, upstream of Billing Aquadrome, and all tributaries such as Wootton Brook, Dallington Brook and Bugbrooke Brook. If the outfall of the attenuation facility is likely to be submerged in a 0.5% (1 in 200 chance) rainfall event then within 24 hours of top water level being attained in a 0.5% (1 in 200) probability flood event the regulation facility must be capable of storing 80% of the additional run-off arising from a 10% (1 in 10) probability flood.

Image 12: Northampton Standards of Protection Area